February 26, 2019

Ms. Alicia Barraza
Project Manager, Environmental Remediation
New York State Department of Environmental Conservation
625 Broadway, 12th Floor
Albany, New York 12233-7016

Re: Supplemental Design Investigation Work Plan
Former Watermark Designs Facility (BCP Site No. C224139)
491 Wortman Avenue, Brooklyn, NY 11208
Langan Project No.: 170329301

Dear Ms. Barraza:

Langan Engineering, Environmental, Survey, Landscape Architecture and Geology, D.P.C. (Langan) presents this Supplemental Design Investigation Work Plan (SDIWP) on behalf of J&H Holding Co. (the Participant) for the property located at 491 Wortman Avenue in Brooklyn, New York (the Site). Since issuance of a Certificate of Completion (COC) on October 24, 2017, the Participant has operated and maintained the air sparge/soil vapor extraction (AS/SVE) system in accordance with the New York State Department of Environmental Conservation (NYSDEC)-approved Remedial Action Work Plan (RAWP) and Site Management Plan (SMP).

The existing AS/SVE system has proven to be an effective method of remediating chlorinated solvent impacts in soil and groundwater for the majority of the Site. This proposed Supplemental Design Investigation (SDI) will investigate the nature and extent of remaining off-site environmental impacts near the northwest portion of the Site (i.e., around MW-6) and collect design data to assess if and how the existing AS/SVE system could be modified to more effectively remediate the Site.

SITE BACKGROUND

The Site consists of a rectangular-shaped lot that encompasses an area of about 79,000 square feet and is identified as Block 4384, Lots 31 and 36 on the Borough of Brooklyn Tax Map. A Site Location Plan is included as Figure 1. During previous environmental subsurface investigations, chlorinated volatile organic compounds (CVOCs) were detected in soil and groundwater samples collected from the western portion of the Site (i.e., the warehouse). The CVOCs are associated with a known historical chlorinated solvent release. J&H Holding Co. enrolled the site into the New York State Brownfield Cleanup Program (NYSBCP) as a Participant in October 2012.

Subsequent to issuance of a COC in October 2017, quarterly monitoring data collected over a two-year period demonstrated sustained remedial effectiveness and Site-wide reduction of CVOCs. On February 24, 2018, the AS/SVE system was temporarily shut down and short- and long-term contaminant rebound tests were performed. The rebound tests demonstrated sustained reduction of CVOCs at the Site. On November 12, 2018 a Remediation System Decommissioning Request Letter was sent to the NYSDEC requesting approval to decommission the AS/SVE system and transition the Site to long-term operation, maintenance, and protection of engineering controls to manage residual contamination and mitigate vapor intrusion. On December 26, 2018, the NYSDEC responded recommending continued operation of the AS/SVE system and continued groundwater monitoring based on residual CVOC contamination in MW-6. The intent for the SDI is to collect data to assess if and how the existing AS/SVE system should be modified to more effectively remediate CVOC impacts at MW-6, and to determine if the observed impacts at MW-6 are due to an offsite source.

SCOPE OF WORK

The SDI will adhere to the existing Site-specific Quality Assurance Project Plan, Health and Safety Plan (Appendix A), and include the following:

Soil Borings and Sampling

- The advancement of three soil borings (SB-17, SB-18, and SB-19) to depths of up to 40 feet below ground surface (bgs); and
- Collection of up to one grab sample (including quality assurance/quality control [QA/QC] samples) from each soil boring for laboratory analysis.

Monitoring Well Installation and Sampling

- The installation and development of four permanent monitoring wells (MW-17, MW-18S, MW-18M, and MW-19) co-located with soil borings;
- Surveying and gauging of existing and newly-installed monitoring wells to evaluate groundwater flow;
- Groundwater sampling of 14 new and existing monitoring wells (MW-1, MW-2, MW-3AS, MW-6, MW-7, MW-9, MW-10, MW-11, MW-16, PZ-2, MW-17, MW-18S, MW-18M, and MW-19).

SOIL INVESTIGATION

Soil Boring Installation

A drilling subcontractor will advance three soil borings (SB-17, SB-18, and SB-19) to depths of up to 40 feet bgs at off-site locations in the vicinity of MW-6. A plan illustrating the proposed boring locations is included as Figure 2.

The soil borings will be hand-cleared to 5 feet and then advanced using direct-push drilling technology. The direct-push drill rig will be equipped with a closed-point MacroCore sampler or dual-tube sampling system to prevent the collapse of sidewall material in the borings. A Langan field engineer, scientist, or geologist will document the work, screen soil samples for environmental impacts, and collect representative soil samples impacted material is observed. Soil will be screened continuously to the boring termination depth for organic vapors with a photoionization detector (PID) equipped with a 10.6 electron volt (eV) bulb and for visual and olfactory evidence of environmental impacts. Soil will be visually classified for color, grain size, texture, and moisture content, and will be recorded in a field log. Non-disposable, down-hole drilling equipment and sampling apparatus will be decontaminated between locations with Alconox® and water. Soil cuttings will be returned to each borehole unless gross-contamination is observed. Grossly-contaminated material will be containerized in United Nations/Department of Transportation (UN/DOT)-approved 55-gallon drums, labeled, and staged for future off-site disposal.

Soil Sampling and Analysis

Up to one grab soil sample will be collected per soil boring location from the interval exhibiting the greatest degree of contamination, where observed, based on the presence of staining, odor, and/or PID readings above background level. If no evidence of contamination is observed within a given boring, a soil sample will not be collected from it. The samples will be collected in laboratory-supplied containers and will be sealed, labeled, and placed in an ice-chilled cooler for delivery to a New York State Department of Health (NYSDOH) Environmental Laboratory Approval Program (ELAP)-certified laboratory. Soil samples will be analyzed for Target Compound List (TCL) volatile organic compounds (VOCs) by the United States Environmental Protection Agency (USEPA) methods 8260C/5035.

Additionally, up to two total in-situ soil samples will be collected from the soil boring locations for visual assessment for AS/SVE design parameters. One sample will be collected above the water table and another will be collected below the water table.

GROUNDWATER INVESTIGATION

Monitoring Well Installation

Four permanent groundwater monitoring wells will be installed during the investigation. A plan illustrating the proposed monitoring well locations is included as Figure 2.

Three of the monitoring wells (MW-17, MW-18S, and MW-19) will be screened across the observed water table (approximately 10 feet bgs). Monitoring well MW-18M (co-located with MW-18S) will be screened from approximately 30 to 40 feet bgs. Monitoring wells will consist of 2-inch diameter, threaded, flush-joint, polyvinyl chloride (PVC) casing, and 0.01-inch slot well screens. Clean sand (e.g., No. 1 or No. 2) will be used to fill the annulus around the screen up to two feet above the top of the screened interval. A two-foot bentonite seal will be installed above

the sand and the borehole annulus will be grouted to the surface with bentonite/cement slurry. The monitoring well will be finished with a flush-mount, bolt-down manhole set into concrete slab.

After installation, the monitoring wells will be developed by surging either a weighted bailer or surge block across the well screen to agitate and remove fines. After surging, wells will be purged until water quality parameters (pH, conductivity, turbidity, dissolved oxygen, temperature, and oxidation-reduction potential) stabilize to the extent practicable. Groundwater samples will be collected at least 48-hours after well development is completed.

Groundwater Sampling and Analysis

Groundwater samples will be collected in general accordance with NYSDEC DER-10 and USEPA's Low Flow Purging and Sampling Procedures for the Collection of Groundwater Samples from Monitoring Wells. The groundwater samples will be collected using a submersible pump (or equivalent) and dedicated polyethylene tubing. Monitoring wells will be gauged and then continuously purged until groundwater quality parameters stabilize to the extent practical, at which point groundwater samples will be collected. A multi-parameter water quality system (Horiba U-52) will be used to monitor and record groundwater quality parameters. Monitoring wells will be gauged with an interface probe to determine depth to groundwater and thickness of any light non-aqueous phase liquid (LNAPL) or dense non-aqueous phase liquid (DNAPL). The pump will be decontaminated with Alconox® and water between each sampling location. Development and purge water will be containerized into UN/DOT-approved 55-gallon drums, labeled, and staged for future off-site disposal.

The SDI groundwater sampling event will be conducted concurrent to the next quarterly groundwater sampling event (proposed for late February or early March 2019). In addition to sampling the newly installed wells (MW-17, MW-18S, MW-18M, and MW-19), sampling will also include: MW-1, MW-2, MW-3AS, MW-6, MW-7, MW-9, MW-10, MW-11, MW-16 and PZ-2. Groundwater samples will be collected directly into laboratory-supplied containers and will be sealed, labeled, and placed in an ice-chilled cooler for delivery to a NYSDOH ELAP-certified laboratory. Groundwater samples will be analyzed for TCL VOCs by the USEPA methods 8260C.

REPORTING

Following completion of the Supplemental Design Investigation, Langan will prepare and submit a Supplemental Design Investigation Report presenting the sampling methodology, observations, boring logs, groundwater sampling logs, analytical results, conclusions, and recommendations for any further assessment or remedial action, as warranted.

If you have any questions, please call me at 212-479-5413.

Sincerely,

Langan Engineering, Environmental, Surveying, Landscape Architecture and Geology, D.P.C.

Gerald F. Nicholls

Gerald Nicholls, PE, CHMM
Associate

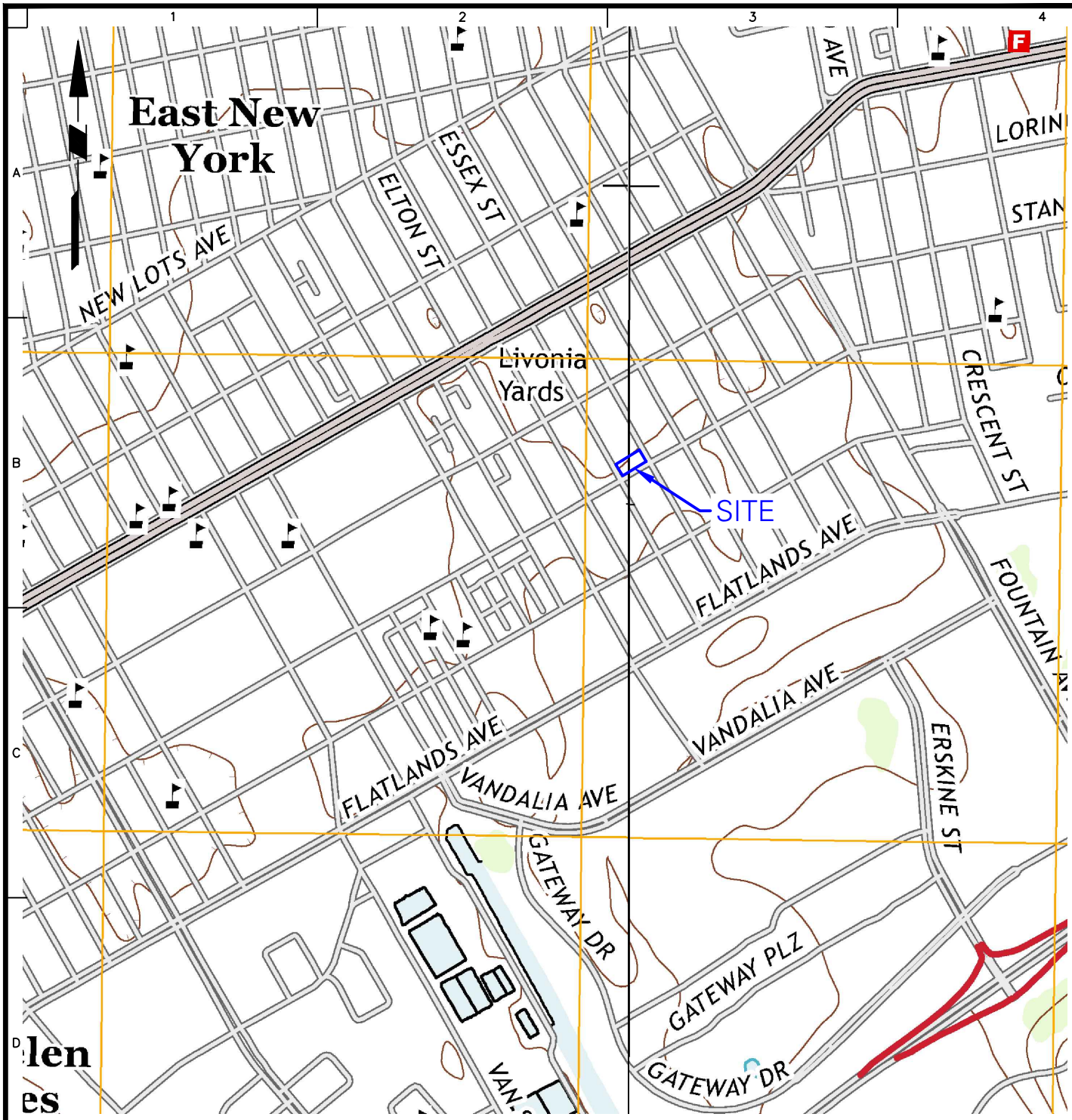
Michael D. Burke

Michael D. Burke, PG, CHMM
Principal/Vice President

cc: G. Nicholls, J. Robinson (Langan)

Enclosures: Figure 1 – Site Location Map
Figure 2 – Supplemental Sample Location Plan
Appendix A – Health and Safety Plan

FIGURES



LEGEND:

APPROXIMATE SITE BOUNDARY

1000 0 500 1000

SCALE IN FEET

WARNING: IT IS A VIOLATION OF THE NYS EDUCATION LAW ARTICLE 145 FOR ANY PERSON, UNLESS HE IS ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER, TO ALTER THIS ITEM IN ANY WAY.

NOTE: BASE MAPS ARE REFERENCED FROM THE UNITED STATES GEOLOGICAL SURVEY (USGS) TOPOGRAPHIC QUADRANGLE MAPS FOR BROOKLYN AND JAMAICA.

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Project
FORMER WATERMARK DESIGNS FACILITY
BLOCK No. 4384, LOT Nos. 31 & 36
BROOKLYN
KINGS COUNTY NEW YORK

Figure Title
SITE LOCATION MAP

Project No.	170329301
Date	02/09/2019
Drawn By	WK
Checked By	GN

Figure No. 1

Sheet 1 of 2

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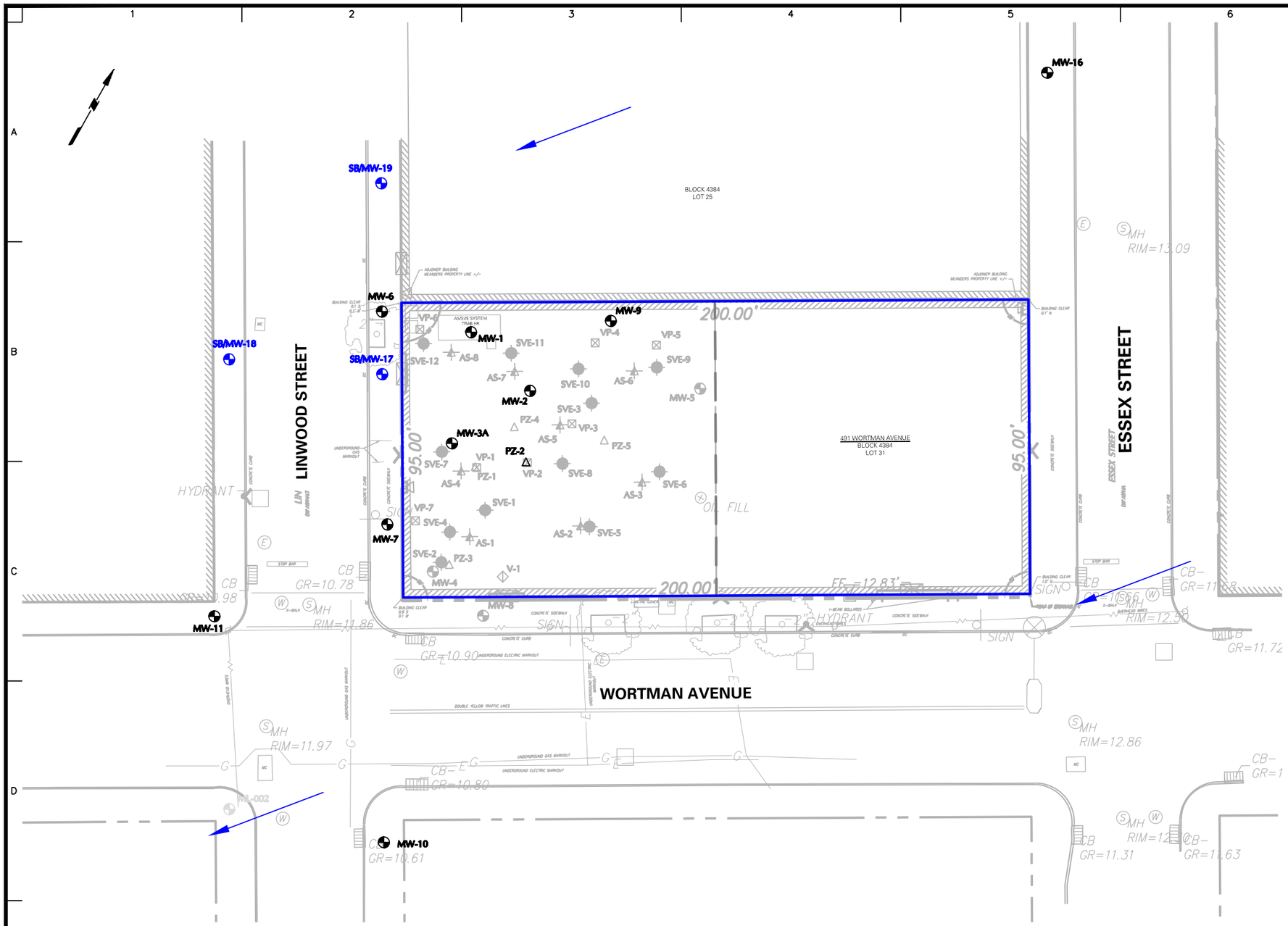

LEGEND:

- APPROXIMATE SITE BOUNDARY
- APPROXIMATE TAX LOT BOUNDARY
- AS-8 — PREVIOUSLY INSTALLED AIR SPARGE WELL LOCATION AND ID
- SVE-10 — PREVIOUSLY INSTALLED SOIL VAPOR EXTRACTION WELL LOCATION AND ID
- VP-5 — PREVIOUSLY INSTALLED VAPOR PROBE LOCATION AND ID
- V-2 — PREVIOUSLY INSTALLED VENT WELL LOCATION AND ID
- PZ-5 — PREVIOUSLY INSTALLED PIEZOMETER LOCATION AND ID (BLACK IF INCLUDED IN SDI SAMPLING EVENT)
- MW-5 — PREVIOUSLY INSTALLED MONITORING WELL LOCATION AND ID (BLACK IF INCLUDED IN SDI SAMPLING EVENT)
- SB/MW-17 — PROPOSED SUPPLEMENTAL SOIL BORING/MONITORING WELL LOCATION AND ID
- INFERRED GROUNDWATER FLOW

NOTES:

1. BASE MAP SOURCE: 491 WORTMAN AVENUE BOUNDARY SURVEY PREPARED BY LANGAN ENGINEERING, SURVEY, LANDSCAPE ARCHITECTURE AND GEOLOGY, D.P.C., DATED NOVEMBER 2, 2015.
2. NORTH ARROW SHOWS TRUE NORTH.
3. THE INFERRED GROUNDWATER FLOW IS BASED ON DEPTH-TO-GROUNDWATER MEASUREMENTS TAKEN ON SEPTEMBER 16, 2016.

WARNING: IT IS A VIOLATION OF THE NYS EDUCATION LAW ARTICLE 145 FOR ANY PERSON, UNLESS HE IS ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER, TO ALTER THIS ITEM IN ANY WAY.

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SCALE IN FEET

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Project
FORMER WATERMARK DESIGNS FACILITY
BLOCK No. 4384, LOT Nos. 31 & 36
BROOKLYN
KINGS NEW YORK

Figure Title
SUPPLEMENTAL SAMPLE LOCATION PLAN
SUPPLEMENTAL DESIGN INVESTIGATION WORK PLAN

Project No.	170329301
Date	02/19/2019
Drawn By	WK
Checked By	GN

Figure No. 2

Sheet 2 of 2

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APPENDIX A

HEALTH AND SAFETY PLAN

HEALTH AND SAFETY PLAN

for

491 Wortman Avenue
Block 4384, Lots 31 & 36
Brooklyn, New York

Prepared For:

J&H Holding Company, LLC
350 DeWitt Avenue
Brooklyn, New York 11207

Prepared By:

Langan Engineering, Environmental, Surveying and Landscape Architecture, D.P.C.
21 Penn Plaza
360 West 31st Street, 8th Floor
New York, New York 10001

April 28, 2015
Revised June 16, 2015
Revised November 28, 2016
Revised March 27, 2017

170329301

LANGAN

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APPENDICES

1.0 INTRODUCTION

1.1 General

This Site-Specific Health and Safety Plan (HASP) has been developed by Langan Engineering, Environmental, Surveying and Landscape Architecture, D.P.C. (Langan) to comply with Occupational Safety and Health Administration (OSHA) Standard 29 CFR 1910.120(b)(4), Hazardous Waste Operations and Emergency Response (HAZWOPER). The plan addresses operation, maintenance, and monitoring (OM&M) of the air sparge and soil vapor extraction (AS/SVE) system installed at 491 Wortman Avenue in Brooklyn, New York.

This HASP is to be implemented by Langan personnel throughout the operational lifetime of the AS/SVE system. Compliance with this HASP is required of all Langan personnel who enter the Site. The management of the day-to-day activities concerning this site and implementation of this HASP in the field is the responsibility of the site Health and Safety Officer (HSO). Assistance in the implementation of this HASP can also be obtained from the Langan Health and Safety Manager (HSM). The content of this HASP may change or undergo revision based upon additional information made available to health and safety personnel, monitoring results, or changes in the scope of work. Any changes proposed must be reviewed by Health and Safety staff and are subject to the approval of the Langan HSM. The OSHA Right-To-Know fact sheet is included in Appendix A.

1.2 Objectives

Langan's primary responsibility is to operate, maintain, and monitor the full-scale AS/SVE system installed in the western portion (i.e. the warehouse) of the existing one-story building. Environmental sampling will be conducted as part of the ongoing AS/SVE system OM&M.

The full scale AS system consists of eight air sparge wells organized into two legs (Leg 1 and 2) and connected to a main air sparge header pipe that extends to the process equipment (i.e., an air compressor) inside the equipment enclosure. The air sparge well network includes AS-1, which was installed during the pilot test, and eight recently installed air sparge wells (AS-2 through AS-8). A network of piezometers is located throughout the warehouse to monitor the AS system and if necessary, act as a passive pathway to mitigate injected air buildup. The piezometer network includes the piezometers previously installed during the pilot test (PZ-01, PZ-02 and PZ-03) and two recently installed piezometers (PZ-04 and PZ-05).

The full scale SVE system consists of twelve SVE wells organized into two legs (Leg 1 and 2) and connected to a main SVE header pipe that extends to the process equipment located inside the equipment enclosure. The process equipment includes a vacuum blower, moisture

separator, and two vapor-phase granular activated carbon (VGAC) units arranged in series. The VGAC units are located outside of the equipment enclosure. The SVE well network includes SVE-01 through SVE-03, which were installed during the pilot test and nine recently installed SVE wells (SVE-04 through SVE-12). A network of seven vapor probes (five pre-existing and two recently installed) and two recently installed vent wells is located throughout the warehouse to monitor the vacuum influence and to prevent the buildup of high vacuum/low flow air conditions, respectively.

During OM&M of the AS/SVE system, quarterly groundwater samples and monthly soil vapor samples will be collected to monitor the performance of the full scale AS/SVE system.

The full scale AS/SVE system is housed in the western portion of the on-site building (i.e., the warehouse), which is currently used as a warehouse to store sound equipment. The eastern portion of the existing one-story building, which is mainly comprised of office space, is currently unoccupied. During remediation, which includes AS/SVE system OM&M, non-workers will not have access to the building.

1.3 Roles and Responsibilities

The following briefly describes the health and safety (H&S) designations and general responsibilities which may be employed for this phase of work. The titles have been established to accommodate the site requirements in order to ensure the safe conduct of on-site work. The number and type of H&S personnel for a given work location is to be based upon the particular H&S requirements relative to the proposed site activities or operations.

1.3.1 Project Manager

The Project Manager (PM) has overall responsibility to ensure that personnel working on-site are safe. The specific responsibilities of the Project Manager include:

- Ensuring that the HASP is developed prior to the field work or site visit;
- Reviewing and approving the HASP prior to the field work or site visit;
- Ensuring employee understanding of and compliance with the HASP; and
- Ensuring that project tasks are performed in a manner consistent with Langan's comprehensive *Health and Safety Program for Hazardous Waste Operations* and the HASP.

1.3.2 Corporate Health and Safety Manager

The corporate health and safety manager (HSM) provides guidance to the Project Manager and

health and safety officer (HSO) on HASP preparation and reviews and approves the HASP. The specific responsibilities of the corporate health and safety manager include:

- Serving as a resource in the development and implementation of HASPs;
- Providing guidance and serving as a resource to the Langan HSO;
- Assisting the HSO with development of the HASP, updating HASP as dictated by changing conditions, jobsite inspection results, etc.;
- Assisting the HSO to conduct jobsite safety Inspections and assisting with the correction of shortcomings found;
- Ensuring training requirements are satisfied in a timely manner;
- Ensuring medical evaluations of Langan personnel are current; and
- Maintaining records on personnel (medical evaluation results, training and certifications, accident investigation results, etc.).

1.3.3 Health and Safety Officer

The health and safety officer (HSO) is responsible and authorized to implement this HASP and verify compliance. The HSO reports to the PM and is on-site or readily accessible to the site during all work operations. The HSO is responsible for assessing site conditions and direction and controlling emergency response activities. The specific responsibilities of the HSO include the following:

- Participating in the development and implementation of this HASP;
- Conducting jobsite safety inspections and correcting any shortcomings in a timely manner;
- Helping to select proper PPE (Personal Protective Equipment) and periodically inspecting it;
- Ensuring that PPE is properly stored and maintained;
- Controlling entry into and exit from the contaminated areas or zones of the site;
- Monitoring the work parties for signs of stress, such as heat stress, fatigue, and cold exposure;
- Monitoring site hazards and conditions;
- Knowing (and ensuring that all site personnel also know) emergency procedures, evacuation routes, and the telephone numbers of the ambulance, local hospital, poison control center, fire department, and police department; and
- Resolving conflicting situations which may arise concerning safety requirements and working conditions.

1.3.4 Key Personnel and Contact Information

Title	Name	Affiliation	Work Telephone	Cell Phone
Project Manager	Gerald Nicholls	Langan	212-479-5559	609-933-5330
HSO	Michele Rogers	Langan	212-479-5429	973-896-9277
HSM	Tony Moffa	Langan	212-491-6545	212-756-2523
N/A	Incident/Injury Hotline	Langan	201-398-4699	N/A
Site Contact	Michele Rogers	Langan	212-479-5429	973-896-9277
Client Contact	Jack Abel	J&H Holding Company, LLC	(718) 257-2800	N/A

1.3.5 Subcontractor Responsibilities

Each subcontractor shall develop and implement their own HASP, which identifies a lead individual responsible for H&S compliance for each of their employees, lower-tier subcontractors, and consultants. The subcontractor's HASP will be at least as stringent as this Langan HASP. The subcontractor must be familiar with and abide by the requirements outlined in their own HASP. A subcontractor may elect to adopt Langan's HASP as its own provided that it has given written notification to Langan, but where Langan's HASP excludes provisions pertinent to the subcontractor's work (i.e., confined space entry); the subcontractor must provide written addendums to this HASP. Additionally, the subcontractor must:

- Ensure their employees are trained in the use of all appropriate PPE for the tasks involved;
- Notify Langan of any hazardous material brought onto the job site, the hazards associated with the material, and must provide a MSDS for the material;
- Have knowledge of, understand, and abide by all current federal, state, and local health and safety regulations pertinent to the work;
- Ensure their employees have received current training in the appropriate levels of 29 CFR 1910.120, HAZWOPER;
- Ensure their employees have been medically cleared to work in Hazardous Waste Sites and to wear a respirator, if necessary;
- Ensure their employees have been fit-tested within the year on the type respirator they will wear; and
- Ensure that its employees have been briefed on this HASP and have signed the HASP Compliance Agreement.

2.0 EMERGENCY RESPONSE PLAN

The following section discusses emergency recognition and prevention and emergency response and notification. Emergency situations include, but are not limited to, injury or chemical exposure to personnel, fire or explosion, environmental release, or serious weather conditions.

2.1 Emergency Prevention, Recognition, Response and Notification

It is the responsibility of all personnel to monitor work at the Site for potential safety hazards. All personnel are required to immediately report any unsafe conditions to the HSO. The HSO is responsible to immediately take steps to remedy any unsafe conditions observed at the Site.

If an emergency at the Site warrants evacuation, all personnel shall immediately evacuate the affected area, report to the predetermined emergency assembly location, and then report the emergency to the HSO. The predetermined emergency assembly location will be at the **southeast corner of Linwood Street and Wortman Avenue**.

In case of injury, field personnel should take precautions to protect the victim from further harm, immediately administer emergency first aid (as necessary), and notify local or facility emergency services and the HSM immediately. Emergency medical care will be provided by the FDNY/NYPD.

All work-related incidents, injuries of any personnel (e.g., Langan employees, subcontractors, property owners, visitors, etc.) associated with field activities, and near-misses and all property damage and injuries must immediately be reported to the Langan Incident/Injury Hotline. The affected employee and the HSO must complete and submit the Employee Exposure/Injury Incident Report (Appendix B) as soon as possible following the incident.

In all situations when an on-site emergency results in an evacuation, Langan personnel shall not re-enter until:

- The conditions resulting in the emergency have been corrected;
- The hazards have been reassessed;
- This HASP has been reviewed and revised, as necessary; and
- Langan field personnel have been briefed on changes to this HASP.

2.2 Hospital Route Map

In case of emergency, the nearest hospital to the Site is Brookdale University Hospital located

at 1235 Linden Blvd, Brooklyn, New York. A route map to the hospital is provided as Figure 1.

Directions to Brookdale University Hospital

START: 491 Wortman Avenue, Brooklyn, NY 11208

1. Head southwest on Wortman Avenue toward Linwood Street
2. Turn right onto Ashford Street
3. Turn left at the second cross street onto Linden Blvd
4. Keep left to stay on Linden Blvd

END: 1235 Linden Boulevard, Brooklyn, NY 11212

2.3 Emergency Contact Information

Local Resource	Name	Telephone
Fire	FDNY	911
Police	NYPD	911
Ambulance	FDNY	911
Hospital	Brookdale Hospital: Radutzky Emergency Department	718-240-5363
Poison Control Center	N/A	1-800-222-1222

3.0 SITE LOCATION AND BACKGROUND

The Site (Block 4384, Lots 31 & 36) is located at 491 Wortman Avenue in Brooklyn, New York and consists of a rectangular shaped lot that is approximately 19,000 square feet (±0.44 acres). The Site is located in an area zoned for industrial/manufacturing use and is bounded by Wortman Street to the south, Linwood Street to the west, Essex Street to the east, and a one-story building to the north. Currently, a one-story building with a partial basement covers the entire Site footprint.

The Site is located in an area of historical industrial and manufacturing usage. The Site has been used for industrial purposes since as early as 1928; most recently operating as a decorative fixture and hardware manufacturer from approximately 1984 to 2007 when the operation was moved off-site to a new facility. Based on previous environmental investigations conducted at the Site, it is evident that inadvertent releases of chlorinated solvents, used during the manufacturing process and stored in the warehouse, have adversely impacted the soil, groundwater, and soil vapor.

Multiple environmental investigations conducted from 2008 to 2013 identified the chlorinated solvents trichloroethene (TCE) and tetrachloroethene (PCE) as the primary contaminants of concern (COCs) in the soil, groundwater, and soil vapor beneath the Site. Due to the on-site presence of TCE and PCE, the Site was entered into the New York State Department of Environmental Conservation (NYSDEC) Brownfield Cleanup Program (BCP) as a Participant in October 2012 and was assigned Site Number C224139.

4.0 SCOPE OF WORK

4.1 Task Descriptions

AS/SVE system OM&M activities include system operation, site checks/inspections, routine (scheduled) or unscheduled maintenance, material change-outs, and system monitoring, optimization, and troubleshooting.

Task #1 - Groundwater Sampling

The location and elevations of all recently installed and existing wells (top of casing) and nearby ground surface were surveyed by a licensed NYS surveyor.

Quarterly On-Site Groundwater Monitoring

Groundwater samples will be collected for laboratory analysis from eleven groundwater monitoring wells and two piezometers quarterly during the operational lifetime of the AS/SVE system. Groundwater samples will be collected in general accordance with the NYSDEC DER-10 Technical Guidance for Site Investigation and Remediation (May 2010) and the United States Environmental Protection Agency's (USEPA's) Low Flow Purging and Sampling Procedures for the Collection of Groundwater Samples from Monitoring Wells. Groundwater samples will be analyzed for TCL VOCs by a NYSDOH ELAP-certified laboratory. The groundwater samples will be collected using a submersible pump (Grundflos Redi-Flo or equivalent) connected to Teflon-lined polyethylene tubing. Before the groundwater samples are collected, wells will be gauged and then continuously purged until all groundwater quality parameters (pH, conductivity, turbidity, dissolved oxygen, temperature, and oxidation-reduction potential) have stabilized, to the extent practicable, in accordance with the USEPA Low Flow Procedures. A multi-parameter water quality system (YSI 6920 or equivalent) will be used to monitor the groundwater quality parameters. Stabilization is achieved when three consecutive readings of all parameters, to the extent practicable, are within the limits specified in the USEPA Low Flow Procedures. Deviations from the stabilization and drawdown criteria, if any, should be noted on the sampling logs. Purged groundwater will be containerized in properly labeled 55-gallon steel drums and stored on-site prior to off-site disposal.

For quality assurance/quality control (QA/QC) purposes, one duplicate sample, one field blank, and one trip blank will be collected and submitted for laboratory analysis during each round of groundwater sampling. The sample containers will be labeled, placed in a laboratory-supplied cooler, packed with ice to maintain a temperature of 4°C, and transported via laboratory courier to a NYSDOH ELAP-certified laboratory for analysis. As previously stated, groundwater samples will be analyzed for TCL VOCs by EPA Method 8260.

Semi-Annual Off-Site Groundwater Monitoring

Groundwater samples will be collected for laboratory analysis from five groundwater monitoring wells semi-annually during the operational lifetime of the AS/SVE system. Groundwater samples will be collected in general accordance with the NYSDEC DER-10 Technical Guidance for Site Investigation and Remediation (May 2010) and the USEPA's Low Flow Purging and Sampling Procedures for the Collection of Groundwater Samples from Monitoring Wells. Groundwater samples will be analyzed for TCL VOCs by a NYSDOH ELAP-certified laboratory. The groundwater samples will be collected using a submersible pump (Grundflos Redi-Flo or equivalent) connected to Teflon-lined polyethylene tubing. Before the groundwater samples are collected, wells will be gauged and then continuously purged until all groundwater quality parameters (pH, conductivity, turbidity, dissolved oxygen, temperature, and oxidation-reduction potential) have stabilized, to the extent practicable, in accordance with the USEPA Low Flow Procedures. A multi-parameter water quality system (YSI 6920 or equivalent) will be used to monitor the groundwater quality parameters. Stabilization is achieved when three consecutive readings of all parameters, to the extent practicable, are within the limits specified in the USEPA Low Flow Procedures. Deviations from the stabilization and drawdown criteria, if any, should be noted on the sampling logs. Purged groundwater will be containerized in properly labeled 55-gallon steel drums and stored on-site prior to off-site disposal.

For QA/QC purposes, one duplicate sample, one field blank, and one trip blank will be collected and submitted for laboratory analysis during each round of groundwater sampling. The sample containers will be labeled, placed in a laboratory-supplied cooler, packed with ice to maintain a temperature of 4°C, and transported via laboratory courier to a NYSDOH ELAP-certified laboratory for analysis. As previously stated, groundwater samples will be analyzed for TCL VOCs by EPA Method 8260.

Task #2 - Soil Vapor Sampling

The location and elevations of all existing and recently installed vapor probe locations (top of casing) and nearby ground surface were surveyed by a licensed NYS surveyor.

Monthly Vapor Sampling

Vapor samples will be collected at the inlet of the vapor collection system blower and at individual vapor collection wellheads on a monthly basis during the system routine operation. The monthly vapor sampling will be performed using a handheld PID. Vapor samples prior to the lead VGAC unit and after the lag VGAC unit will also be collected for VOC analysis via USEPA Method TO-15.

Vapor samples will be collected into laboratory-cleaned and batch-certified 2.7-liter, stainless

steel Summa® canisters with regulators calibrated for a sampling rate of 0.02 L/min for a two-hour sampling interval. A laboratory-provided courier will transport the soil vapor samples to a NYSDOH ELAP-certified laboratory under standard chain-of-custody protocol for analysis of VOCs via USEPA Method TO-15.

DAR-1 Compliance Monitoring

Compliance monitoring will be conducted to verify compliance with Policy DAR-1: Guidelines for the Control of Toxic Ambient Air Contaminants. Typically, air emissions are periodically sampled during routine site checks using a handheld PID at the outlet of the vapor collection blower and between the two VGAC units to evaluate concentration breakthrough and to monitor the discharge vapor concentrations. In addition, vapor samples will be collected from system effluent for laboratory analysis of VOCs via USEPA Method TO-15 in accordance with DAR-1. It is anticipated that vapor discharge monitoring will be performed during the initial startup of the system, weekly for the first three months, and monthly thereafter.

Vapor samples will be collected into laboratory-cleaned and batch-certified 2.7-liter, stainless steel Summa® canisters with regulators calibrated for a sampling rate of 0.02 L/min for a two-hour sampling interval. A laboratory-provided courier will transport the soil vapor samples to a NYSDOH ELAP-certified laboratory under standard chain-of-custody protocol for analysis of VOCs via USEPA Method TO-15.

5.0 HAZARD EVALUATION

This section provides an assessment of the general hazards that may be encountered during field work activities through a task-by-task risk analysis. Potential hazards as chemical exposure and physical hazards are presented below.

5.1 Chemical Hazard Evaluation

Potentially hazardous constituents known to exist at the Site are volatile organic compounds (VOCs). Exposure to chemical hazards is possible during all proposed site tasks. Multiple environmental investigations conducted have identified the chlorinated solvents trichloroethene (TCE) and tetrachloroethene (PCE) as the primary contaminants of concern (COCs) in the soil, groundwater, and soil vapor beneath the Site. The subsurface stratigraphy generally consists of two to five feet of miscellaneous uncontrolled fill underlain by medium to fine sand with some gravel.

5.2 Summary of Potential Chemical Hazards

The following table (Table 1) lists the known potentially hazardous constituents at the Site. The table also lists the chemical properties and OSHA permissible exposure limit (PEL), short-term exposure limit (STEL), and immediately dangerous to life and health (IDLH) level.

More information about the potentially hazardous constituents at the Site, including acute toxicological symptoms and first aid procedures, can be found on their Material Safety Data Sheets (MSDS) in Appendix C.

Table 1: Potential Chemical Hazards Summary								
Constituent of Concern	**Environmental Medium**	**OSHA PEL**	**OSHA STEL**	**OSHA IDLH**	**IP (eV)**	**Hazards**	**Route of Exposure**	**Monitoring Device**
Contaminants of Concern								
Tetrachloroethene (PCE)	Groundwater/Soil Vapor	100ppm	200 for 5 minutes in 3-hour period	150ppm	9.32	Ca	Inhalation Ingestion Absorption Contact	PID
Tricholorethene (TCE)	Soil/Groundwater/ Soil Vapor	100ppm	-	-	-	-	Inhalation Ingestion Absorption Contact	PID
Other Volatile Organic Compounds								
1,1,1-trichloroethane	Soil Vapor	-	-	-	-	Ca Flammable	Inhalation Ingestion Contact	PID
Benzene	Groundwater	1ppm	5pmm	500pmm	9.24	Ca Flammable	Inhalation Ingestion Absorption Contact	PID
benzo (a) anthracene	Groundwater	0.2 mg/m^3	-	-	-	Ca Flammable	Inhalation Ingestion Absorption Contact	PID
benzo (a) pyrene	Groundwater	0.2 mg/m^3	-	-	-	Ca Irritant Respiratory sensitization	Inhalation Absorption	PID
benzo (b) fluoranthene	Groundwater	0.2 mg/m^3	-	-	-	Ca Irritant Respiratory	Inhalation, Absorption	PID

Table 1: Potential Chemical Hazards Summary								
Constituent of Concern	**Environmental Medium**	**OSHA PEL**	**OSHA STEL**	**OSHA IDLH**	**IP (eV)**	**Hazards**	**Route of Exposure**	**Monitoring Device**
						sensitization		
benzo (k) fluoranthene	Groundwater	-	-	-	-	Ca Irritant Respiratory sensitization	Inhalation, Absorption	PID
Chloroform	Groundwater	-	-	-	-	Ca Irritant Respiratory sensitization	Inhalation Ingestion Absorption Contact	PID
Chrysene	Groundwater	-	-	-	-	Ca Irritant Respiratory sensitization	Inhalation Absorption	PID
Cis-1,2,-dichloroethene	Groundwater	-	-	-	-	Flammable, Irritant	Inhalation Ingestion Absorption Contact	PID
Ethylbenzene	Soil/Groundwater	100ppm	NIOSH ST 125ppm	800ppm	8.76	Flammable	Inhalation Ingestion Contact	PID
ideno (1,2,3-cd)Pyrene	Groundwater	-	-	-	-	Ca Respiratory sensitization	Inhalation Ingestion Absorption Contact	PID
Toluene	Groundwater	200ppm	300ppm	500ppm	8.82	Flammable	Inhalation Ingestion Absorption Contact	PID
Total Xylenes	Soil/Groundwater	100ppm	NIOSH ST 150ppm	900ppm	8.56	Flammable	Inhalation Ingestion	PID

Table 1: Potential Chemical Hazards Summary								
Constituent of Concern	**Environmental Medium**	**OSHA PEL**	**OSHA STEL**	**OSHA IDLH**	**IP (eV)**	**Hazards**	**Route of Exposure**	**Monitoring Device**
							Absorption Contact	

Notes:
NIOSH – National Institute for Occupational Safety and Health
REL – Recommended Exposure Limit
OSHA – Occupational Safety and Health Administration
PEL – Permissible Exposure Limit
STEL – Short-Term Exposure Limit
IDLH – Immediate Danger to Life and Health
TLV – Threshold Limit Value
CPTV – Coal Tar Pitch Volatiles
IP – Ionization Potential
Ca – Carcinogen
Sources: NIOSH Pocket Guide to Chemical Hazards (Department of Health and Human Services, Centers for Disease Control and Prevention, September 2007); OSHA Chemical Sampling Information Search (http://www.osha.gov/dts/chemicalsampling/toc/toc_chemsamp.html)

5.3 Physical Hazard Evaluation

5.3.1 Drilling Hazards

Use of a drill rig will require all personnel in the vicinity of the operating rig to wear steel-toed boots, hardhats, hearing protection and safety eyewear. Langan personnel should not remain in the vicinity of operating equipment unless it is required for their work responsibilities. Additionally, the following safety requirements must be followed:

- All drill rigs and other machinery with exposed moving parts must be equipped with an operational emergency stop device. Drillers and Langan personnel must be aware of this device. This device must be tested before the job starts and periodically thereafter. The driller and helper shall not simultaneously handle augers unless there is a standby person to activate the emergency stop when necessary;

- A remote sampling device must be used to sample drill cuttings if the tools are rotating or if the tools are readily capable of rotating. Langan personnel must not reach into or near the rotating equipment. If personnel must work near any tools that could rotate, the driller must shut down the rig prior to initiating work;

- Langan personnel must secure all loose clothing when in the vicinity of drilling operations;

- Direct push rigs use tremendous force to load the steel push rods. Care must be taken to maintain a safe operating distance; and

- There is a potential with using direct push rigs powered with hydraulic oil for a rupture of a hydraulic hose or fitting. Safety glasses should always be worn when operating this equipment for this reason. Exposure of body parts to a pressurized oil, air or water stream can result in severe injury or death.

5.3.2 Underground Utilities

New York law requires that a utility mark out be performed at a site at least 72 hours prior to starting any subsurface work. Langan's drilling subcontractor will contact New York One Call (1-800-272-4480) to request a mark out of underground utilities in the proposed excavation and drilling areas. Work will not begin until the required utility clearances have been completed.

Public utilities typically do not mark-out utility lines that are located on private property. Therefore, a geophysical survey will be performed to identify the location of any utilities beneath the Site.

5.3.3 Noise

The use of excavation and drilling equipment may generate noise levels that will require the use of hearing protection in the immediate vicinity. Hearing protection will be used around drilling equipment. Appropriate earplugs or earmuffs with a noise reduction rating (NRR) greater than 25 will be worn to prevent overexposure.

5.3.4 Operational AS/SVE System

While in use, the AS/SVE system will operate continuously (i.e., 24 hours a day, 7 days a week). The continuously functioning process equipment will include an air compressor and heat exchanger associated with the AS system and a vacuum blower, moisture separator and two VGAC units associated with the SVE system. All process equipment, with the exception of the VGAC units, will be housed in the equipment enclosure, which will be located in the southwestern corner of the warehouse. The VGAC units will be installed directly north of the equipment enclose inside the warehouse.

During the operational lifetime of the AS/SVE system, all personnel should wear steel-toed boots, hardhats and safety eyewear while on-Site. While inside the equipment enclosure, Langan personnel should also wear hearing protection. Langan personnel should not remain in the vicinity of operating equipment (i.e., inside the equipment enclosure) unless it is required for their work responsibilities.

The process equipment will be controlled via a programmable logic control (PLC) which will monitor, at a minimum, the pressure/vacuum and flow rates associated with each system. The PLC will be programmed to ensure the process equipment is operating within safe parameters. Langan personnel must be aware of all process equipment and the PLC. On-Site Langan personnel should have a basic knowledge of how the PLC functions and what to do in the event of an alarm condition.

Specific maintenance tasks associated with the system operation will be scheduled as required and in accordance with equipment manufacturer specifications to ensure each component of the system is operating as required. For detailed instructions on performing preventative maintenance on system components, field personnel will refer to the Operation and Maintenance (O&M) Manual, which will be stored inside the equipment enclosure. The O&M Manual will summarize protocols to maintain and monitor the system and will contain system component cut sheets, sizing, specification, and warranty information provided by the equipment manufacturer.

5.3.5 Miscellaneous

Applicable OSHA 29 CFR 1910.120(m) standards for illumination shall apply. Work should be conducted during daylight hours whenever possible.

Electrical power should be provided through a ground fault circuit interrupter. Equipment that will enter an excavation must be suitable and approved (i.e. intrinsically safe) for use in potentially explosive environments. Applicable OSHA 29 CFR 1926 Subpart K standards for use of electricity shall apply.

Work where there is a fall hazard should be performed using appropriate ladders and/or protection (e.g. body harness and lifeline). All work should be conducted at the ground surface.

In accordance with 29 CFR 1910.151(c), workers involved in operations where there is the risk of eye injury, (chemical splash, etc.), should have ready access to an approved eye wash unit. Protective eye wear shall be donned in Level D. The full-face APR required by Level C and the pressure demand self-contained breathing apparatus mask required by Level B provide eye protection.

Operations where there is a potential for fire should be conducted in a manner that minimizes risk. Non-sparking tools and fire extinguishers shall be used or available as directed by the site safety officer when work is in potentially explosive atmospheres. Ignition sources shall be removed from work areas. Explosion-proof instruments and/or bonding and grounding should be used to prevent fire or explosion when the site safety officer directs their use.

Overhead utilities should be identified and/or inspected and appropriate safety precautions taken before conducting operations where there is potential for contact or interference.

5.4 Summary of Potential Physical Hazards

The following table (Table 2) presents a summary of possible physical hazardous that are likely to be encountered during completion of field task. Fact sheets for cold and heat stress are included as Appendix D to this HASP.

Table 2: Potential Physical Hazards Summary			
Task	**Possible Hazard**	**Description**	**Safety/Control Procedures**
#2, #3	Heavy equipment	Drill rig and support vehicle.	Stay back from operating equipment; wear safety vests and hard hats, coordinate and maintain eye contact with equipment operator.
#2, #3	Noise	Drill rig engine, probe, auger.	Wear hearing protection.
#2, #3	Falling objects	Tools and other equipment falling off drill rig.	Wear hard hat.
#2, #3	Underground/overhead utilities	Drill rig probe or auger or subsurface probing tool makes contact with underground object; boom touches overhead power line.	Follow mark-out policy and safe drilling practices.
#1, #2, #3, #4	Biological	Bee stings; dog, tick, snake bites; poison ivy; mosquitoes.	Wear proper PPE; be vigilant; follow safe work practices; wear insect repellant.
#2, #3, #4	Improper material handling	Improper lifting/carrying of equipment and materials causing strains.	Follow safe lifting and general material handling techniques.
#1, #2, #3, #4	Slips, trips, and falls	Various injuries could occur from slips, trips, and falls in carrying out field activities.	Good housekeeping, constant awareness and focus on the task.
#1, #2, #3, #4	Vehicular traffic	Various injuries or incidents could result from vehicular traffic.	Wear high visibility safety vests; use cones to designate work area; follow safe work practices.
#1, #2, #3, #4	Sunburn	Exposure to ultraviolet solar radiation.	Wear broad spectrum sunscreen.
#1, #2, #3, #4	Adverse weather	Severe thunderstorms with strong winds and lightning; heavy precipitation (rain).	Seek shelter; work in adverse weather conditions only with proper training and equipment. In the event of heavy precipitation (rain) conditions will be assessed to determine if

Table 2: Potential Physical Hazards Summary			
Task	**Possible Hazard**	**Description**	**Safety/Control Procedures**
			the work can proceed safely. If it is determined that the weather poses a significant hazard, site operations will be stopped and rescheduled.
#1, #2, #3, #4	Heat stress	Heat exhaustion, heat stroke, dehydration.	Proper and consistent hydration; seek shade during work breaks; wear light-colored and breathable clothing; in cases of heat stroke call for emergency help.
#1, #2, #3, #4	Cold stress	Frostbite, hypothermia.	Proper and consistent hydration; wear warm clothing in cold weather; seek warmth during work breaks; in cases of hypothermia call for emergency help

6.0 PERSONAL PROTECTIVE EQUIPMENT

PPE must protect workers from the specific hazards they are likely to encounter on-site. Selection of the appropriate PPE must take into consideration: (1) identification of the hazards or suspected hazards; (2) potential exposure routes; and (3) the performance of the PPE construction (materials and seams) in providing a barrier to these hazards. Based on anticipated site conditions, engineering controls and the proposed work tasks to be performed at the Site, Level D Protection should be used. The decision to modify standard PPE will be made by the Site HSO. The general levels of protection are described below.

Level D

- Safety glasses with side-shields or chemical splash goggles if a splash hazard is present;
- Safety boots/shoes (toe-protected);
- Hard hat;
- Long sleeve work shirt and work pants;
- Nitrile gloves;
- Hearing protection (as needed);
- Traffic vest (if working or adjacent to roadway);
- Coveralls (Tyvek or equivalent) if extensive splashing or contaminated media is expected.

Level C

- Full or half mask respirator, air-purifying, cartridge-equipped, NIOSH approved respirator suitable for the compound of concern
- Inner (latex) and outer (nitrile) chemical resistant gloves;
- Chemical-resistant safety boots/shoes (toe-protected);
- Hard hat;
- Long sleeve work shirt and work pants;
- Coveralls (Tyvek or equivalent);
- Hearing protection (as needed);
- Traffic vest (if working on or adjacent to roadway).

7.0 AIR MONITORING

7.1 General

Continuous, real-time air monitoring for VOCs and particulate matter at the perimeter of the construction area will be performed by Langan during excavation, earthwork, and other such activities that disturb the subsurface (e.g., drilling and well installation). Soil disturbance activities include, but are not limited to, the excavation, handling, stockpiling, and loading of soil and fill material, grading and compaction of trenches, and drilling and installation of various well types (e.g., AS wells, SVE wells, vapor probes, piezometers, etc.).

In addition, atmospheric conditions during field activities will be monitored to identify potentially hazardous environments and determine reference or background concentrations. Air monitoring will be used to define work zones and determine the appropriate level of PPE to be worn by Langan field personnel. Air monitoring will be performed at the breathing zone. Upgrades and/or downgrades to PPE will be made based on air monitoring results in the breathing zone. In general, work shall be initiated in Level D PPE with a contingency to upgrade the level of PPE based on exceedances of action levels.

7.2 Instrumentation

Langan field personnel will be equipped with a RAE Systems MultiRAE 2000 or 3000 with a 10.6 eV lamp (PID) and a MIE pdr-1000 Personal Data Ram (PDR) (aerosol monitor). The PID will be used to monitor total VOC levels. The PDR will be used to monitoring levels of aerosols (particulate matter). The PDR may be used for ground intrusive activities. Instruments will be calibrated before each use; calibration readings will be recorded in the field log book. The PID and PDR must be calibrated daily in accordance with the manufacturer's specifications. The PID calibration typically requires the use of a span gas (e.g., 100 ppm isobutylene) and zero gas (e.g., fresh air). Be sure that all the required calibration equipment and supplies are provided with the PID (e.g., span gas cylinder, regulator, tubing, and TedlarTM bag).

7.3 Action Levels

Action levels for total VOCs and aerosols (particulate matter) are presented in the following tables (Table 3 and Table 4). If present, non-workers in the eastern portion of the building will be notified immediately if any of the following action levels are exceeded.

Table 3: Action Levels for VOCs	
Reading	**Action Required**
Background to < 5 ppm(1)	No respirator required; no further action required.
> 5 ppm, <50 ppm(2) for > 5 minutes	Temporarily discontinue all activities and evaluate potential causes of the excessive readings. If these levels persist and cannot be mitigated (i.e., via dust suppression, etc.), contact HSO to review conditions and determine source and appropriate response action. If PID readings remain above 5 ppm, temporarily discontinue work and upgrade to Level C protection. If sustained PID readings fall below 5 ppm, downgrading to Level D protection may be permitted.
> 50 ppm, <500 ppm(3) for > 5 minutes	Discontinue all work; all workers shall move to an area upwind of the job site. Evaluate potential causes of the excessive readings and allow work area to vent until VOC concentrations fall below 100 ppm. Level C protection will continue to be used until PID readings fall below 5 ppm.
> 500 ppm for > 5 minutes	Evacuate work area.
Notes: (1) 5 ppm is based on OSHA STEL for benzene. (2) 100 ppm is based on 1% being the OSHA PEL for benzene (1 ppm). (3) 500 ppm is based on NIOSH IDLH for benzene.	

Table 4: Action Levels for Particulate Matter (Respirable Dust)	
Reading	**Action Required**
< 5.0 µg/m^3 above background	Continue to work in Level D (Long sleeve work shirt and work pants, coveralls, steel toed boots, safety glasses and hearing protection)
> 5.0 µg/m^3 above background	Temporarily discontinue all activities and/or implement dust suppression measures (e.g., wet area)

8.0 SITE CONTROL

8.1 Work Zones

The need to formally establish specific work zones (e.g., support zone, contamination reduction zone, and exclusion zone) during work activities will be determined by the HSO. The support zone is any area of the Site that is outside of the exclusion and contamination reduction zones. The contamination reduction zone is the area between the exclusion and support zones that provides a transition between contaminated and clean areas. The exclusion zone is any area of the Site where hazardous substances are present, or are reasonably suspected to be present, and pose an exposure hazard to personnel.

8.2 General Safe Work Practices

Hazards should be controlled at Site areas by limiting entrance to exclusion zones to essential personnel and by implementing the following rules:

- Non-essential (as judged by the HSO) personnel and unauthorized persons shall not enter the exclusion or decontamination zone;
- Before entering the exclusion or decontamination zones, all personnel should be familiar with emergency response procedures, site safety locations, first aid and communication equipment, and the location of the map to the hospital and the list of emergency telephone numbers;
- The buddy system should be used at all times by field personnel in the exclusion zone; no one is to perform work within the exclusion zone alone. When in Level D or C, visual contact or radio contact should be maintained at all times;
- Contact with contaminated and potentially contaminated surfaces should be avoided. Walk around (not through) puddles and discolored surfaces. Do not kneel on the ground or place equipment on the ground. Protect equipment from contamination;
- Only properly trained personnel will have access to the equipment enclosure and the PLC. A limited number of trained personnel will have access to the PLC and should an alarm condition be encountered, it may only be reversed once the cause of the alarm has been identified and appropriately corrected in accordance with the guidelines set forth in the O&M Manual.
- No open flames in the work zone;
- Always use the appropriate level of personal protective equipment (PPE)

- Report any unusual conditions;
- Work areas will be kept clear and uncluttered. Debris and other slip, trip, and fall hazards will be removed as frequently as possible;
- The number of personnel and equipment in the work zone will be kept to an essential minimum;
- Be alert to the symptoms of fatigue and heat/cold stress and their effects on the normal caution and judgment of personnel;
- All personnel exiting the exclusion zone should exercise the decontamination procedures described in this HASP;
- Beards or other facial hair that interferes with respirator fit will preclude admission to the exclusion zone.
- Each worker will be supplied with and maintain his/her PPE.
- No person will eat, drink, or chew gum or tobacco in potentially contaminated areas. Single portion drink containers and drinking of replacement fluids for heat stress control will be permitted only in support areas; and
- Smoking is prohibited by Langan personnel and subcontractors in all areas of the Site because of the potential for contaminating samples and for the health of the field team.

8.3 Site Safety Meetings

Langan personnel will be given briefings by the HSO on a daily or as-needed basis to further assist personnel in conducting the work activities safely. Briefings will be provided when new activities are to be conducted, new staff enters the Site, changes in work practices are to be implemented due to new information, or if Site or environmental conditions change. Briefings will also be given to facilitate conformance with prescribed safe practices when performance deficiencies are identified during routine daily activities or as a result of jobsite safety inspections. The jobsite safety inspection form is included as Appendix E. The site safety briefing form is included as Appendix F.

8.4 Site Communications

Each field team will carry a cell phone or satellite phone that is in good working order. If there is any type of emergency that requires the site to be evacuated (e.g., severe thunderstorm with lightning), the field team leader will lead the team to the predetermined emergency assembly

location. All other emergency notifications that do not require evacuation will be conducted using a cell or satellite phone. Emergency phone numbers are listed above in Section 2.3.

8.5 Buddy System

The buddy system will be used at the Site at all times. The buddy system is a system of organizing employees into field teams in such a manner that each employee of the field team is designated to be observed by at least one other employee in the field team. The purpose of the buddy system is to provide rapid assistance to employees in the event of an emergency.

8.6 Personnel Hygiene

The following personnel hygiene practices will be used at the Site to reduce exposure to hazards:

- Long hair will be secured away from the face so it does not interfere with any work activities;
- Personnel leaving potentially contaminated areas will wash their hands, forearms and faces in the contamination reduction zone prior to entering any clean areas or eating areas.
- Personnel leaving potentially contaminated areas will shower (including washing hair) and change to clean clothing as soon as possible after leaving the Site.
- No person will eat, drink, or chew gum or tobacco in potentially contaminated areas. Single portion drink containers and drinking of replacement fluids for heat stress control will be permitted only in support areas.
- Smoking is prohibited by Langan personnel and subcontractors in all areas of the Site because of the potential for contaminating samples and for the health of the field team.

8.7 Decontamination

Personnel, clothing, equipment, and samples leaving a contaminated area of the Site must be decontaminated. Decontamination for this operation is achieved through physical removal and chemical detoxification/disinfection/sterilization. The first step in decontamination is prevention. Detailed procedures for personnel and equipment decontamination are provided in Appendix G. The following standard operating procedures were established to minimize contact with wastes:

- Wear disposable clothing;

- Practice work habits that minimize contact with hazardous or potentially hazardous substances; and

- Use disposable equipment, where appropriate.

Boots and other potentially contaminated garments that have come in contact with hazardous materials should be cleaned in wash tubs with a detergent/water solution and rinsed with water and should remain on-Site. Decontamination waste (e.g. solutions, etc.) resulting from the decontamination of field equipment (e.g., sampling equipment, etc.) will be collected, containerized in tightly-sealed, well-marked drums, characterized, and properly disposed of. Disposable contaminated clothing and equipment will be collected in plastic bags, containerized in tightly-sealed, well-marked drums, and properly disposed of.

9.0 HEALTH AND SAFETY TRAINING AND MEDICAL SURVEILLANCE

The completion of an initial 40-hour HAZWOPER training program (or its equivalent) as detailed in OSHA's 29 CFR 1910.120(e) is required for all employees who will perform work in areas where the potential for exposure to hazardous substances exists. Annual 8-hour refresher training is also required to maintain competencies to ensure a safe work environment. In addition to these training requirements, supervisory personnel must also receive eight additional hours of specialized management training. Training records are maintained by the HSM.

The HSO shall inform Langan employees about the activities, procedures, monitoring, and equipment for Site operations (including, but not limited to, site and facility layout, chemical and physical hazards, emergency services at the site, and the provisions set forth in the HASP).

9.1 Respirator Fit Testing Requirements

Langan personnel who may be required to perform work activities while wearing a respirator must receive medical clearance to do so consistent with 29 CFR 1910.134(e), Respiratory Protection. Medical evaluations will be performed by, or under the direction of, a physician board-certified in occupational medicine. Langan employees who have medical clearance to wear a respirator and could be potentially exposed to hazardous substances at the Site shall possess a full face-piece, air-purifying respirator that has been successfully quantitative fit-tested within the past year. Results of medical evaluations and quantitative fit-test records are maintained by the HSM.

9.2 Medical Monitoring Requirements

Langan personnel who will be performing work activities involving potential exposure to hazardous substances will be required to have passed an initial baseline medical examination, with annual follow-up medical exams thereafter, consistent with 29 CFR 1910.120(f). Medical evaluations will be performed by, or under the direction of, a physician board-certified in occupational medicine.

9.3 Confined Space Entry

Entry into confined space is not anticipated as part of the Remedial Investigation. If a project area were identified as a confined space, entry into this confined space by Langan personnel is prohibited by its own policy.

10.0 HEALTH AND SAFETY PLAN APPROVAL

By their signature, the undersigned certify that this HASP is approved.

_____	_____
Gerald Nicholls, Project Manager (PM)	Date
_____	_____
Tony Moffa, CHMM, Health & Safety Manager (HSM)	Date
_____	_____
Michele Rogers, Site Health & Safety Officer (HSO)	Date

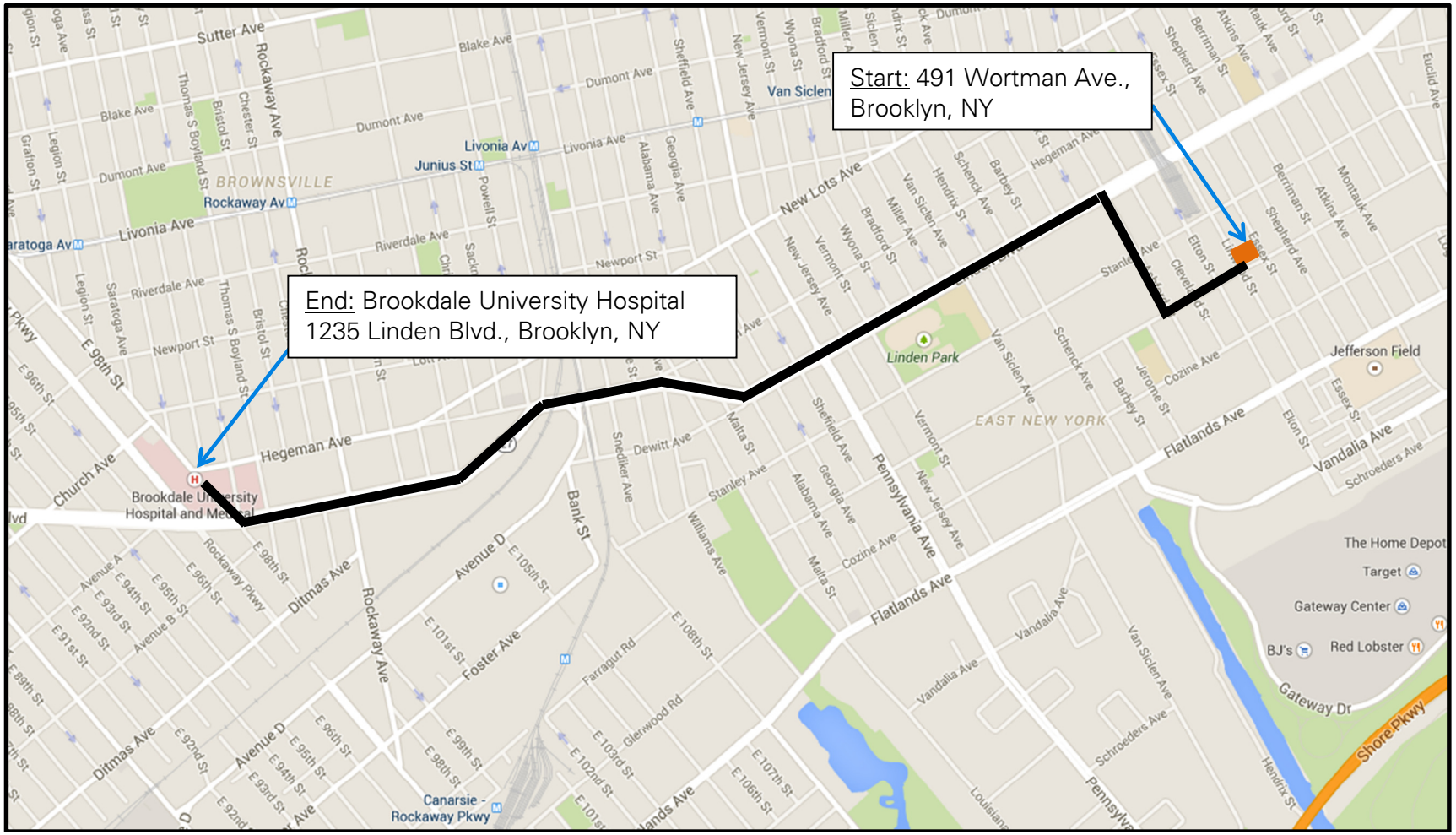
11.0 HASP COMPLIANCE AGREEMENT

All Langan field personnel and subcontractors who enter the Site will sign this HASP Compliance Agreement to indicate that they are familiar with this HASP and that they understand it and agree to abide by it. A copy of this HASP must be on-site at all times and must be maintained by the HSO.

Printed Name	Signature	Affiliation	Date

FIGURES

FIGURE 1
ROUTE MAP TO HOSPITAL (BROOKDALE UNIVERSITY HOSPITAL)



APPENDIX A

OSHA RIGHT-TO-KNOW FACT SHEET

You Have a Right to a Safe and Healthful Workplace.

IT'S THE LAW!

- You have the right to notify your employer or OSHA about workplace hazards. You may ask OSHA to keep your name confidential.
- You have the right to request an OSHA inspection if you believe that there are unsafe and unhealthful conditions in your workplace. You or your representative may participate in the inspection.
- You can file a complaint with OSHA within 30 days of discrimination by your employer for making safety and health complaints or for exercising your rights under the *OSH Act.*
- You have a right to see OSHA citations issued to your employer. Your employer must post the citations at or near the place of the alleged violation.
- Your employer must correct workplace hazards by the date indicated on the citation and must certify that these hazards have been reduced or eliminated.
- You have the right to copies of your medical records or records of your exposure to toxic and harmful substances or conditions.
- Your employer must post this notice in your workplace.

The *Occupational Safety and Health Act of 1970 (OSH Act),* P.L. 91-596, assures safe and healthful working conditions for working men and women throughout the Nation. The Occupational Safety and Health Administration, in the U.S. Department of Labor, has the primary responsibility for administering the *OSH Act.* The rights listed here may vary depending on the particular circumstances. To file a complaint, report an emergency, or seek OSHA advice, assistance, or products, call 1-800-321-OSHA or your nearest OSHA office: • Atlanta (404) 562-2300 • Boston (617) 565-9860 • Chicago (312) 353-2220 • Dallas (214) 767-4731 • Denver (303) 844-1600 • Kansas City (816) 426-5861 • New York (212) 337-2378 • Philadelphia (215) 861-4900 • San Francisco (415) 975-4310 • Seattle (206) 553-5930. Teletypewriter (TTY) number is 1-877-889-5627. To file a complaint online or obtain more information on OSHA federal and state programs, visit OSHA's website at **www.osha.gov**. If your workplace is in a state operating under an OSHA-approved plan, your employer must post the required state equivalent of this poster.

1-800-321-OSHA
www.osha.gov

U.S. Department of Labor • Occupational Safety and Health Administration • OSHA 3165

APPENDIX B

EMPLOYEE EXPOSURE/INJURY INDICENT REPORT

INCIDENT REPORT

LANGAN EMPLOYEE EXPOSURE/INJURY INCIDENT REPORT
(Submit a Separate Report for Each Employee and/or Incident)

Date: _____

Employee Name:_____ Employee No:_____

Sex: M _____ F _____ Age: _____

Region: _____ Location:_____

Project: _____ Project No: _____

Incident:_____

Type: Possible Exposure _____ Exposure _____ Physical Injury _____

Location: _____

Date of Incident: _____ Time of Incident: _____

Date of Report Incident: _____

Person(s) to Whom Incident was Reported: _____

Weather Conditions During Incident: Temperature _____ Humidity _____

Wind Speed and Direction: _____ Cloud Cover: _____

Clear: _____ Precipitation: _____

Materials Potentially Encountered: _____

Chemical (give name of description - liquid, solid, gas, vapor, fume, mist):

_____

_____

Radiological:_____

Other: _____

Nature of the Exposure/Injury: (State the nature of the exposure/injury in detail and list the parts of the body affected. Attach extra sheets if necessary).

_____

_____

_____

_____

_____

Did you receive medical care? Yes _____ No _____ If so, when _____

Where? On-Site _____ Off-Site _____

By Whom: Name of Paramedic: _____

Name of Physician: _____

Other: _____

If Off-Site, name facility (hospital, clinic, etc):_____

_____

Length of stay at the facility?_____

Was the Site Safety Officer contacted? Yes _____ No _____ When?_____

Was the Corporate Health and Safety Officer contacted? Yes _____ No _____

If so, who was the contact?_____

Did the exposure/injury result in permanent disability? Yes _____ No _____

If so, explain:_____

_____

_____

_____

Has the employee returned to work? Yes _____ No _____

List the names of other persons affected during this incident:

_____

_____

_____

_____

List the names of persons who witnessed the exposure/injury incident:

_____

_____

_____

_____

_____

_____

_____

Possible cause of the exposure/injury incident: _____

_____

_____

_____

_____

_____

What was the name and title of the field team leader or immediate supervisor at the site of the incident?

_____

Was the operation being conducted under an established Health and Safety Plan?

Yes _____ No _____ If yes, attach a copy. If no, explain

_____

_____

_____

_____

Describe protective equipment and clothing used by the employee:

_____

_____

_____

_____

_____

_____

Did any limitations in safety equipment or protective clothing contribute to or affect exposure? If so, explain:

_____

_____

What was the employee doing when the exposure/injury occurred? (Describe briefly as Site Reconnaissance, Site Characterization, or Sampling, etc.):

_____

_____

_____

_____

_____

_____

Where exactly on site or off site did the exposure/injury occur?

_____

_____

_____

_____

_____

How did the exposure/injury occur? (Describe fully what factors led up to and/or contributed to the incident):

_____

_____

_____

_____

_____

Name of person(s) initiating report, job title, phone number:

_____

_____

_____

_____

_____ _____

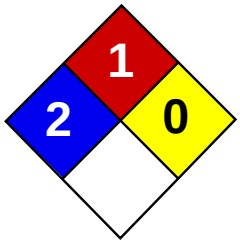
Employee Signature Date

_____ _____

Site Safety Officer Signature or Field Team Leader Signature Date

APPENDIX C

MATERIAL SAFETY DATA SHEETS



Health	2
Fire	1
Reactivity	0
Personal Protection	H

Material Safety Data Sheet
1,1,1-Trichloroethane MSDS

Section 1: Chemical Product and Company Identification

Product Name: 1,1,1-Trichloroethane

Catalog Codes:

CAS#: 71-55-6

RTECS: KJ2975000

TSCA: TSCA 8(b) inventory: 1,1,1-Trichloroethane

CI#: Not available.

Synonym:

Chemical Formula: CH3CCl3

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:
1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
{1,1,1-}Trichloroethane	71-55-6	100

Toxicological Data on Ingredients: 1,1,1-Trichloroethane: ORAL (LD50): Acute: 9600 mg/kg [Rat]. 6000 mg/kg [Mouse]. DERMAL (LD50): Acute: 15800 mg/kg [Rabbit]. VAPOR (LC50): Acute: 18000 ppm 4 hour(s) [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects:
Very hazardous in case of eye contact (irritant), of ingestion. Hazardous in case of skin contact (irritant, permeator), of inhalation. Inflammation of the eye is characterized by redness, watering, and itching.

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance is toxic to lungs, the nervous system, liver, mucous membranes. Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact:

Check for and remove any contact lenses. Immediately flush eyes with running water for at least 15 minutes, keeping eyelids open. Cold water may be used. Do not use an eye ointment. Seek medical attention.

Skin Contact:
After contact with skin, wash immediately with plenty of water. Gently and thoroughly wash the contaminated skin with running water and non-abrasive soap. Be particularly careful to clean folds, crevices, creases and groin. Cover the irritated skin with an emollient. If irritation persists, seek medical attention. Wash contaminated clothing before reusing.

Serious Skin Contact:
Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek medical attention.

Inhalation: Allow the victim to rest in a well ventilated area. Seek immediate medical attention.

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek medical attention.

Ingestion:
Do not induce vomiting. Loosen tight clothing such as a collar, tie, belt or waistband. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek immediate medical attention.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: May be combustible at high temperature.

Auto-Ignition Temperature: 537°C (998.6°F)

Flash Points: Not available.

Flammable Limits: LOWER: 7.5% UPPER: 12.5%

Products of Combustion: These products are carbon oxides (CO, CO2), halogenated compounds.

Fire Hazards in Presence of Various Substances: Slightly flammable to flammable in presence of oxidizing materials, of acids, of alkalis.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available. Slightly explosive to explosive in presence of oxidizing materials, of acids, of alkalis.

Fire Fighting Media and Instructions:
SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray, fog or foam. Do not use water jet.

Special Remarks on Fire Hazards: Not available.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill: Absorb with an inert material and put the spilled material in an appropriate waste disposal.

Large Spill:
Absorb with an inert material and put the spilled material in an appropriate waste disposal. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:

Keep away from heat. Keep away from sources of ignition. Empty containers pose a fire risk, evaporate the residue under a fume hood. Ground all equipment containing material. Do not ingest. Do not breathe gas/fumes/ vapour/spray. In case of insufficient ventilation, wear suitable respiratory equipment If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes

Storage:
Keep container dry. Keep in a cool place. Ground all equipment containing material. Keep container tightly closed. Keep in a cool, well-ventilated place. Combustible materials should be stored away from extreme heat and away from strong oxidizing agents.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection:
Splash goggles. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
TWA: 350 STEL: 440 CEIL: 440 (ppm) from ACGIH (TLV) [1995] TWA: 1900 STEL: 2460 CEIL: 2380 (mg/m3) from ACGIH [1995]Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid.

Odor: Not available.

Taste: Not available.

Molecular Weight: 133.41 g/mole

Color: Not available.

pH (1% soln/water): Not available.

Boiling Point: 74.1°C (165.4°F)

Melting Point: -32.5°C (-26.5°F)

Critical Temperature: Not available.

Specific Gravity: 1.3376 (Water = 1)

Vapor Pressure: 100 mm of Hg (@ 20°C)

Vapor Density: 4.6 (Air = 1)

Volatility: Not available.

Odor Threshold: 400 ppm

Water/Oil Dist. Coeff.: The product is equally soluble in oil and water; log(oil/water) = 0

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility: Very slightly soluble in cold water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Not available.

Incompatibility with various substances: Not available.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: Not available.

Polymerization: No.

Section 11: Toxicological Information

Routes of Entry: Dermal contact. Eye contact. Inhalation. Ingestion.

Toxicity to Animals:
WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE. Acute oral toxicity (LD50): 6000 mg/kg [Mouse]. Acute dermal toxicity (LD50): 15800 mg/kg [Rabbit]. Acute toxicity of the vapor (LC50): 18000 ppm 4 hour(s) [Rat].

Chronic Effects on Humans: The substance is toxic to lungs, the nervous system, liver, mucous membranes.

Other Toxic Effects on Humans:
Very hazardous in case of ingestion. Hazardous in case of skin contact (irritant, permeator), of inhalation.

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Detected in maternal milk in human.

Special Remarks on other Toxic Effects on Humans: Not available.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are more toxic.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Section 14: Transport Information

DOT Classification: CLASS 6.1: Poisonous material.

Identification: : 1,1,1-Trichloroethane : UN2831 PG: III

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
Pennsylvania RTK: 1,1,1-Trichloroethane Massachusetts RTK: 1,1,1-Trichloroethane TSCA 8(b) inventory: 1,1,1-Trichloroethane SARA 313 toxic chemical notification and release reporting: 1,1,1-Trichloroethane CERCLA: Hazardous substances.: 1,1,1-Trichloroethane

Other Regulations: OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

Other Classifications:

WHMIS (Canada): CLASS D-1B: Material causing immediate and serious toxic effects (TOXIC).

DSCL (EEC):
R38- Irritating to skin. R41- Risk of serious damage to eyes.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 1

Reactivity: 0

Personal Protection: h

National Fire Protection Association (U.S.A.):

Health: 2

Flammability: 1

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Splash goggles.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

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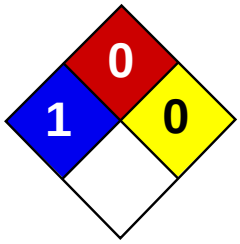

Health	2
Fire	0
Reactivity	0
Personal Protection	E

Material Safety Data Sheet
Zinc oxide MSDS

Section 1: Chemical Product and Company Identification

Product Name: Zinc oxide

Catalog Codes: SLZ1009, SLZ1114, SLZ1222, SLZ1057

CAS#: 1314-13-2

RTECS: ZH4810000

TSCA: TSCA 8(b) inventory: Zinc oxide

CI#: Not available.

Synonym: Calamine; Zinc white

Chemical Name: Zinc Oxide

Chemical Formula: ZnO

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:
1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Zinc oxide	1314-13-2	100

Toxicological Data on Ingredients: Zinc oxide: ORAL (LD50): Acute: 7950 mg/kg [Mouse].

Section 3: Hazards Identification

Potential Acute Health Effects:
Hazardous in case of inhalation. Slightly hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion.

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Mutagenic for mammalian somatic cells. Mutagenic for bacteria and/or yeast. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. Repeated or prolonged exposure is not known to aggravate medical condition.

Section 4: First Aid Measures

Eye Contact:
Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention if irritation occurs.

Skin Contact: Wash with soap and water. Cover the irritated skin with an emollient. Get medical attention if irritation develops.

Serious Skin Contact: Not available.

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Serious Inhalation: Not available.

Ingestion:
Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention if symptoms appear.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Non-flammable.

Auto-Ignition Temperature: Not applicable.

Flash Points: Not applicable.

Flammable Limits: Not applicable.

Products of Combustion: Not available.

Fire Hazards in Presence of Various Substances: Not applicable.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions: Not applicable.

Special Remarks on Fire Hazards: Slow addition of zinc oxide to cover linseed oil varnish causes generation of heat and ignition.

Special Remarks on Explosion Hazards:
May explode when mixed with chlorinated rubber. Zinc Oxide and Magnesium can react explosively when heated.

Section 6: Accidental Release Measures

Small Spill:
Use appropriate tools to put the spilled solid in a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and dispose of according to local and regional authority requirements.

Large Spill:
Use a shovel to put the material into a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and allow to evacuate through the sanitary system. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep locked up.. Do not ingest. Do not breathe dust. Wear suitable protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Keep away from incompatibles such as acids.

Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area. Do not store above 25°C (77°F).

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection: Safety glasses. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
TWA: 5 STEL: 10 (mg/m3) from ACGIH (TLV) [United States] Inhalation TWA: 15 (mg/m3) from OSHA (PEL) [United States] Inhalation Total. TWA: 5 STEL: 10 CEIL: 25 (mg/m3) from NIOSH Inhalation TWA: 5 STEL: 10 (mg/m3) from OSHA (PEL) [United States] Inhalation Respirable.Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid. (Powdered solid.)

Odor: Odorless.

Taste: Bitter.

Molecular Weight: 81.38 g/mole

Color: White to yellowish-white

pH (1% soln/water): Not applicable.

Boiling Point: Not available.

Melting Point: 1975°C (3587°F)

Critical Temperature: Not available.

Specific Gravity: 5.607 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: Is not dispersed in cold water, hot water.

Solubility:
Insoluble in cold water, hot water Soluble in dilute acetic acid, or mineral acids, ammonia, ammonium carbonate, fixed alkali hydroxide solution..

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Not available.

Incompatibility with various substances: Not available.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity:
Reacts violently with magnesium, linseed oil. Reacts with hydrochloric acid to produce zinc chloride. Reacts with sulfuric acid to produce zinc sulfate. Reacts with hydrogen fluoride to produce zinc fluoride tetrahydrate. Gradually absorbs CO2 on exposure to air. Sublimes at normal pressure. Zinc Oxide reacts with Carbon Monoxide or hydrogen to produce elemental zinc.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Dermal contact. Inhalation. Ingestion.

Toxicity to Animals: Acute oral toxicity (LD50): 7950 mg/kg [Mouse].

Chronic Effects on Humans: MUTAGENIC EFFECTS: Mutagenic for mammalian somatic cells. Mutagenic for bacteria and/or yeast.

Other Toxic Effects on Humans:
Hazardous in case of inhalation. Slightly hazardous in case of skin contact (irritant), of ingestion.

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans:
May cause adverse reproductive effects based on animal data. No human data found at this time. May affect genetic material (mutagenic).

Special Remarks on other Toxic Effects on Humans:
Acute Potential Health Effects: May cause mild skin irritation. Eyes: May cause mechanical eye irritation and conjunctivitis. Inhalation: May cause mechanical irritation of the respiratory tract. A few sources claim that finely divided zinc oxide dust can cause "metal fume fever." Zinc oxide dust is generally considered a nuisance dust; adverse effects are unlikely when exposures are kept under reasonable control. Inhalation of high concentrations of Zinc Oxide fume or dust may cause "Metal Fume Fever." Symptoms of metal fume fever may include a flu-like condition involving headache, chills, fever, sweats, nausea, vomiting, cough, muscle aches and pains, and difficulty breathing, ;ulmonary edema. May also affect the liver. Ingestion: May cause digestive tract irritation although Zinc oxide has a low toxicity by oral exposure route. Chronic Potential Health Effects: Ingestion: Prolonged or repeated ingestion of zinc oxide may affect blood, metabolism, and the thyroid.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The product itself and its products of degradation are not toxic.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: Not a DOT controlled material (United States).

Identification: Not applicable.

Special Provisions for Transport: Not applicable.

Section 15: Other Regulatory Information

Federal and State Regulations:
Illinois toxic substances disclosure to employee act: Zinc oxide Rhode Island RTK hazardous substances: Zinc oxide Pennsylvania RTK: Zinc oxide Minnesota: Zinc oxide Massachusetts RTK: Zinc oxide New Jersey: Zinc oxide California Director's List of Hazardous Substances: Zinc oxide TSCA 8(b) inventory: Zinc oxide

Other Regulations: EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada): Not controlled under WHMIS (Canada).

DSCL (EEC):
R40- Possible risks of irreversible effects. S2- Keep out of the reach of children. S36/37- Wear suitable protective clothing and gloves.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 0

Reactivity: 0

Personal Protection: E

National Fire Protection Association (U.S.A.):

Health: 1

Flammability: 0

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Safety glasses.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

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Last Updated: 05/21/2013 12:00 PM

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for

their particular purposes. In no event shall ScienceLab.com be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if ScienceLab.com has been advised of the possibility of such damages.

Right to Know

Hazardous Substance Fact Sheet

Common Name: **XYLENES**

Synonyms: Methyl Toluene (mixed isomers); Xylol

Chemical Name: Benzene, Dimethyl-

Date: August 2006 Revision: October 2011

CAS Number: 1330-20-7

RTK Substance Number: 2014

DOT Number: UN 1307

EMERGENCY RESPONDERS >>>> SEE LAST PAGE

Description and Use

Xylenes are colorless liquids with a faint, sweet odor. They are used as solvents and in making paints, adhesives and other chemicals.

- **ODOR THRESHOLD = 0.07 to 40 ppm**
- Odor thresholds vary greatly. Do not rely on odor alone to determine potentially hazardous exposures.

This fact sheet can be used for:

m-Xylene	CAS#: 108-38-3
o-Xylene	CAS#: 95-47-6
p-Xylene	CAS#: 106-42-3

Reasons for Citation

- **Xylenes** are on the Right to Know Hazardous Substance List because they are cited by OSHA, ACGIH, DOT, NIOSH, DEP, IARC, IRIS, NFPA and EPA.

SEE GLOSSARY ON PAGE 5.

FIRST AID

Eye Contact

- Immediately flush with large amounts of water for at least 15 minutes, lifting upper and lower lids. Remove contact lenses, if worn, while flushing. Seek medical attention.

Skin Contact

- Quickly remove contaminated clothing. Immediately wash contaminated skin with large amounts of soap and water.

Inhalation

- Remove the person from exposure.
- Begin rescue breathing (using universal precautions) if breathing has stopped and CPR if heart action has stopped.
- Transfer promptly to a medical facility.

EMERGENCY NUMBERS

Poison Control: 1-800-222-1222

CHEMTREC: 1-800-424-9300

NJDEP Hotline: 1-877-927-6337

National Response Center: 1-800-424-8802

Hazard Summary

Hazard Rating	NJDHSS	NFPA
HEALTH	-	2
FLAMMABILITY	-	3
REACTIVITY	-	0

FLAMMABLE
POISONOUS GASES ARE PRODUCED IN FIRE
CONTAINERS MAY EXPLODE IN FIRE

Hazard Rating Key: 0=minimal; 1=slight; 2=moderate; 3=serious; 4=severe

- **Xylenes** can affect you when inhaled and by passing through the skin.
- Contact can irritate the skin and eyes. Prolonged or repeated contact can cause a skin rash, dryness and redness.
- Inhaling **Xylenes** can irritate the nose and throat causing coughing and wheezing.
- Exposure can cause headache, dizziness, lightheadedness and passing out. Repeated exposure can affect concentration, memory, vision, and muscle coordination. Higher levels can cause coma and death.
- **Xylenes** may damage the liver and kidneys.
- **Xylenes** are FLAMMABLE LIQUIDS and DANGEROUS FIRE HAZARDS.

Workplace Exposure Limits

OSHA: The legal airborne permissible exposure limit (PEL) is **100 ppm** averaged over an 8-hour workshift.

NIOSH: The recommended airborne exposure limit (REL) is **100 ppm** averaged over a 10-hour workshift and **150 ppm**, not to be exceeded during any 15-minute work period.

ACGIH: The threshold limit value (TLV) is **100 ppm** averaged over an 8-hour workshift and **150 ppm** as a STEL (short-term exposure limit).

- The above exposure limits are for air levels only. When skin contact also occurs, you may be overexposed, even though air levels are less than the limits listed above.

Determining Your Exposure

- Read the product manufacturer's Material Safety Data Sheet (MSDS) and the label to determine product ingredients and important safety and health information about the product mixture.
- For each individual hazardous ingredient, read the New Jersey Department of Health and Senior Services Hazardous Substance Fact Sheet, available on the RTK Program website (www.nj.gov/health/eoh/rtkweb) or in your facility's RTK Central File or Hazard Communication Standard file.
- You have a right to this information under the New Jersey Worker and Community Right to Know Act and the Public Employees Occupational Safety and Health (PEOSH) Act if you are a public worker in New Jersey, and under the federal Occupational Safety and Health Act (OSHA) if you are a private worker.
- The New Jersey Right to Know Act requires most employers to label chemicals in the workplace and requires public employers to provide their employees with information concerning chemical hazards and controls. The federal OSHA Hazard Communication Standard (29 CFR 1910.1200) and the PEOSH Hazard Communication Standard (N.J.A.C. 12:100-7) require employers to provide similar information and training to their employees.

This Fact Sheet is a summary of available information regarding the health hazards that may result from exposure. Duration of exposure, concentration of the substance and other factors will affect your susceptibility to any of the potential effects described below.

Health Hazard Information

Acute Health Effects
The following acute (short-term) health effects may occur immediately or shortly after exposure to **Xylenes**:

- Contact can irritate the skin and eyes.
- Inhaling **Xylenes** can irritate the nose and throat causing coughing and wheezing.
- Exposure can cause headache, nausea and vomiting, dizziness, lightheadedness and passing out.

Chronic Health Effects
The following chronic (long-term) health effects can occur at some time after exposure to **Xylenes** and can last for months or years:

Cancer Hazard
- While **Xylenes** have been tested, they are not classifiable as to their potential to cause cancer.

Reproductive Hazard
- **Xylenes** may damage the developing fetus.

Other Effects
- Repeated exposure can affect concentration, memory, vision, and muscle coordination. Higher levels can cause coma and death.
- Prolonged or repeated contact can cause a skin rash, dryness and redness.
- **Xylenes** may damage the liver and kidneys.

Medical

Medical Testing
For frequent or potentially high exposure (half the PEL or greater), the following are recommended before beginning work and at regular times after that:

- Liver and kidney function tests

If symptoms develop or overexposure is suspected, the following are recommended:

- Exam of the eyes and vision
- Exam of the nervous system

Any evaluation should include a careful history of past and present symptoms with an exam. Medical tests that look for damage already done are not a substitute for controlling exposure.

You have a legal right to request copies of your medical testing under the OSHA Access to Employee Exposure and Medical Records Standard (29 CFR 1910.1020).

Mixed Exposures
- More than light alcohol consumption can cause liver damage. Drinking alcohol can increase the liver damage caused by **Xylenes**.

Workplace Controls and Practices

Very toxic chemicals, or those that are reproductive hazards or sensitizers, require expert advice on control measures if a less toxic chemical cannot be substituted. Control measures include: (1) enclosing chemical processes for severely irritating and corrosive chemicals, (2) using local exhaust ventilation for chemicals that may be harmful with a single exposure, and (3) using general ventilation to control exposures to skin and eye irritants. For further information on workplace controls, consult the NIOSH document on Control Banding at www.cdc.gov/niosh/topics/ctrlbanding/.

The following work practices are also recommended:

- Label process containers.
- Provide employees with hazard information and training.
- Monitor airborne chemical concentrations.
- Use engineering controls if concentrations exceed recommended exposure levels.
- Provide eye wash fountains and emergency showers.
- Wash or shower if skin comes in contact with a hazardous material.
- Always wash at the end of the workshift.
- Change into clean clothing if clothing becomes contaminated.
- Do not take contaminated clothing home.
- Get special training to wash contaminated clothing.
- Do not eat, smoke, or drink in areas where chemicals are being handled, processed or stored.
- Wash hands carefully before eating, smoking, drinking, applying cosmetics or using the toilet.

In addition, the following may be useful or required:

- Before entering a confined space where **Xylenes** may be present, check to make sure that an explosive concentration does not exist.

Personal Protective Equipment

The OSHA Personal Protective Equipment Standard (29 CFR 1910.132) requires employers to determine the appropriate personal protective equipment for each hazard and to train employees on how and when to use protective equipment.

The following recommendations are only guidelines and may not apply to every situation.

Gloves and Clothing

- Avoid skin contact with **Xylenes**. Wear personal protective equipment made from material that can not be permeated or degraded by this substance. Safety equipment suppliers and manufacturers can provide recommendations on the most protective glove and clothing material for your operation.
- The recommended glove materials for **Xylenes** are Viton/Butyl, Polyvinyl Alcohol, Silver Shield®/4H®, Viton and Barrier®.
- The recommended protective clothing materials for **Xylenes** are Tychem® BR, CSM and TK, or the equivalent.
- All protective clothing (suits, gloves, footwear, headgear) should be clean, available each day, and put on before work.

Eye Protection

- Wear indirect vent goggles when working with liquids that may splash, spray or mist. A face shield is also required if the liquid is severely irritating or corrosive to the skin and eyes.

Respiratory Protection

Improper use of respirators is dangerous. Respirators should only be used if the employer has implemented a written program that takes into account workplace conditions, requirements for worker training, respirator fit testing, and medical exams, as described in the OSHA Respiratory Protection Standard (29 CFR 1910.134). **Only NIOSH approved respirators should be used.**

- Where the potential exists for exposure over **100 ppm**, use a full facepiece respirator with an organic vapor cartridge. Increased protection is obtained from full facepiece powered-air purifying respirators.
- Leave the area immediately if (1) while wearing a filter or cartridge respirator you can smell, taste, or otherwise detect **Xylenes**, (2) while wearing particulate filters abnormal resistance to breathing is experienced, or (3) eye irritation occurs while wearing a full facepiece respirator. Check to make sure the respirator-to-face seal is still good. If it is, replace the filter or cartridge. If the seal is no longer good, you may need a new respirator.
- Consider all potential sources of exposure in your workplace. You may need a combination of filters, prefilters or cartridges to protect against different forms of a chemical (such as vapor and mist) or against a mixture of chemicals.
- Where the potential for high exposure exists, use a supplied-air respirator with a full facepiece operated in a pressure-demand or other positive-pressure mode. For increased protection use in combination with an auxiliary self-contained breathing apparatus or an emergency escape air cylinder.
- Exposure to **900 ppm** is immediately dangerous to life and health. If the possibility of exposure above **900 ppm** exists, use a self-contained breathing apparatus with a full facepiece operated in a pressure-demand or other positive-pressure mode equipped with an emergency escape air cylinder.

Fire Hazards

If employees are expected to fight fires, they must be trained and equipped as stated in the OSHA Fire Brigades Standard (29 CFR 1910.156).

- **Xylenes** are FLAMMABLE LIQUIDS.
- Use dry chemical, CO_2, water spray or foam as extinguishing agents.
- POISONOUS GASES ARE PRODUCED IN FIRE.
- CONTAINERS MAY EXPLODE IN FIRE.
- Use water spray to keep fire-exposed containers cool.
- Vapors are heavier than air and may travel a distance to cause a fire or explosion far from the source and flash back.
- Flow or agitation may generate electrostatic charges.
- **Xylenes** may form an ignitable vapor/air mixture in closed tanks or containers.

Spills and Emergencies

If employees are required to clean-up spills, they must be properly trained and equipped. The OSHA Hazardous Waste Operations and Emergency Response Standard (29 CFR 1910.120) may apply.

If **Xylenes** are spilled or leaked, take the following steps:

- Evacuate personnel and secure and control entrance to the area.
- Eliminate all ignition sources.
- Absorb *liquids* in dry sand, earth, or a similar material and place into sealed containers for disposal.
- Keep **Xylenes** out of confined spaces, such as sewers, because of the possibility of an explosion.
- Ventilate area of spill or leak.
- DO NOT wash into sewer.
- It may be necessary to contain and dispose of **Xylenes** as a HAZARDOUS WASTE. Contact your state Department of Environmental Protection (DEP) or your regional office of the federal Environmental Protection Agency (EPA) for specific recommendations.

Handling and Storage

Prior to working with **Xylenes** you should be trained on its proper handling and storage.

- **Xylenes** react with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE) and STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC).
- Store in tightly closed containers in a cool, well-ventilated area.
- Sources of ignition, such as smoking and open flames, are prohibited where **Xylenes** are used, handled, or stored.
- Metal containers involving the transfer of **Xylenes** should be grounded and bonded.
- Use explosion-proof electrical equipment and fittings wherever **Xylenes** are used, handled, manufactured, or stored.
- Use only non-sparking tools and equipment, especially when opening and closing containers of **Xylenes**.

Occupational Health Information Resources

The New Jersey Department of Health and Senior Services, Occupational Health Service, offers multiple services in occupational health. These services include providing informational resources, educational materials, public presentations, and industrial hygiene and medical investigations and evaluations.

For more information, please contact:

New Jersey Department of Health & Senior Services
Right to Know Program
PO Box 368
Trenton, NJ 08625-0368
Phone: 609-984-2202
Fax: 609-984-7407
E-mail: rtk@doh.state.nj.us
Web address: http://www.nj.gov/health/eoh/rtkweb

GLOSSARY

ACGIH is the American Conference of Governmental Industrial Hygienists. They publish guidelines called Threshold Limit Values (TLVs) for exposure to workplace chemicals.

Acute Exposure Guideline Levels (AEGLs) are established by the EPA. They describe the risk to humans resulting from once-in-a lifetime, or rare, exposure to airborne chemicals.

Boiling point is the temperature at which a substance can change its physical state from a liquid to a gas.

A **carcinogen** is a substance that causes cancer.

The **CAS number** is unique, identifying number, assigned by the Chemical Abstracts Service, to a specific chemical.

CFR is the Code of Federal Regulations, which are the regulations of the United States government.

A **combustible** substance is a solid, liquid or gas that will burn.

A **corrosive** substance is a gas, liquid or solid that causes destruction of human skin or severe corrosion of containers.

The **critical temperature** is the temperature above which a gas cannot be liquefied, regardless of the pressure applied.

DEP is the New Jersey Department of Environmental Protection.

DOT is the Department of Transportation, the federal agency that regulates the transportation of chemicals.

EPA is the Environmental Protection Agency, the federal agency responsible for regulating environmental hazards.

ERG is the Emergency Response Guidebook. It is a guide for emergency responders for transportation emergencies involving hazardous substances.

Emergency Response Planning Guideline (ERPG) values provide estimates of concentration ranges where one reasonably might anticipate observing adverse effects.

A **fetus** is an unborn human or animal.

A **flammable** substance is a solid, liquid, vapor or gas that will ignite easily and burn rapidly.

The **flash point** is the temperature at which a liquid or solid gives off vapor that can form a flammable mixture with air.

IARC is the International Agency for Research on Cancer, a scientific group.

Ionization Potential is the amount of energy needed to remove an electron from an atom or molecule. It is measured in electron volts.

IRIS is the Integrated Risk Information System database on human health effects that may result from exposure to various chemicals, maintained by federal EPA.

LEL or **Lower Explosive Limit**, is the lowest concentration of a combustible substance (gas or vapor) in the air capable of continuing an explosion.

mg/m^3 means milligrams of a chemical in a cubic meter of air. It is a measure of concentration (weight/volume).

A **mutagen** is a substance that causes mutations. A **mutation** is a change in the genetic material in a body cell. Mutations can lead to birth defects, miscarriages, or cancer.

NFPA is the National Fire Protection Association. It classifies substances according to their fire and explosion hazard.

NIOSH is the National Institute for Occupational Safety and Health. It tests equipment, evaluates and approves respirators, conducts studies of workplace hazards, and proposes standards to OSHA.

NTP is the National Toxicology Program which tests chemicals and reviews evidence for cancer.

OSHA is the federal Occupational Safety and Health Administration, which adopts and enforces health and safety standards.

PEOSHA is the New Jersey Public Employees Occupational Safety and Health Act, which adopts and enforces health and safety standards in public workplaces.

Permeated is the movement of chemicals through protective materials.

ppm means parts of a substance per million parts of air. It is a measure of concentration by volume in air.

Protective Action Criteria (PAC) are values established by the Department of Energy and are based on AEGLs and ERPGs. They are used for emergency planning of chemical release events.

A **reactive** substance is a solid, liquid or gas that releases energy under certain conditions.

STEL is a Short Term Exposure Limit which is usually a 15-minute exposure that should not be exceeded at any time during a work day.

A **teratogen** is a substance that causes birth defects by damaging the fetus.

UEL or **Upper Explosive Limit** is the highest concentration in air above which there is too much fuel (gas or vapor) to begin a reaction or explosion.

Vapor Density is the ratio of the weight of a given volume of one gas to the weight of another (usually *Air*), at the same temperature and pressure.

The **vapor pressure** is a force exerted by the vapor in equilibrium with the solid or liquid phase of the same substance. The higher the vapor pressure the higher concentration of the substance in air.

Right to Know Hazardous Substance Fact Sheet

Emergency Responders Quick Reference

Common Name: **XYLENES**

Synonyms: Dimethylbenzene; Methyl Toluene (mixed isomers); Xylol
CAS No: 1330-20-7
Molecular Formula: $C_6H_4(CH_3)_2$
RTK Substance No: 2014
Description: Colorless liquids with a faint, sweet odor

HAZARD DATA

Hazard Rating	Firefighting	Reactivity
2 - Health **3 - Fire** **0 - Reactivity** **DOT#:** UN 2014 **ERG Guide #:** 130 **Hazard Class:** 3 (Flammable)	FLAMMABLE LIQUIDS Use dry chemical, CO_2, water spray or foam as extinguishing agents. POISONOUS GASES ARE PRODUCED IN FIRE. CONTAINERS MAY EXPLODE IN FIRE. Use water spray to keep fire-exposed containers cool. Vapors are heavier than air and may travel a distance to cause a fire or explosion far from the source and flash back. Flow or agitation may generate electrostatic charges. **Xylenes** may form an ignitable vapor/air mixture in closed tanks or containers.	**Xylenes** react with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE) and STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC).

SPILL/LEAKS

Isolation Distance:

Spill: 50 meters (150 feet)

Fire: 800 meters (1/2 mile)

Absorb *liquids* in dry sand, earth, or a similar material and place into sealed containers for disposal.

Ground and bond containers when transferring **Xylenes**.

Use only non-sparking tools and equipment.

Keep **Xylenes** out of confined spaces, such as sewers, because of the possibility of an explosion.

DO NOT wash into sewer.

Xylenes are toxic to aquatic organisms.

PHYSICAL PROPERTIES

Odor Threshold:	0.07 to 40 ppm
Flash Point:	63° to 77°F (17° to 25°C)
LEL:	0.9 to 1.1%
UEL:	6.7 to 7%
Auto Ignition Temp:	867° to 984°F (464° to 529°C)
Vapor Density:	3.7 (air = 1)
Vapor Pressure:	7 to 9 mm Hg at 68°F (20°C)
Specific Gravity:	0.86 (water = 1)
Water Solubility:	Insoluble
Boiling Point:	279° to 291°F (137° to 144°C)
Freezing Point:	-53°F (-47°C) to 55.4°F (13°C)
Ionization Potential:	8.44 to 8.56 eV
Molecular Weight:	106.2

EXPOSURE LIMITS

OSHA:	100 ppm, 8-hr TWA
NIOSH:	100 ppm, 10-hr TWA; 150 ppm, STEL
ACGIH:	100 ppm, 8-hr TWA; 150 ppm, STEL
IDLH:	900 ppm

The Protective Action Criteria values are:
PAC-1 = 130 ppm PAC-2 = 920 ppm PAC-3 = 2,500 ppm

PROTECTIVE EQUIPMENT

Gloves:	Vinton/Butyl, Polyvinyl Alcohol, Silver Shield®/4H®, Viton and Barrier® (>8-hr breakthrough)
Coveralls:	Tychem® BR, CSM and TK (>8-hr breakthrough) **Use turnout gear or flash protection if ignition/fire is the greatest hazard**
Respirator:	>100 ppm - full facepiece APR with *Organic vapor cartridge* >900 ppm - SCBA

HEALTH EFFECTS

Eyes:	Irritation
Skin:	Irritation (skin absorbable)
Inhalation:	Nose and throat irritation with coughing and wheezing Headache, dizziness, lightheadedness, and passing out

FIRST AID AND DECONTAMINATION

Remove the person from exposure.

Flush eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.

Quickly remove contaminated clothing and wash contaminated skin with large amounts of soap and water.

Begin artificial respiration if breathing has stopped and CPR if necessary.

Transfer promptly to a medical facility.

Fisher Scientific
Part of Thermo Fisher Scientific

Material Safety Data Sheet

Trichloroethylene, stabilized

ACC# 23850

Section 1 - Chemical Product and Company Identification

MSDS Name: Trichloroethylene, stabilized
Product Grade : SQ, ExcelaR, EL
Catalog Numbers: 28455, 28456, 28457, 14715, 41957
Synonyms: Trichloroethylene
Company Identification:

Fisher Scientific
Part of Thermo Fisher Scientific
THERMO ELECTRON LLS INDIA PVT.LTD.
Godrej Coliseum, 101A-101B, Somaiya Hospital Road,
Off Eastern Express Highway, Sion (East), Mumbai-400 022, India

For information, call: 022 – 6680 3001/2, **Call India Toll Free** – 1800 209 7001
Emergency Number: 022-66803004/14
For CHEMTREC assistance, call: 800-424-9300 [International]
For International CHEMTREC assistance, call: 703-527-3887 [International]

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
79-01-6	Trichloroethylene	>99	201-167-4

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: clear, colorless liquid.
Warning! Breathing vapors may cause drowsiness and dizziness. Causes eye and skin irritation. Aspiration hazard if swallowed. Can enter lungs and cause damage. May cause cancer based on animal studies. May cause liver damage.
Target Organs: Central nervous system, liver, eyes, skin.

Potential Health Effects

Eye: Causes moderate eye irritation. May result in corneal injury. Contact produces irritation, tearing, and burning pain. Contact with trichloroethylene causes pain but no permanent injury to the eyes. (Doc of TLV)
Skin: Causes mild skin irritation. Prolonged and/or repeated contact may cause defatting of the skin and dermatitis. May cause peripheral nervous system function impairment including persistent neuritis, and temporary loss of touch. Damage to the liver and other organs has been observed in workers who have been overexposed.
Ingestion: May cause irritation of the digestive tract. Aspiration of material into the lungs may cause chemical pneumonitis, which may be fatal.
Inhalation: May cause respiratory tract irritation. May cause liver abnormalities. May cause cardiac abnormalities. May cause peripheral nervous system effects. Inhalation overexposure may lead to central nervous system depression, producing effects such as dizziness, headache, confusion, incoordination, nausea, weakness, and loss of consciousness. Extreme exposures may cause other CNS effects including death. The chief symptoms of TCE exposure were found to be abnormal fatigue, irritability, headache, gastric disturbances, and intolerance to alcohol. (Doc to TLV)
Chronic: Possible cancer hazard based on tests with laboratory animals. Chronic inhalation may cause effects similar to those of acute inhalation. Prolonged or repeated skin contact may cause defatting and dermatitis. May cause peripheral nervous system function impairment including persistent neuritis, and temporary loss of touch. Damage to the liver and other organs has been observed in workers who have been overexposed.

Section 4 - First Aid Measures

Eyes: Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical aid imme diately.
Skin: Get medical aid if irritation develops or persists. Flush skin with plenty of soap and water.
Ingestion: If victim is conscious and alert, give 2-4 cupfuls of milk or water. Never give anything by mouth to an unconscious person. Possible aspiration hazard. Get medical aid immediately.
Inhalation: Get medical aid immediately. Remove from exposure and move to fresh air immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Do NOT use mouth-to-mouth resuscitation.
Notes to Physician: Treat symptomatically and supportively.

Section 5 - Fire Fighting Measures

General Information: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion. Use water spray to keep fire-exposed containers cool.

Extinguishing Media: Use extinguishing media most appropriate for the surrounding fire.
Flash Point: None
Autoignition Temperature: 420 deg C (788.00 deg F)
Explosion Limits, Lower:8
Upper: 10.5
NFPA Rating: (estimated) Health: 2; Flammability: 1; Instability: 0

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.
Spills/Leaks: Absorb spill with inert material (e.g. vermiculite, sand or earth), then place in suitable container. Provide ventilation. Approach spill from upwind. Control runoff and isolate discharged material for proper disposal.

Section 7 - Handling and Storage

Handling: Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Use with adequate ventilation. Avoid contact with eyes, skin, and clothing. Avoid breathing vapor.
Storage: Store in a tightly closed container. Store in a cool, dry, well-ventilated area away from incompatible substances.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use adequate general or local exhaust ventilation to keep airborne concentrations below the permissible exposure limits.
Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Trichloroethylene	50 ppm TWA; 100 ppm STEL	1000 ppm IDLH	100 ppm TWA; 200 ppm Ceiling

OSHA Vacated PELs: Trichloroethylene: 50 ppm TWA; 270 mg/m3 TWA

Personal Protective Equipment
Eyes: Wear chemical splash goggles.
Skin: Wear appropriate protective gloves to prevent skin exposure.
Clothing: Wear appropriate protective clothing to prevent skin exposure.
Respirators: Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

Section 9 - Physical and Chemical Properties

Physical State: Liquid
Appearance: clear, colorless
Odor: chloroform-like
pH: Not available.
Vapor Pressure: 58 mm Hg @ 20 deg C
Vapor Density: 4.5 (air=1)
Evaporation Rate:0.69 (CCl4=1)
Viscosity: 0.0055 poise
Boiling Point: 87 deg C
Freezing/Melting Point:-86 deg C
Decomposition Temperature: Not available.
Solubility: Slightly soluble.
Specific Gravity/Density:1.46
Molecular Formula:C2HCl3
Molecular Weight:131.39

Section 10 - Stability and Reactivity

Chemical Stability: Stable under normal temperatures and pressures.
Conditions to Avoid: Light, confined spaces.
Incompatibilities with Other Materials: Active metals.
Hazardous Decomposition Products: Hydrogen chloride, phosgene, carbon monoxide, carbon dioxide.
Hazardous Polymerization: May occur.

Section 11 - Toxicological Information

RTECS#:
CAS# 79-01-6: KX4550000
LD50/LC50:
CAS# 79-01-6:
Draize test, rabbit, eye: 20 mg/24H Moderate;
Draize test, rabbit, skin: 2 mg/24H Severe;
Inhalation, mouse: LC50 = 8450 ppm/4H;
Inhalation, mouse: LC50 = 220000 mg/m3/20M;
Inhalation, mouse: LC50 = 262000 mg/m3/30M;
Inhalation, mouse: LC50 = 40000 mg/m3/4H;
Inhalation, rat: LC50 = 140700 mg/m3/1H;
Oral, mouse: LD50 = 2402 mg/kg;
Oral, mouse: LD50 = 2400 mg/kg;
Oral, rat: LD50 = 4920 mg/kg;
Skin, rabbit: LD50 = >20 gm/kg;
Skin, rabbit: LD50 = 20 mL/kg;
.

Carcinogenicity:
CAS# 79-01-6:

- **ACGIH:** Not listed.
- **California:** carcinogen, initial date 4/1/88
- **NTP:** Suspect carcinogen
- **IARC:** Group 2A carcinogen

Epidemiology: In six epidemiological studies completed, there was no evidence to suggest that trichloroethylene has increased the incidence of cancer in humans. (Documentation of the TLV, 7th edition)
Teratogenicity: No information available.
Reproductive Effects: Experimental reproductive effects have been observed.
Mutagenicity: Human mutation data has been reported. IARC and the National Toxicology Program (NTP) stated that variability in the mutagencity test results with trichloroethylene may be due to the presence of various stabilizers used in TCEwhich are mutagens (e.g.epoxybutane, epichlorohydrin).See actual entry in RTECS for complete infomation.R68 Mutagen Category 3 (CHIP 2002, UK).
Neurotoxicity: No information available.
Other Studies:

Section 12 - Ecological Information

Ecotoxicity: Fish: Fathead Minnow: 41-67 mg/L; 96 hrs.; LC50Daphnia: Daphnia: 2.2-100 mg/L; 48 hrs.; LC50Mollusk Shrimp: 2 mg/L; 96 hrs.; LC50 Bluegill sunfish, LD50= 44,700 ug/L/96Hr. Fathead minnow, LC50=40.7 mg/L/96Hr.
Environmental: In air, substance is photooxidized and is reported to form phosgene, dichloroacetyl chloride, and formyl chloride. In water, it evaporates rapidly. Potential for

mobility in soil is high.
Physical: No information available.
Other: Bioconcentration potential is low (BCF less than 100).

Section 13 - Disposal Considerations

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.
RCRA P-Series: None listed.
RCRA U-Series:
CAS# 79-01-6: waste number U228.

Section 14 - Transport Information

	US DOT	Canada TDG
Shipping Name:	TRICHLOROETHYLENE	TRICHLOROETHYLENE
Hazard Class:	6.1	6.1
UN Number:	UN1710	UN1710
Packing Group:	III	III

Section 15 - Regulatory Information

US FEDERAL

TSCA
CAS# 79-01-6 is listed on the TSCA inventory.
Health & Safety Reporting List
None of the chemicals are on the Health & Safety Reporting List.
Chemical Test Rules
None of the chemicals in this product are under a Chemical Test Rule.
Section 12b
None of the chemicals are listed under TSCA Section 12b.
TSCA Significant New Use Rule
None of the chemicals in this material have a SNUR under TSCA.
CERCLA Hazardous Substances and corresponding RQs

CAS# 79-01-6: 100 lb final RQ; 45.4 kg final RQ

SARA Section 302 Extremely Hazardous Substances

None of the chemicals in this product have a TPQ.

SARA Codes

CAS # 79-01-6: immediate, delayed, reactive.

Section 313

This material contains Trichloroethylene (CAS# 79-01-6, >99%),which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR

Clean Air Act:

CAS# 79-01-6 is listed as a hazardous air pollutant (HAP).

This material does not contain any Class 1 Ozone depletors.

This material does not contain any Class 2 Ozone depletors.

Clean Water Act:

CAS# 79-01-6 is listed as a Hazardous Substance under the CWA. CAS# 79-01-6 is listed as a Priority Pollutant under the Clean Water Act. CAS# 79-01-6 is listed as a Toxic Pollutant under the Clean Water Act.

OSHA:

None of the chemicals in this product are considered highly hazardous by OSHA.

STATE

CAS# 79-01-6 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Minnesota, Massachusetts.

California Prop 65

The following statement(s) is(are) made in order to comply with the California Safe Drinking Water Act:

WARNING: This product contains Trichloroethylene, a chemical known to the state of California to cause cancer.

California No Significant Risk Level: CAS# 79-01-6: 50 æg/day NSRL (oral); 80 æg/day NSRL (inhalation)

European/International Regulations

European Labeling in Accordance with EC Directives

Hazard Symbols:

T

Risk Phrases:

R 36/38 Irritating to eyes and skin.

R 45 May cause cancer.

R 52/53 Harmful to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

R 67 Vapours may cause drowsiness and dizziness.

Safety Phrases:

S 45 In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

S 53 Avoid exposure - obtain special instructions before use.

S 61 Avoid release to the environment. Refer to special instructions /safety data sheets.

WGK (Water Danger/Protection)

CAS# 79-01-6: 3

Canada - DSL/NDSL

CAS# 79-01-6 is listed on Canada's DSL List.

Canada - WHMIS

This product has a WHMIS classification of D1B, D2B.

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all of the information required by those regulations.

Canadian Ingredient Disclosure List

CAS# 79-01-6 is listed on the Canadian Ingredient Disclosure List.

Section 16 - Additional Information

MSDS Creation Date: 2/01/1999
Revision #7 Date: 12/27/2006

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall Fisher be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if Fisher has been advised of the possibility of such damages.

Material Safety Data Sheet

Toluene, 99%

ACC# 96584

Section 1 - Chemical Product and Company Identification

MSDS Name: Toluene, 99%
Catalog Numbers: AC177160000, AC177160010, AC177160025, AC177160200, AC177160250
Synonyms: Methacide; Methylbenzene; Methylbenzol; Phenylmethane; Toluol.
Company Identification:

Acros Organics N.V.
One Reagent Lane
Fair Lawn, NJ 07410

For information in North America, call: 800-ACROS-01
For emergencies in the US, call CHEMTREC: 800-424-9300

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
108-88-3	Benzene, methyl-	>99.0	203-625-9

Hazard Symbols: XN F
Risk Phrases: 11 20

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: colorless liquid. Flash Point: 40 deg F. **Flammable liquid and vapor.** May cause central nervous system depression. May cause liver and kidney damage. This substance has caused adverse reproductive and fetal effects in animals. Causes digestive and respiratory tract irritation. May cause skin irritation. Aspiration hazard if swallowed. Can enter lungs and cause damage.

Danger! Harmful or fatal if swallowed. Causes eye irritation and possible transient injury. Poison! May be absorbed through intact skin. Vapor harmful. Call physician immmediately.
Target Organs: Kidneys, central nervous system, liver.

Potential Health Effects

Eye: Causes eye irritation. May result in corneal injury. Vapors may cause eye irritation.
Skin: May cause skin irritation. Prolonged and/or repeated contact may cause irritation and/or dermatitis. May be absorbed through the skin.
Ingestion: Aspiration hazard. May cause irritation of the digestive tract. May cause effects similar to those for inhalation exposure. Aspiration of material into the lungs may cause chemical pneumonitis, which may be fatal.
Inhalation: Inhalation of high concentrations may cause central nervous system effects characterized by nausea, headache, dizziness, unconsciousness and coma. Inhalation of vapor may cause respiratory tract irritation. May cause liver and kidney damage. Vapors may cause dizziness or suffocation. Overexposure may cause dizziness, tremors, restlessness, rapid heart beat, increased blood pressure, hallucinations, acidosis, kidney failure.

Chronic: Prolonged or repeated skin contact may cause dermatitis. May cause cardiac sensitization and severe heart abnormalities. May cause liver and kidney damage.

Section 4 - First Aid Measures

Eyes: Flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical aid immediately.
Skin: Flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Get medical aid if irritation develops or persists.
Ingestion: Do NOT induce vomiting. If victim is conscious and alert, give 2-4 cupfuls of milk or water. Never give anything by mouth to an unconscious person. Possible aspiration hazard. Get medical aid immediately.
Inhalation: Get medical aid immediately. Remove from exposure and move to fresh air immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.
Notes to Physician: Causes cardiac sensitization to endogenous catelcholamines which may lead to cardiac arrhythmias. Do NOT use adrenergic agents such as epinephrine or pseudoepinephrine.

Section 5 - Fire Fighting Measures

General Information: Containers can build up pressure if exposed to heat and/or fire. As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Water runoff can cause environmental damage. Dike and collect water used to fight fire. Vapors may form an explosive mixture with air. Vapors can travel to a source of ignition and flash back. Flammable Liquid. Can release vapors that form explosive mixtures at temperatures above the flashpoint. Use water spray to keep fire-exposed containers cool. Water may be ineffective. Material is lighter than water and a fire may be spread by the use of water. Vapors may be heavier than air. They can spread along the ground and collect in low or confined areas. Containers may explode when heated.
Extinguishing Media: Use water spray to cool fire-exposed containers. Water may be ineffective. Do NOT use straight streams of water. For small fires, use dry chemical, carbon dioxide, water spray or regular foam. Cool containers with flooding quantities of water until well after fire is out. For large fires, use water spray, fog or regular foam.
Flash Point: 40e deg F (4.44 deg C)
Autoignition Temperature: 896 deg F (480.00 deg C)
Explosion Limits, Lower:1.1
Upper: 7.1
NFPA Rating: (estimated) Health: 2; Flammability: 3; Instability: 0

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.
Spills/Leaks: Avoid runoff into storm sewers and ditches which lead to waterways. Remove all sources of ignition. Absorb spill using an absorbent, non-combustible material such as earth, sand, or vermiculite. Do not use combustible materials such as saw dust. A vapor suppressing foam may be used to reduce vapors. Water spray may reduce vapor but may not prevent ignition in closed spaces.

Section 7 - Handling and Storage

Handling: Wash thoroughly after handling. Use with adequate ventilation. Ground and bond containers when transferring material. Avoid contact with eyes, skin, and clothing. Empty containers retain product residue, (liquid and/or vapor), and can be dangerous. Keep container tightly closed. Avoid contact with heat, sparks and flame. Avoid ingestion and inhalation. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose empty containers to heat, sparks or open flames.
Storage: Keep away from heat, sparks, and flame. Keep away from sources of ignition. Store in a tightly closed container. Store in a cool, dry, well-ventilated area away from incompatible substances.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use adequate general or local exhaust ventilation to keep airborne concentrations below the permissible exposure limits.
Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Benzene, methyl-	50 ppm TWA; skin - potential for cutaneous absorption	100 ppm TWA; 375 mg/m3 TWA 500 ppm IDLH	200 ppm TWA; 300 ppm Ceiling

OSHA Vacated PELs: Benzene, methyl-: 100 ppm TWA; 375 mg/m3 TWA
Personal Protective Equipment
Eyes: Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.
Skin: Wear appropriate protective gloves to prevent skin exposure.
Clothing: Wear appropriate protective clothing to prevent skin exposure.
Respirators: Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Always use a NIOSH or European Standard EN 149 approved respirator when necessary.

Section 9 - Physical and Chemical Properties

Physical State: Liquid
Appearance: colorless
Odor: sweetish odor - pleasant odor
pH: Not available.
Vapor Pressure: 36.7 mm Hg @ 30C
Vapor Density: 3.1 (Air=1)
Evaporation Rate:2.4 (Butyl acetate=1)
Viscosity: 0.59 cP @ 20C
Boiling Point: 232 deg F
Freezing/Melting Point:-139 deg F
Decomposition Temperature: Not available.
Solubility: Insoluble.
Specific Gravity/Density:0.9 (Water=1)

Molecular Formula:C6H5CH3
Molecular Weight:92.056

Section 10 - Stability and Reactivity

Chemical Stability: Stable under normal temperatures and pressures.
Conditions to Avoid: Incompatible materials, ignition sources, excess heat.
Incompatibilities with Other Materials: Ntrogen tetroxide, nitric acid + sulfuric acid, silver perchlorate, strong oxidizers, sodium dilfuoride, .
Hazardous Decomposition Products: Carbon monoxide, carbon dioxide.
Hazardous Polymerization: Has not been reported.

Section 11 - Toxicological Information

RTECS#:
CAS# 108-88-3: XS5250000
LD50/LC50:
CAS# 108-88-3:
Draize test, rabbit, eye: 870 ug Mild;
Draize test, rabbit, eye: 2 mg/24H Severe;
Draize test, rabbit, skin: 435 mg Mild;
Draize test, rabbit, skin: 500 mg Moderate;
Draize test, rabbit, skin: 20 mg/24H Moderate;
Inhalation, mouse: LC50 = 400 ppm/24H;
Inhalation, rat: LC50 = 49 gm/m3/4H;
Oral, rat: LD50 = 636 mg/kg;
Skin, rabbit: LD50 = 14100 uL/kg;
Carcinogenicity:
CAS# 108-88-3:
ACGIH: A4 - Not Classifiable as a Human Carcinogen
IARC: IARC Group 3 - not classifiable
Epidemiology: No information available.
Teratogenicity: Specific developmental abnormalities included craniofacial effects involving the nose and tongue, musculoskeletal effects, urogenital and metabolic effects in studies on mice and rats by the inhalation and oral routes of exposure. Some evidence of fetotoxicity with reduced fetal weight and retarded skeletal development has been reported in mice and rats.
Reproductive Effects: Effects on fertility such as abortion were reported in rabbits by inhalation. Paternal effects were noted in rats by inhalation. These effects involved the testes, sperm duct and epididymis.
Neurotoxicity: No information available.
Mutagenicity: No information available.
Other Studies: See actual entry in RTECS for complete information.

Section 12 - Ecological Information

Ecotoxicity: No data available. Bluegill LC50=17 mg/L/24H Shrimp LC50=4.3 ppm/96HFathead minnow LC50=36.2 mg/L/96HSunfish (fresh water) TLm=1180 mg/L/96H
Environmental: From soil, substance evaporates and is microbially biodegraded. In water,

substance volatilizes and biodegrades.
Physical: Photochemically produced hydroxyl radicals degrade substance.
Other: None.

Section 13 - Disposal Considerations

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.
RCRA P-Series: None listed.
RCRA U-Series: CAS# 108-88-3: waste number U220.

Section 14 - Transport Information

	US DOT	IATA	RID/ADR	IMO	Canada TDG
Shipping Name:	TOLUENE				No information available.
Hazard Class:	3				
UN Number:	UN1294				
Packing Group:	II				

Section 15 - Regulatory Information

US FEDERAL

TSCA
CAS# 108-88-3 is listed on the TSCA inventory.
Health & Safety Reporting List
CAS# 108-88-3: Effective Date: 10/4/82; Sunset Date: 10/4/92
Chemical Test Rules
None of the chemicals in this product are under a Chemical Test Rule.
Section 12b
None of the chemicals are listed under TSCA Section 12b.
TSCA Significant New Use Rule
None of the chemicals in this material have a SNUR under TSCA.
SARA

CERCLA Hazardous Substances and corresponding RQs
CAS# 108-88-3: 1000 lb final RQ; 454 kg final RQ
SARA Section 302 Extremely Hazardous Substances
None of the chemicals in this product have a TPQ.
SARA Codes
CAS # 108-88-3: acute, flammable.
Section 313
This material contains Benzene, methyl- (CAS# 108-88-3, 99 0%),which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR Part 373.
Clean Air Act:
CAS# 108-88-3 is listed as a hazardous air pollutant (HAP). This material does not contain any

Class 1 Ozone depletors. This material does not contain any Class 2 Ozone depletors.
Clean Water Act:
CAS# 108-88-3 is listed as a Hazardous Substance under the CWA. CAS# 108-88-3 is listed as a Priority Pollutant under the Clean Water Act. CAS# 108-88-3 is listed as a Toxic Pollutant under the Clean Water Act.
OSHA:
None of the chemicals in this product are considered highly hazardous by OSHA.
STATE
CAS# 108-88-3 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Minnesota, Massachusetts.
WARNING: This product contains Benzene, methyl-, a chemical known to the state of California to cause birth defects or other reproductive harm. California No Significant Risk Level: None of the chemicals in this product are listed.

European/International Regulations

European Labeling in Accordance with EC Directives
Hazard Symbols:
XN F
Risk Phrases:
R 11 Highly flammable.
R 20 Harmful by inhalation.

Safety Phrases:
S 16 Keep away from sources of ignition - No smoking.
S 25 Avoid contact with eyes.
S 29 Do not empty into drains.
S 33 Take precautionary measures against static discharges.

WGK (Water Danger/Protection)
CAS# 108-88-3: 2
Canada - DSL/NDSL
CAS# 108-88-3 is listed on Canada's DSL List.
Canada - WHMIS
This product does not have a WHMIS classification.
Canadian Ingredient Disclosure List
CAS# 108-88-3 is listed on the Canadian Ingredient Disclosure List.
Exposure Limits
CAS# 108-88-3: OEL-AUSTRALIA:TWA 100 ppm (375 mg/m3);STEL 150 ppm (560 mg/m3) OEL-BELGIUM:TWA 100 ppm (377 mg/m3);STEL 150 ppm (565 mg/m3) OEL-CZECHOSLOVAKIA:TWA 200 mg/m3;STEL 1000 mg/m3 OEL-DENMARK:TWA 50 ppm (190 mg/m3);Skin OEL-FINLAND:TWA 100 ppm (375 mg/m3);STEL 150 ppm;Skin OEL-FRANCE:TWA 100 ppm (375 mg/m3);STEL 150 ppm (560 mg/m3) OEL-GERMANY:TWA 100 ppm (380 mg/m3) OEL-HUNGARY:TWA 100 mg/m3;STEL 300 mg/m3;Skin OEL-JAPAN:TWA 100 ppm (380 mg/m3) OEL-THE NETHERLANDS:TWA 100 ppm (375 mg/m3);Skin OEL-THE PHILIPPINES:TWA 100 ppm (375 mg/m3) OEL-POLAND:TWA 100 mg/m3 OEL-RUSSIA:TWA 100 ppm;STEL 50 mg/m3 OEL-SWEDEN:TWA 50 ppm (200 mg/m3);STEL 100 ppm (400 mg/m3);Skin OEL-SWITZERLAND:TWA 100 ppm (380 mg/m3);STEL 500 ppm OEL-THAILAND:TWA 200 ppm;STEL 300 ppm OEL-TURKEY:TWA 200 ppm (750 mg/m3) OEL-UNITED KINGDOM:TWA 100 ppm (375 mg/m3);STEL 150 ppm;Skin OEL IN BULGARIA, COLOMBIA, JORDAN, KOREA check ACGIH TLV OEL IN NEW ZEALAND, SINGAPORE, VIETNAM check ACGI TLV

Section 16 - Additional Information

MSDS Creation Date: 6/01/1999
Revision #5 Date: 3/18/2003

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall Fisher be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if Fisher has been advised of the possibility of such damages.

Right to Know

Hazardous Substance Fact Sheet

Common Name: **TETRACHLOROETHYLENE**

Synonyms: Ethylene Tetrachloride; Perchloroethylene

Chemical Name: Ethene, Tetrachloro-

Date: March 2002 Revision: October 2011

CAS Number: 127-18-4

RTK Substance Number: 1810

DOT Number: UN 1897

EMERGENCY RESPONDERS >>>> SEE LAST PAGE

Description and Use

Tetrachloroethylene is a clear, colorless liquid with a sweet *Ether*-like odor. It is used as a dry cleaning solvent, heat transfer medium, degreaser, solvent, and drying agent for metals.

- **ODOR THRESHOLD = 5 to 50 ppm**
- Odor thresholds vary greatly. Do not rely on odor alone to determine potentially hazardous exposures.

Reasons for Citation

- **Tetrachloroethylene** is on the Right to Know Hazardous Substance List because it is cited by OSHA, ACGIH, DOT, NIOSH, NTP, DEP, IARC, IRIS, NFPA and EPA.
- This chemical is on the Special Health Hazard Substance List.

SEE GLOSSARY ON PAGE 5.

FIRST AID

Eye Contact

- Immediately flush with large amounts of water for at least 15 minutes, lifting upper and lower lids. Remove contact lenses, if worn, while rinsing.

Skin Contact

- Quickly remove contaminated clothing. Immediately wash contaminated skin with large amounts of soap and water.

Inhalation

- Remove the person from exposure.
- Begin rescue breathing (using universal precautions) if breathing has stopped and CPR if heart action has stopped.
- Transfer promptly to a medical facility.
- Medical observation is recommended for 24 to 48 hours after overexposure, as pulmonary edema may be delayed.

EMERGENCY NUMBERS

Poison Control: 1-800-222-1222

CHEMTREC: 1-800-424-9300

NJDEP Hotline: 1-877-927-6337

National Response Center: 1-800-424-8802

Hazard Summary

Hazard Rating	NJDHSS	NFPA
HEALTH	3	2
FLAMMABILITY	-	0
REACTIVITY	-	0

CARCINOGEN
POISONOUS GASES ARE PRODUCED IN FIRE
DOES NOT BURN

Hazard Rating Key: 0=minimal; 1=slight; 2=moderate; 3=serious; 4=severe

- **Tetrachloroethylene** can affect you when inhaled and by passing through the skin.
- **Tetrachloroethylene** should be handled as a CARCINOGEN--WITH EXTREME CAUTION.
- **Tetrachloroethylene** can cause reproductive damage.
- Contact can irritate and burn the skin and eyes. Prolonged or repeated exposure can cause drying and cracking of the skin with rash, redness and blisters.
- Exposure can irritate the eyes, nose and throat.
- Inhaling **Tetrachloroethylene** can irritate the lungs. Higher exposures may cause a build-up of fluid in the lungs (pulmonary edema), a medical emergency.
- Exposure can cause headache, dizziness, lightheadedness, nausea, vomiting, and passing out.
- **Tetrachloroethylene** may damage the liver and kidneys and affect the nervous system and heart.

Workplace Exposure Limits

OSHA: The legal airborne permissible exposure limit (PEL) is **100 ppm** averaged over an 8-hour workshift, **200 ppm**, not to be exceeded during any 15-minute work period, and **300 ppm** as a maximum peak for 5-minutes during any 3-hour period.

NIOSH: Recommends that exposure to occupational carcinogens be limited to the lowest feasible concentration.

ACGIH: The threshold limit value (TLV) is **25 ppm** averaged over an 8-hour workshift and **100 ppm** as a STEL (short-term exposure limit).

- **Tetrachloroethylene** is a PROBABLE CARCINOGEN in humans. There may be no safe level of exposure to a carcinogen, so all contact should be reduced to the lowest possible level.
- The above exposure limits are for air levels only. When skin contact also occurs, you may be overexposed, even though air levels are less than the limits listed above.

Determining Your Exposure

- Read the product manufacturer's Material Safety Data Sheet (MSDS) and the label to determine product ingredients and important safety and health information about the product mixture.
- For each individual hazardous ingredient, read the New Jersey Department of Health and Senior Services Hazardous Substance Fact Sheet, available on the RTK Program website (www.nj.gov/health/eoh/rtkweb) or in your facility's RTK Central File or Hazard Communication Standard file.
- You have a right to this information under the New Jersey Worker and Community Right to Know Act and the Public Employees Occupational Safety and Health (PEOSH) Act if you are a public worker in New Jersey, and under the federal Occupational Safety and Health Act (OSHA) if you are a private worker.
- The New Jersey Right to Know Act requires most employers to label chemicals in the workplace and requires public employers to provide their employees with information concerning chemical hazards and controls. The federal OSHA Hazard Communication Standard (29 CFR 1910.1200) and the PEOSH Hazard Communication Standard (N.J.A.C. 12:100-7) require employers to provide similar information and training to their employees.

This Fact Sheet is a summary of available information regarding the health hazards that may result from exposure. Duration of exposure, concentration of the substance and other factors will affect your susceptibility to any of the potential effects described below.

Health Hazard Information

Acute Health Effects
The following acute (short-term) health effects may occur immediately or shortly after exposure to **Tetrachloroethylene**:

- Contact can irritate and burn the skin and eyes.
- Exposure can irritate the eyes, nose and throat.
- Inhaling **Tetrachloroethylene** can irritate the lungs causing coughing and/or shortness of breath. Higher exposures may cause a build-up of fluid in the lungs (pulmonary edema), a medical emergency, with severe shortness of breath.
- Exposure can cause headache, dizziness, lightheadedness, incoordination, nausea, vomiting, and passing out.

Chronic Health Effects
The following chronic (long-term) health effects can occur at some time after exposure to **Tetrachloroethylene** and can last for months or years:

Cancer Hazard
- **Tetrachloroethylene** is a PROBABLE CARCINOGEN in humans. There is evidence that it causes cancer of the liver, esophagus, bladder, and other types of cancer in humans. It has also been shown to cause cancer of the liver and leukemia in animals.
- Many scientists believe there is no safe level of exposure to a carcinogen.

Reproductive Hazard
- **Tetrachloroethylene** may damage the developing fetus.
- **Tetrachloroethylene** may decrease fertility in males and females and may damage the male (testes) and female (ovaries) reproductive systems in animals.
- There is limited evidence that **Tetrachloroethylene** causes spontaneous abortions.

Other Effects
- Prolonged or repeated exposure can cause drying and cracking of the skin with rash, redness and blisters.
- **Tetrachloroethylene** may damage the liver and kidneys and affect the nervous system and heart

Medical

Medical Testing
For frequent or potentially high exposure (half the TLV or greater), the following are recommended before beginning work and at regular times after that:

- Liver and kidney function tests

If symptoms develop or overexposure is suspected, the following are recommended:

- Consider chest x-ray after acute overexposure
- Exam of the nervous system
- EKG

Any evaluation should include a careful history of past and present symptoms with an exam. Medical tests that look for damage already done are not a substitute for controlling exposure.

You have a legal right to request copies of your medical testing under the OSHA Access to Employee Exposure and Medical Records Standard (29 CFR 1910.1020).

Mixed Exposures
- Smoking can cause heart disease, lung cancer, emphysema, and other respiratory problems. It may worsen respiratory conditions caused by chemical exposure. Even if you have smoked for a long time, stopping now will reduce your risk of developing health problems.
- More than light alcohol consumption can cause liver damage. Drinking alcohol can increase the liver damage caused by **Tetrachloroethylene**.

Workplace Controls and Practices

Very toxic chemicals, or those that are reproductive hazards or sensitizers, require expert advice on control measures if a less toxic chemical cannot be substituted. Control measures include: (1) enclosing chemical processes for severely irritating and corrosive chemicals, (2) using local exhaust ventilation for chemicals that may be harmful with a single exposure, and (3) using general ventilation to control exposures to skin and eye irritants. For further information on workplace controls, consult the NIOSH document on Control Banding at www.cdc.gov/niosh/topics/ctrlbanding/.

The following work practices are also recommended:

- Label process containers.
- Provide employees with hazard information and training.
- Monitor airborne chemical concentrations.
- Use engineering controls if concentrations exceed recommended exposure levels.
- Provide eye wash fountains and emergency showers.
- Wash or shower if skin comes in contact with a hazardous material.
- Always wash at the end of the workshift.
- Change into clean clothing if clothing becomes contaminated.
- Do not take contaminated clothing home.
- Get special training to wash contaminated clothing.
- Do not eat, smoke, or drink in areas where chemicals are being handled, processed or stored.
- Wash hands carefully before eating, smoking, drinking, applying cosmetics or using the toilet.

In addition, the following may be useful or required:

- Where possible, transfer **Tetrachloroethylene** from drums or other containers to process containers in an enclosed system.

Personal Protective Equipment

The OSHA Personal Protective Equipment Standard (29 CFR 1910.132) requires employers to determine the appropriate personal protective equipment for each hazard and to train employees on how and when to use protective equipment.

The following recommendations are only guidelines and may not apply to every situation.

Gloves and Clothing

- Avoid skin contact with **Tetrachloroethylene**. Wear personal protective equipment made from material that can not be permeated or degraded by this substance. Safety equipment suppliers and manufacturers can provide recommendations on the most protective glove and clothing material for your operation.
- The recommended glove materials for **Tetrachloroethylene** are Polyvinyl Alcohol, Silver Shield®/4H®, Viton, Viton/Butyl and Barrier®.
- The recommended protective clothing materials for **Tetrachloroethylene** are Tychem® F, CPF3, BR, CSM and TK; and Trellchem® HPS and VPS, or the equivalent.
- All protective clothing (suits, gloves, footwear, headgear) should be clean, available each day, and put on before work.

Eye Protection

- Wear indirect vent goggles when working with liquids that may splash, spray or mist. A face shield is also required if the liquid is severely irritating or corrosive to the skin and eyes.

Respiratory Protection

Improper use of respirators is dangerous. Respirators should only be used if the employer has implemented a written program that takes into account workplace conditions, requirements for worker training, respirator fit testing, and medical exams, as described in the OSHA Respiratory Protection Standard (29 CFR 1910.134).

- Where the potential exists for exposure to **Tetrachloroethylene**, use a NIOSH approved respirator with an organic vapor cartridge. More protection is provided by a full facepiece respirator than by a half-mask respirator, and even greater protection is provided by a powered-air purifying respirator.
- Leave the area immediately if (1) while wearing a filter or cartridge respirator you can smell, taste, or otherwise detect **Tetrachloroethylene**, (2) while wearing particulate filters abnormal resistance to breathing is experienced, or (3) eye irritation occurs while wearing a full facepiece respirator. Check to make sure the respirator-to-face seal is still good. If it is, replace the filter or cartridge. If the seal is no longer good, you may need a new respirator.
- Consider all potential sources of exposure in your workplace. You may need a combination of filters, prefilters or cartridges to protect against different forms of a chemical (such as vapor and mist) or against a mixture of chemicals.
- Where the potential exists for exposure over **25 ppm**, use a NIOSH approved supplied-air respirator with a full facepiece operated in a pressure-demand or other positive-pressure mode. For increased protection use in combination with an auxiliary self-contained breathing apparatus or an emergency escape air cylinder.
- Exposure to **150 ppm** is immediately dangerous to life and health. If the possibility of exposure above **150 ppm** exists, use a NIOSH approved self-contained breathing apparatus with a full facepiece operated in a pressure-demand or other positive-pressure mode equipped with an emergency escape air cylinder.

Fire Hazards

If employees are expected to fight fires, they must be trained and equipped as stated in the OSHA Fire Brigades Standard (29 CFR 1910.156).

- Extinguish fire using an agent suitable for type of surrounding fire. **Tetrachloroethylene** itself does not burn.
- POISONOUS GASES ARE PRODUCED IN FIRE, including *Hydrogen Chloride* and *Phosgene*.
- Use water spray to keep fire-exposed containers cool.

Spills and Emergencies

If employees are required to clean-up spills, they must be properly trained and equipped. The OSHA Hazardous Waste Operations and Emergency Response Standard (29 CFR 1910.120) may apply.

If **Tetrachloroethylene** is spilled or leaked, take the following steps:

- Evacuate personnel and secure and control entrance to the area.
- Eliminate all ignition sources.
- Absorb liquids in dry sand, earth, or a similar material and place into sealed containers for disposal.
- Ventilate area of spill or leak.
- DO NOT wash into sewer.
- It may be necessary to contain and dispose of **Tetrachloroethylene** as a HAZARDOUS WASTE. Contact your state Department of Environmental Protection (DEP) or your regional office of the federal Environmental Protection Agency (EPA) for specific recommendations.

Handling and Storage

Prior to working with **Tetrachloroethylene** you should be trained on its proper handling and storage.

- **Tetrachloroethylene** reacts violently with *finely dispersed* or *finely divided* METALS (such as ALUMINUM, BARIUM, LITHIUM, BERYLLIUM and ZINC).
- **Tetrachloroethylene** is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); SULFURIC ACID; NITRIC ACID; SODIUM HYDROXIDE; and POTASSIUM HYDROXIDE.
- **Tetrachloroethylene** slowly decomposes in WATER to form acids such as *Hydrogen Chloride*.
- **Tetrachloroethylene** decomposes slowly with heating, and with exposure to ultraviolet light or on contact with hot surfaces, to form toxic *Hydrogen Chloride* and *Phosgene gases*.
- Store in tightly closed containers in a cool, well-ventilated area.

Occupational Health Information Resources

The New Jersey Department of Health and Senior Services, Occupational Health Service, offers multiple services in occupational health. These services include providing informational resources, educational materials, public presentations, and industrial hygiene and medical investigations and evaluations.

For more information, please contact:

New Jersey Department of Health & Senior Services
Right to Know Program
PO Box 368
Trenton, NJ 08625-0368
Phone: 609-984-2202
Fax: 609-984-7407
E-mail: rtk@doh.state.nj.us
Web address: http://www.nj.gov/health/eoh/rtkweb

GLOSSARY

ACGIH is the American Conference of Governmental Industrial Hygienists. They publish guidelines called Threshold Limit Values (TLVs) for exposure to workplace chemicals.

Acute Exposure Guideline Levels (AEGLs) are established by the EPA. They describe the risk to humans resulting from once-in-a lifetime, or rare, exposure to airborne chemicals.

Boiling point is the temperature at which a substance can change its physical state from a liquid to a gas.

A **carcinogen** is a substance that causes cancer.

The **CAS number** is unique, identifying number, assigned by the Chemical Abstracts Service, to a specific chemical.

CFR is the Code of Federal Regulations, which are the regulations of the United States government.

A **combustible** substance is a solid, liquid or gas that will burn.

A **corrosive** substance is a gas, liquid or solid that causes destruction of human skin or severe corrosion of containers.

The **critical temperature** is the temperature above which a gas cannot be liquefied, regardless of the pressure applied.

DEP is the New Jersey Department of Environmental Protection.

DOT is the Department of Transportation, the federal agency that regulates the transportation of chemicals.

EPA is the Environmental Protection Agency, the federal agency responsible for regulating environmental hazards.

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Emergency Response Planning Guideline (ERPG) values provide estimates of concentration ranges where one reasonably might anticipate observing adverse effects.

A **fetus** is an unborn human or animal.

A **flammable** substance is a solid, liquid, vapor or gas that will ignite easily and burn rapidly.

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Permeated is the movement of chemicals through protective materials.

ppm means parts of a substance per million parts of air. It is a measure of concentration by volume in air.

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A **reactive** substance is a solid, liquid or gas that releases energy under certain conditions.

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A **teratogen** is a substance that causes birth defects by damaging the fetus.

UEL or **Upper Explosive Limit** is the highest concentration in air above which there is too much fuel (gas or vapor) to begin a reaction or explosion.

Vapor Density is the ratio of the weight of a given volume of one gas to the weight of another (usually *Air*), at the same temperature and pressure.

The **vapor pressure** is a force exerted by the vapor in equilibrium with the solid or liquid phase of the same substance. The higher the vapor pressure the higher concentration of the substance in air.

Right to Know Hazardous Substance Fact Sheet

Emergency Responders Quick Reference

Common Name: **TETRACHLOROETHYLENE**

Synonyms: Ethene, Tetrachloro-; Ethylene Tetrachloride; Perchloroethylene
CAS No: 127-18-4
Molecular Formula: $Cl_2C=CCl_2$
RTK Substance No: 1810
Description: Clear, colorless liquid with a sweet *Ether*-like odor

HAZARD DATA

Hazard Rating	Firefighting	Reactivity
3 - Health **0 - Fire** **0 - Reactivity** **DOT#:** UN 1897 **ERG Guide #:** 160 **Hazard Class:** 6.1 (Toxic)	Extinguish fire using an agent suitable for type of surrounding fire. **Tetrachloroethylene** itself does not burn. POISONOUS GASES ARE PRODUCED IN FIRE, including *Hydrogen Chloride* and *Phosgene*. Use water spray to keep fire-exposed containers cool.	**Tetrachloroethylene** reacts violently with *finely dispersed* or *finely divided* METALS (such as ALUMINUM, BARIUM, LITHIUM, BERYLLIUM and ZINC). **Tetrachloroethylene** is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); SULFURIC ACID; NITRIC ACID; SODIUM HYDROXIDE; and POTASSIUM HYDROXIDE. **Tetrachloroethylene** slowly decomposes in WATER to form acids such as *Hydrogen Chloride*. **Tetrachloroethylene** decomposes slowly with heating, and with exposure to ultraviolet light or on contact with hot surfaces, to form toxic *Hydrogen Chloride* and *Phosgene gases*.

SPILL/LEAKS

Isolation Distance:

Spill: 50 meters (150 feet)
Fire: 800 meters (1/2 mile)

Absorb liquids in dry sand, earth, or a similar material and place into sealed containers for disposal.
DO NOT wash into sewer.
Tetrachloroethylene is toxic to aquatic organisms and may cause long term effects on the aquatic environment.

PHYSICAL PROPERTIES

Odor Threshold:	5 to 50 ppm
Flash Point:	Noncombustible
Vapor Density:	5.8 (air = 1)
Vapor Pressure:	14 mm Hg at 68°F (20°C)
Specific Gravity:	1.62 (water = 1)
Water Solubility:	Very slightly soluble
Boiling Point:	250°F (121°C)
Freezing Point:	-2°F (-19°C)
Ionization Potential:	9.32 eV
Molecular Weight:	165.8

EXPOSURE LIMITS

OSHA: 100 ppm, 8-hr TWA; 200 ppm, Ceiling; 300 ppm, Peak
NIOSH: Lowest feasible concentration
ACGIH: 25 ppm, 8-hr TWA; 100 ppm, STEL
IDLH: 150 ppm

The Protective Action Criteria values are:
PAC-1 = 35 ppm PAC-2 = 230 ppm
PAC-3 = 1,200 ppm

PROTECTIVE EQUIPMENT

Gloves: Polyvinyl Alcohol, Silver Shield®/4H®, Viton, Viton/Butyl and Barrier® (>8-hr breakthrough)

Coveralls: Tychem® F, CPF3, BR and CSM; Trellchem® HPS and VPS (>8-hr breakthrough)

Respirator: <25 ppm - full facepiece APR with *Organic vapor filters*
Spills or Fire - SCBA

HEALTH EFFECTS

Eyes: Irritation and burns

Skin: Irritation and burns (skin absorbable)

Inhalation: Nose, throat and lung irritation with coughing and severe shortness of breath (pulmonary edema)
Headache, dizziness, lightheadedness, and passing out

Chronic: Cancer (liver, esophagus and bladder)

FIRST AID AND DECONTAMINATION

Remove the person from exposure.
Flush eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.
Quickly remove contaminated clothing and wash contaminated skin with large amounts of soap and water.
Begin artificial respiration if breathing has stopped and CPR if necessary.
Transfer promptly to a medical facility.
Medical observation is recommended as symptoms may be delayed.

Right to Know

Hazardous Substance Fact Sheet

Common Name: **SODIUM**

Synonyms: Natrium

Chemical Name: Sodium

Date: April 2001 Revision: April 2010

CAS Number: 7440-23-5

RTK Substance Number: 1674

DOT Number: UN 1428

EMERGENCY RESPONDERS >>>> SEE LAST PAGE

Description and Use

Sodium is an odorless, soft, silvery-white metal. It is used as a laboratory reagent, to make other chemicals and *Sodium compounds*, in non-glare lighting on highways, and as a heat transfer agent.

Reasons for Citation

- **Sodium** is on the Right to Know Hazardous Substance List because it is cited by DOT, NFPA, and EPA.
- This chemical is on the Special Health Hazard Substance List.

SEE GLOSSARY ON PAGE 5.

FIRST AID

Eye Contact

- Quickly brush off excess chemical from the face. Immediately flush with large amounts of water for at least 30 minutes, lifting upper and lower lids. Remove contact lenses, if worn, while flushing. Seek medical attention immediately.

Skin Contact

- Quickly remove contaminated clothing. Immediately blot or brush off excess chemical and wash gently with large amounts of water for at least 30 minutes. Seek medical attention immediately.

Inhalation

- Remove the person from exposure.
- Begin rescue breathing (using universal precautions) if breathing has stopped and CPR if heart action has stopped.
- Transfer promptly to a medical facility.
- Medical observation is recommended for 24 to 48 hours after overexposure, as pulmonary edema may be delayed.

EMERGENCY NUMBERS

Poison Control: 1-800-222-1222

CHEMTREC: 1-800-424-9300

NJDEP Hotline: 1-877-927-6337

National Response Center: 1-800-424-8802

Hazard Summary

Hazard Rating	NJDHSS	NFPA
HEALTH	-	3
FLAMMABILITY	-	3
REACTIVITY	-	2

FLAMMABLE
WATER AND AIR REACTIVE
POISONOUS GASES ARE PRODUCED IN FIRE

Hazard Rating Key: 0=minimal; 1=slight; 2=moderate; 3=serious; 4=severe

- **Sodium** can affect you when inhaled.
- Contact can severely irritate and burn the skin and eyes with possible eye damage.
- Exposure can irritate the nose and throat.
- Inhaling **Sodium** can irritate the lungs. Higher exposures may cause a build-up of fluid in the lungs (pulmonary edema), a medical emergency.
- **Sodium** can cause headache, nausea, vomiting, diarrhea and abdominal pain.
- When **Sodium** combines with moisture from the air or skin it becomes corrosive *Sodium Hydroxide*. *For more information, consult the Right to Know Hazardous Substance Fact Sheet on SODIUM HYDROXIDE*.
- **Sodium** is FLAMMABLE and REACTIVE and a DANGEROUS FIRE and EXPLOSION HAZARD when exposed to WATER, STEAM, AIR or MOIST AIR.

Workplace Exposure Limits

No occupational exposure limits have been established for **Sodium**. However, it may pose a health risk. Always follow safe work practices.

Determining Your Exposure

- Read the product manufacturer's Material Safety Data Sheet (MSDS) and the label to determine product ingredients and important safety and health information about the product mixture.
- For each individual hazardous ingredient, read the New Jersey Department of Health and Senior Services Hazardous Substance Fact Sheet, available on the RTK Program website (www.nj.gov/health/eoh/rtkweb) or in your facility's RTK Central File or Hazard Communication Standard file.
- You have a right to this information under the New Jersey Worker and Community Right to Know Act and the Public Employees Occupational Safety and Health (PEOSH) Act if you are a public worker in New Jersey, and under the federal Occupational Safety and Health Act (OSHA) if you are a private worker.
- The New Jersey Right to Know Act requires most employers to label chemicals in the workplace and requires public employers to provide their employees with information concerning chemical hazards and controls. The federal OSHA Hazard Communication Standard (29 CFR 1910.1200) and the PEOSH Hazard Communication Standard (N.J.A.C. 12:100-7) require employers to provide similar information and training to their employees.

This Fact Sheet is a summary of available information regarding the health hazards that may result from exposure. Duration of exposure, concentration of the substance and other factors will affect your susceptibility to any of the potential effects described below.

Health Hazard Information

Acute Health Effects
The following acute (short-term) health effects may occur immediately or shortly after exposure to **Sodium**:

- Contact can severely irritate and burn the skin and eyes with possible eye damage.
- Exposure can irritate the nose and throat.
- Inhaling **Sodium** can irritate the lungs causing coughing and/or shortness of breath. Higher exposures may cause a build-up of fluid in the lungs (pulmonary edema), a medical emergency, with severe shortness of breath.
- **Sodium** can cause headache, nausea, vomiting, diarrhea and abdominal pain.
- When **Sodium** combines with moisture from the air or skin, it becomes corrosive *Sodium Hydroxide*.

Chronic Health Effects
The following chronic (long-term) health effects can occur at some time after exposure to **Sodium** and can last for months or years:

Cancer Hazard
- According to the information presently available to the New Jersey Department of Health and Senior Services, **Sodium** has not been tested for its ability to cause cancer in animals.

Reproductive Hazard
- According to the information presently available to the New Jersey Department of Health and Senior Services, **Sodium** has not been tested for its ability to affect reproduction.

Other Effects
- **Sodium** can irritate the lungs. Repeated exposure may cause bronchitis to develop with coughing, phlegm, and/or shortness of breath.

Medical

Medical Testing
If symptoms develop or overexposure is suspected, the following is recommended:

- Consider chest x-ray after acute overexposure

Any evaluation should include a careful history of past and present symptoms with an exam. Medical tests that look for damage already done are not a substitute for controlling exposure.

Request copies of your medical testing. You have a legal right to this information under the OSHA Access to Employee Exposure and Medical Records Standard (29 CFR 1910.1020).

Mixed Exposures
- Smoking can cause heart disease, lung cancer, emphysema, and other respiratory problems. It may worsen respiratory conditions caused by chemical exposure. Even if you have smoked for a long time, stopping now will reduce your risk of developing health problems.

Workplace Controls and Practices

Very toxic chemicals, or those that are reproductive hazards or sensitizers, require expert advice on control measures if a less toxic chemical cannot be substituted. Control measures include: (1) enclosing chemical processes for severely irritating and corrosive chemicals, (2) using local exhaust ventilation for chemicals that may be harmful with a single exposure, and (3) using general ventilation to control exposures to skin and eye irritants. For further information on workplace controls, consult the NIOSH document on Control Banding at www.cdc.gov/niosh/topics/ctrlbanding/.

The following work practices are also recommended:

- Label process containers.
- Provide employees with hazard information and training.
- Monitor airborne chemical concentrations.
- Use engineering controls if concentrations exceed recommended exposure levels.
- Provide eye wash fountains and emergency showers.
- Wash or shower if skin comes in contact with a hazardous material.
- Always wash at the end of the workshift.
- Change into clean clothing if clothing becomes contaminated.
- Do not take contaminated clothing home.
- Get special training to wash contaminated clothing.
- Do not eat, smoke, or drink in areas where chemicals are being handled, processed or stored.
- Wash hands carefully before eating, smoking, drinking, applying cosmetics or using the toilet.

In addition, the following may be useful or required:

- Before entering a confined space where **Sodium** may be present, check to make sure that an explosive concentration does not exist.
- Always keep **Sodium** dry and store under a liquid such as *Kerosene*.

Personal Protective Equipment

The OSHA Personal Protective Equipment Standard (29 CFR 1910.132) requires employers to determine the appropriate personal protective equipment for each hazard and to train employees on how and when to use protective equipment.

The following recommendations are only guidelines and may not apply to every situation.

Gloves and Clothing

- Avoid skin contact with **Sodium**. Wear personal protective equipment made from material which can not be permeated or degraded by this substance. Safety equipment suppliers and manufacturers can provide recommendations on the most protective glove and clothing material for your operation.
- Safety equipment manufacturers recommend Nitrile gloves, and flame-retardant protective clothing for **Sodium**.
- All protective clothing (suits, gloves, footwear, headgear) should be clean, available each day, and put on before work.

Eye Protection

- Wear eye protection with side shields or goggles.
- If additional protection is needed for the entire face, use in combination with a face shield. A face shield should not be used without another type of eye protection.

Respiratory Protection

Improper use of respirators is dangerous. Respirators should only be used if the employer has implemented a written program that takes into account workplace conditions, requirements for worker training, respirator fit testing, and medical exams, as described in the OSHA Respiratory Protection Standard (29 CFR 1910.134).

- Where the potential exists for overexposure to **Sodium**, use a NIOSH approved full facepiece negative pressure, air-purifying, particulate filter respirator with an N, R or P95 filter. More protection is provided by a full facepiece respirator than by a half-mask respirator.
- Leave the area immediately if (1) while wearing a filter or cartridge respirator you can smell, taste, or otherwise detect **Sodium**, (2) while wearing particulate filters abnormal resistance to breathing is experienced, or (3) eye irritation occurs while wearing a full facepiece respirator. Check to make sure the respirator-to-face seal is still good. If it is, replace the filter or cartridge. If the seal is no longer good, you may need a new respirator.
- Consider all potential sources of exposure in your workplace. You may need a combination of filters, prefilters or cartridges to protect against different forms of a chemical (such as vapor and mist) or against a mixture of chemicals.
- Where the potential for high exposure exists, use a NIOSH approved supplied-air respirator with a full facepiece operated in a pressure-demand or other positive-pressure mode. For increased protection use in combination with an auxiliary self-contained breathing apparatus or an emergency escape air cylinder.

Fire Hazards

If employees are expected to fight fires, they must be trained and equipped as stated in the OSHA Fire Brigades Standard (29 CFR 1910.156).

- **Sodium** is a FLAMMABLE SOLID which will ignite spontaneously in AIR or MOIST AIR and reacts violently with WATER or STEAM to produce flammable and explosive *Hydrogen gas*.
- Use dry chemicals appropriate for extinguishing metal fires such as graphite, soda ash or powdered sodium chloride.
- DO NOT USE WATER, CO_2 or halogenated extinguishing agents.
- POISONOUS GASES ARE PRODUCED IN FIRE, including *Sodium Oxides*.

Spills and Emergencies

If employees are required to clean-up spills, they must be properly trained and equipped. The OSHA Hazardous Waste Operations and Emergency Response Standard (29 CFR 1910.120) may apply.

If **Sodium** is spilled or leaked, take the following steps:

- Evacuate personnel and secure and control entrance to the area.
- Eliminate all ignition sources.
- DO NOT sweep up dry material, keep dry, cover with dry sand, limestone or clay, and place quickly into a dry container of *Kerosene*, *Naphtha*, *Light Oil* or similar material.
- DO NOT USE WATER OR WET METHOD.
- Ventilate and wash area after clean-up is complete.
- DO NOT wash into sewer.
- Keep **Sodium** out of confined spaces, such as sewers, because of the possibility of an explosion.
- It may be necessary to contain and dispose of **Sodium** as a HAZARDOUS WASTE. Contact your state Department of Environmental Protection (DEP) or your regional office of the federal Environmental Protection Agency (EPA) for specific recommendations.

Handling and Storage

Prior to working with **Sodium** you should be trained on its proper handling and storage.

- **Sodium** reacts violently with WATER, STEAM, AIR and MOIST AIR to produce corrosive *Sodium Hydroxide* and flammable and explosive *Hydrogen gas*.
- **Sodium** can react explosively or violently with a broad range of chemicals including METALS (such as ALUMINUM, ARSENIC and ZINC); METAL COMPOUNDS; STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); CHLORINATED HYDROCARBONS (such as METHYLENE CHLORIDE and TRICHLOROETHYLENE); CARBON DIOXIDE; AZIDES; and MALEIC ANHYDRIDE.
- Store under *Kerosene*, *Naphtha* or other *Light Oil* and in tightly closed containers in a cool, well-ventilated area away from ORGANICS and all forms of MOISTURE.
- Sources of ignition, such as smoking and open flames, are prohibited where **Sodium** is used, handled, or stored.
- Use only non-sparking tools and equipment, especially when opening and closing containers of **Sodium**.

Occupational Health Information Resources

The New Jersey Department of Health and Senior Services, Occupational Health Service, offers multiple services in occupational health. These services include providing informational resources, educational materials, public presentations, and industrial hygiene and medical investigations and evaluations.

For more information, please contact:

New Jersey Department of Health & Senior Services
Right to Know Program
PO Box 368
Trenton, NJ 08625-0368
Phone: 609-984-2202
Fax: 609-984-7407
E-mail: rtk@doh.state.nj.us
Web address: http://www.nj.gov/health/eoh/rtkweb

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UEL or **Upper Explosive Limit** is the highest concentration in air above which there is too much fuel (gas or vapor) to begin a reaction or explosion.

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The **vapor pressure** is a force exerted by the vapor in equilibrium with the solid or liquid phase of the same substance. The higher the vapor pressure the higher concentration of the substance in air.

Right to Know Hazardous Substance Fact Sheet

Emergency Responders Quick Reference

Common Name: **SODIUM**

Synonyms: Natrium
CAS No: 7440-23-5
Molecular Formula: Na
RTK Substance No: 1674
Description: Odorless, soft, silvery-white metal

HAZARD DATA

Hazard Rating	Firefighting	Reactivity
3 - Health **3 - Fire** **2 - Reactivity** **DOT#:** UN 1428 **ERG Guide #:** 138 **Hazard Class:** 4.3 (Dangerous when wet)	**Sodium** is a FLAMMABLE SOLID which will ignite spontaneously in AIR or MOIST AIR and reacts violently with WATER or STEAM to produce flammable and explosive *Hydrogen gas*. Use dry chemicals appropriate for extinguishing metal fires such as graphite, soda ash or powdered sodium chloride. DO NOT USE WATER, CO_2 or halogenated extinguishing agents. POISONOUS GASES ARE PRODUCED IN FIRE, including (*Sodium Oxides*).	**Sodium** reacts violently with WATER, STEAM, AIR and MOIST AIR to produce corrosive *Sodium Hydroxide* and flammable and explosive *Hydrogen gas*. **Sodium** can react explosively or violently with a broad range of chemicals including METALS (such as ALUMINUM, ARSENIC and ZINC); METAL COMPOUNDS; STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); CHLORINATED HYDROCARBONS (such as METHYLENE CHLORIDE and TRICHLOROETHYLENE); CARBON DIOXIDE; AZIDES; and MALEIC ANHYDRIDE.

SPILL/LEAKS

Isolation Distance:

Spill: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

DO NOT sweep up dry material, keep dry, cover with dry sand, limestone or clay, and place quickly into a container of *Kerosene*, *Naphtha, Light Oil* or similar material.

Use only non-sparking tools and equipment, especially when opening and closing containers of **Sodium**.

DO NOT wash into sewer.

Keep **Sodium** out of confined spaces, such as sewers, because of the possibility of an explosion.

Sodium is dangerous to aquatic life at high concentrations.

PHYSICAL PROPERTIES

Odor Threshold:	Odorless
Flash Point:	Flammable solid
Auto Ignition Temp:	>239°F (115°C)
Vapor Density:	0.003 (air = 1)
Vapor Pressure:	1.2 mm Hg at 752°F (400°C)
Specific Gravity:	0.97 (water = 1)
Water Solubility:	Decomposes (violently)
Boiling Point:	1,619°F (882°C)
Melting Point:	208°F (98°C)
Molecular Weight:	22.49

EXPOSURE LIMITS

No occupational exposure limits have been established for **Sodium**.

The Protective Action Criteria values are:

PAC-1 = 0.5 mg/m^3 PAC-2 = 5 mg/m^3

PAC-3 = 50 mg/m^3

PROTECTIVE EQUIPMENT

Gloves:	Nitrile (>8-hr breakthrough for *Kerosene* and *Naphtha*)
Coveralls:	Turn out gear or flash protection
Respirator:	>0.5 mg/m^3 -full facepiece APR with High efficiency filters >5 mg/m^3 - SCBA

HEALTH EFFECTS

Eyes:	Irritation and burns
Skin:	Irritation and burns
Inhalation:	Nose, throat and lung irritation, with coughing, and severe shortness of breath (pulmonary edema) Headache, dizziness, nausea and vomiting

FIRST AID AND DECONTAMINATION

Remove the person from exposure.

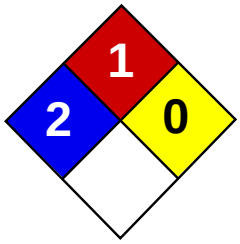
Quickly brush off excess chemical from the face. Flush with large amounts of water for at least 30 minutes. Remove contact lenses, if worn. Seek medical attention immediately.

Quickly remove contaminated clothing. Immediately blot or brush off excess chemical and wash with large amounts of water for at least 30 minutes. Seek medical attention immediately.

Begin artificial respiration if breathing has stopped and CPR if necessary.

Transfer promptly to a medical facility.

Medical observation is recommended as symptoms may be delayed.



Material Safety Data Sheet
Selenium MSDS

Section 1: Chemical Product and Company Identification

Product Name: Selenium

Catalog Codes: SLS2629

CAS#: 7782-49-2

RTECS: VS7700000

TSCA: TSCA 8(b) inventory: Selenium

CI#: Not available.

Synonym:

Chemical Name: Not available.

Chemical Formula: Se

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:
1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Selenium	7782-49-2	100

Toxicological Data on Ingredients: Selenium: ORAL (LD50): Acute: 6700 mg/kg [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects:
Hazardous in case of eye contact (irritant), of ingestion, of inhalation. Slightly hazardous in case of skin contact (irritant).

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. Repeated or prolonged exposure is not known to aggravate medical condition.

Section 4: First Aid Measures

Eye Contact: Check for and remove any contact lenses. Do not use an eye ointment. Seek medical attention.

Skin Contact:
After contact with skin, wash immediately with plenty of water. Gently and thoroughly wash the contaminated skin with running water and non-abrasive soap. Be particularly careful to clean folds, crevices, creases and groin. Cover the irritated skin with an emollient. If irritation persists, seek medical attention. Wash contaminated clothing before reusing.

Serious Skin Contact: Not available.

Inhalation: Allow the victim to rest in a well ventilated area. Seek immediate medical attention.

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek medical attention.

Ingestion:
Do not induce vomiting. Loosen tight clothing such as a collar, tie, belt or waistband. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek immediate medical attention.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: May be combustible at high temperature.

Auto-Ignition Temperature: Not available.

Flash Points: Not available.

Flammable Limits: Not available.

Products of Combustion: Not available.

Fire Hazards in Presence of Various Substances: Not available.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions:
SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray, fog or foam. Do not use water jet.

Special Remarks on Fire Hazards: Material in powder form, capable of creating a dust explosion.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill: Use appropriate tools to put the spilled solid in a convenient waste disposal container.

Large Spill:
Use a shovel to put the material into a convenient waste disposal container. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep away from heat. Keep away from sources of ignition. Empty containers pose a fire risk, evaporate the residue under a fume hood. Ground all equipment containing material. Do not ingest. Do not breathe dust. Avoid contact with eyes Wear suitable protective clothing In case of insufficient ventilation, wear suitable respiratory equipment If ingested, seek medical advice immediately and show the container or the label.

Storage:
Keep container dry. Keep in a cool place. Ground all equipment containing material. Keep container tightly closed. Keep in a cool, well-ventilated place. Combustible materials should be stored away from extreme heat and away from strong oxidizing agents.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection:
Splash goggles. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
TWA: 0.2 (mg/m3) Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid. (Solid metallic powder.)

Odor: Odorless.

Taste: Not available.

Molecular Weight: 78.96 g/mole

Color: Not available.

pH (1% soln/water): Not applicable.

Boiling Point: 684.9°C (1264.8°F)

Melting Point: 217°C (422.6°F)

Critical Temperature: Not available.

Specific Gravity: 4.81 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility: Insoluble in cold water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Not available.

Incompatibility with various substances: Not available.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: Not available.

Polymerization: No.

Section 11: Toxicological Information

Routes of Entry: Eye contact. Inhalation. Ingestion.

Toxicity to Animals: Acute oral toxicity (LD50): 6700 mg/kg [Rat].

Chronic Effects on Humans: Not available.

Other Toxic Effects on Humans:
Hazardous in case of ingestion, of inhalation. Slightly hazardous in case of skin contact (irritant).

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Passes through the placental barrier in animal. Excreted in maternal milk in human.

Special Remarks on other Toxic Effects on Humans: Not available.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are more toxic.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Section 14: Transport Information

DOT Classification: CLASS 6.1: Poisonous material.

Identification: : Selenium powder : UN2658 PG: III

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
Pennsylvania RTK: Selenium Massachusetts RTK: Selenium TSCA 8(b) inventory: Selenium SARA 313 toxic chemical notification and release reporting: Selenium CERCLA: Hazardous substances.: Selenium

Other Regulations: OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

Other Classifications:

WHMIS (Canada): CLASS D-1B: Material causing immediate and serious toxic effects (TOXIC).

DSCL (EEC): R36- Irritating to eyes.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 1

Reactivity: 0

Personal Protection: E

National Fire Protection Association (U.S.A.):

Health: 2

Flammability: 1

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Splash goggles.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

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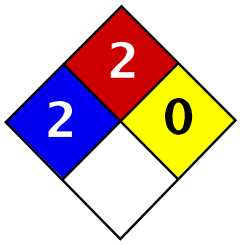

Health	2
Fire	2
Reactivity	0
Personal Protection	E

Material Safety Data Sheet
Naphthalene MSDS

Section 1: Chemical Product and Company Identification

Product Name: Naphthalene

Catalog Codes: SLN1789, SLN2401

CAS#: 91-20-3

RTECS: QJ0525000

TSCA: TSCA 8(b) inventory: Naphthalene

CI#: Not available.

Synonym:

Chemical Name: Not available.

Chemical Formula: C10H8

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:
1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Naphthalene	91-20-3	100

Toxicological Data on Ingredients: Naphthalene: ORAL (LD50): Acute: 490 mg/kg [Rat]. 533 mg/kg [Mouse]. 1200 mg/kg [Guinea pig]. DERMAL (LD50): Acute: 20001 mg/kg [Rabbit]. VAPOR (LC50): Acute: 170 ppm 4 hour(s) [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects:
Very hazardous in case of ingestion. Hazardous in case of eye contact (irritant), of inhalation. Slightly hazardous in case of skin contact (irritant, permeator). Severe over-exposure can result in death.

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: A4 (Not classifiable for human or animal.) by ACGIH.
MUTAGENIC EFFECTS: Not available.
TERATOGENIC EFFECTS: Not available.
DEVELOPMENTAL TOXICITY: Classified Development toxin [POSSIBLE].
The substance is toxic to blood, kidneys, the nervous system, the reproductive system, liver, mucous membranes, gastrointestinal tract, upper respiratory tract, central nervous system (CNS).
Repeated or prolonged exposure to the substance can produce target organs damage. Repeated exposure to an highly toxic material may produce general deterioration of health by an accumulation in one or many human organs.

Section 4: First Aid Measures

Eye Contact:
Check for and remove any contact lenses. Immediately flush eyes with running water for at least 15 minutes, keeping eyelids open. Cold water may be used. Do not use an eye ointment. Seek medical attention.

Skin Contact:
After contact with skin, wash immediately with plenty of water. Gently and thoroughly wash the contaminated skin with running water and non-abrasive soap. Be particularly careful to clean folds, crevices, creases and groin. Cover the irritated skin with an emollient. If irritation persists, seek medical attention. Wash contaminated clothing before reusing.

Serious Skin Contact: Not available.

Inhalation: Allow the victim to rest in a well ventilated area. Seek immediate medical attention.

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. WARNING: It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek immediate medical attention.

Ingestion:
Do not induce vomiting. Examine the lips and mouth to ascertain whether the tissues are damaged, a possible indication that the toxic material was ingested; the absence of such signs, however, is not conclusive. Loosen tight clothing such as a collar, tie, belt or waistband. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek immediate medical attention.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Flammable.

Auto-Ignition Temperature: 567°C (1052.6°F)

Flash Points: CLOSED CUP: 88°C (190.4°F). OPEN CUP: 79°C (174.2°F).

Flammable Limits: LOWER: 0.9% UPPER: 5.9%

Products of Combustion: These products are carbon oxides (CO, CO2).

Fire Hazards in Presence of Various Substances: Not available.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available.
Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions:
Flammable solid.
SMALL FIRE: Use DRY chemical powder.
LARGE FIRE: Use water spray or fog. Cool containing vessels with water jet in order to prevent pressure build-up, autoignition or explosion.

Special Remarks on Fire Hazards: Not available.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill: Use appropriate tools to put the spilled solid in a convenient waste disposal container.

Large Spill:
Flammable solid.
Stop leak if without risk. Do not touch spilled material. Use water spray curtain to divert vapor drift. Prevent entry into sewers, basements or confined areas; dike if needed. Eliminate all ignition sources. Call for assistance on disposal. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep locked up Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not ingest. Do not breathe dust. Avoid contact with eyes Wear suitable protective clothing In case of insufficient ventilation, wear suitable respiratory equipment If ingested, seek medical advice immediately and show the container or the label. Keep away from incompatibles such as oxidizing agents.

Storage:
Flammable materials should be stored in a separate safety storage cabinet or room. Keep away from heat. Keep away from sources of ignition. Keep container tightly closed. Keep in a cool, well-ventilated place. Ground all equipment containing material. Keep container dry. Keep in a cool place.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection:
Splash goggles. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
Israel: TWA: 10 (ppm)
TWA: 10 STEL: 15 (ppm) from ACGIH (TLV) [1995]
TWA: 52 STEL: 79 (mg/m3) from ACGIH [1995]
Australia: STEL: 15 (ppm)
Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid. (Crystalline solid.)

Odor: Aromatic.

Taste: Not available.

Molecular Weight: 128.19 g/mole

Color: White.

pH (1% soln/water): Not available.

Boiling Point: 218°C (424.4°F)

Melting Point: 80.2°C (176.4°F)

Critical Temperature: Not available.

Specific Gravity: 1.162 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: 4.4 (Air = 1)

Volatility: Not available.

Odor Threshold: 0.038 ppm

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties:
Partially dispersed in hot water, methanol, n-octanol.
Very slightly dispersed in cold water.
See solubility in methanol, n-octanol.

Solubility:
Partially soluble in methanol, n-octanol.
Very slightly soluble in cold water, hot water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Not available.

Incompatibility with various substances: Highly reactive with oxidizing agents.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: May attack some forms of rubber and plastic

Polymerization: No.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Dermal contact. Eye contact. Inhalation. Ingestion.

Toxicity to Animals:
WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE.
Acute oral toxicity (LD50): 490 mg/kg [Rat].
Acute dermal toxicity (LD50): 20001 mg/kg [Rabbit].
Acute toxicity of the vapor (LC50): 170 ppm 4 hour(s) [Rat].

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: A4 (Not classifiable for human or animal.) by ACGIH.

DEVELOPMENTAL TOXICITY: Classified Development toxin [POSSIBLE].
The substance is toxic to blood, kidneys, the nervous system, the reproductive system, liver, mucous membranes, gastrointestinal tract, upper respiratory tract, central nervous system (CNS).

Other Toxic Effects on Humans:
Very hazardous in case of ingestion.
Hazardous in case of inhalation.
Slightly hazardous in case of skin contact (irritant, permeator).

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Not available.

Special Remarks on other Toxic Effects on Humans: Not available.

Section 12: Ecological Information

Ecotoxicity: Ecotoxicity in water (LC50): 305.2 ppm 96 hour(s) [Trout].

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are more toxic.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Section 14: Transport Information

DOT Classification: CLASS 4.1: Flammable solid.

Identification: : Naphthalene, refined : UN1334 PG: III

Special Provisions for Transport: Marine Pollutant

Section 15: Other Regulatory Information

Federal and State Regulations:
Rhode Island RTK hazardous substances: Naphthalene
Pennsylvania RTK: Naphthalene
Florida: Naphthalene
Minnesota: Naphthalene
Massachusetts RTK: Naphthalene
TSCA 8(b) inventory: Naphthalene
TSCA 8(a) PAIR: Naphthalene
TSCA 8(d) H and S data reporting: Naphthalene: 06/01/87
SARA 313 toxic chemical notification and release reporting: Naphthalene: 1%
CERCLA: Hazardous substances.: Naphthalene: 100 lbs. (45.36 kg)

Other Regulations:
OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada):
CLASS B-4: Flammable solid.
CLASS D-1B: Material causing immediate and serious toxic effects (TOXIC).
CLASS D-2B: Material causing other toxic effects (TOXIC).

DSCL (EEC):
R36- Irritating to eyes.
R40- Possible risks of irreversible effects.
R48/22- Harmful: danger of serious damage to health by prolonged exposure if swallowed.
R48/23- Toxic: danger of serious damage to health by prolonged exposure through inhalation.
R63- Possible risk of harm to the unborn child.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 2

Reactivity: 0

Personal Protection: E

National Fire Protection Association (U.S.A.):

Health: 2

Flammability: 2

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves.
Lab coat.
Dust respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate.
Splash goggles.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

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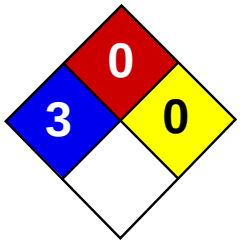

Material Safety Data Sheet
Mercury MSDS

Section 1: Chemical Product and Company Identification

Product Name: Mercury

Catalog Codes: SLM3505, SLM1363

CAS#: 7439-97-6

RTECS: OV4550000

TSCA: TSCA 8(b) inventory: Mercury

CI#: Not applicable.

Synonym: Quick Silver; Colloidal Mercury; Metallic Mercury; Liquid Silver; Hydragyrum

Chemical Name: Mercury

Chemical Formula: Hg

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call: 1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Mercury	7439-97-6	100

Toxicological Data on Ingredients: Mercury LD50: Not available. LC50: Not available.

Section 3: Hazards Identification

Potential Acute Health Effects:
Very hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, of inhalation. Hazardous in case of skin contact (corrosive, permeator). Liquid or spray mist may produce tissue damage particularly on mucous membranes of eyes, mouth and respiratory tract. Skin contact may produce burns. Inhalation of the spray mist may produce severe irritation of respiratory tract, characterized by coughing, choking, or shortness of breath. Severe over-exposure can result in death. Inflammation of the eye is characterized by redness, watering, and itching. Skin inflammation is characterized by itching, scaling, reddening, or, occasionally, blistering.

Potential Chronic Health Effects:
Hazardous in case of skin contact (permeator). CARCINOGENIC EFFECTS: Classified A5 (Not suspected for human.) by ACGIH. 3 (Not classifiable for human.) by IARC. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to blood, kidneys, liver, brain, peripheral nervous system, central nervous system (CNS). Repeated or prolonged exposure to the substance can produce target organs damage. Repeated or prolonged contact with spray mist may produce chronic eye irritation and severe skin irritation.

Repeated or prolonged exposure to spray mist may produce respiratory tract irritation leading to frequent attacks of bronchial infection. Repeated exposure to a highly toxic material may produce general deterioration of health by an accumulation in one or many human organs.

Section 4: First Aid Measures

Eye Contact:
Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. WARM water MUST be used. Get medical attention immediately.

Skin Contact:
In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Cover the irritated skin with an emollient. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.

Serious Skin Contact:
Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. WARNING: It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek immediate medical attention.

Ingestion:
Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Non-flammable.

Auto-Ignition Temperature: Not applicable.

Flash Points: Not applicable.

Flammable Limits: Not applicable.

Products of Combustion: Not available.

Fire Hazards in Presence of Various Substances: Not applicable.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions: Not applicable.

Special Remarks on Fire Hazards:
When thrown into mercury vapor, boron phosphodiiodide ignites at once. Flame forms with chlorine jet over mercury surface at 200 deg to 300 deg C. Mercury undergoes hazardous reactions in the presence of heat and sparks or ignition.

Special Remarks on Explosion Hazards:
A violent exothermic reaction or possible explosion occurs when mercury comes in contact with lithium and rubidium. CHLORINE DIOXIDE & LIQUID HG, WHEN MIXED, EXPLODE VIOLENTLY. Mercury and Ammonia can produce an

explosive compound. A mixture of the dry carbonyl and oxygen will explode on vigorous shaking with mercury. Methyl azide in the presence of mercury was shown to be potentially explosive.

Section 6: Accidental Release Measures

Small Spill: Absorb with an inert material and put the spilled material in an appropriate waste disposal.

Large Spill:
Corrosive liquid. Poisonous liquid. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not get water inside container. Do not touch spilled material. Use water spray curtain to divert vapor drift. Use water spray to reduce vapors. Prevent entry into sewers, basements or confined areas; dike if needed. Call for assistance on disposal. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep locked up.. Keep container dry. Do not ingest. Do not breathe gas/fumes/ vapor/spray. Never add water to this product. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents, metals.

Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area. Do not store above 25°C (77°F).

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection:
Face shield. Full suit. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves. Boots.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
TWA: 0.025 from ACGIH (TLV) [United States] SKIN TWA: 0.05 CEIL: 0.1 (mg/m3) from OSHA (PEL) [United States] Inhalation TWA: 0.025 (mg/m3) [United Kingdom (UK)] Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid. (Heavy liquid)

Odor: Odorless.

Taste: Not available.

Molecular Weight: 200.59 g/mole

Color: Silver-white

pH (1% soln/water): Not available.

Boiling Point: 356.73°C (674.1°F)

Melting Point: -38.87°C (-38°F)

Critical Temperature: 1462°C (2663.6°F)

Specific Gravity: 13.55 (Water = 1)

Vapor Pressure: Not available.

Vapor Density: 6.93 (Air = 1)

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility: Very slightly soluble in cold water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Incompatible materials

Incompatibility with various substances: Reactive with oxidizing agents, metals.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity:
Ground mixtures of sodium carbide and mercury, aluminum, lead, or iron can react vigorously. A violent exothermic reaction or possible explosion occurs when mercury comes in contact with lithium and rubidium. Incompatible with boron diiodophosphide; ethylene oxide; metal oxides, metals(aluminum, potassium, lithium, sodium, rubidium); methyl azide; methylsilane, oxygen; oxidants(bromine, peroxyformic acid, chlorine dioxide, nitric acid, tetracarbonynickel, nitromethane, silver perchlorate, chlorates, sulfuric acid, nitrates,); tetracarbonylnickel, oxygen, acetylinic compounds, ammonia, ethylene oxide, methylsiliane, calcium,

Special Remarks on Corrosivity:
The high mobility and tendency to dispersion exhibited by mercury, and the ease with which it forms alloys (amalga) with many laboratory and electrical contact metals, can cause severe corrosion problems in laboratories. Special precautions: Mercury can attack copper and copper alloy materials.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Dermal contact. Eye contact. Inhalation. Ingestion.

Toxicity to Animals:
LD50: Not available. LC50: Not available.

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: Classified A5 (Not suspected for human.) by ACGIH. 3 (Not classifiable for human.) by IARC. May cause damage to the following organs: blood, kidneys, liver, brain, peripheral nervous system, central nervous system (CNS).

Other Toxic Effects on Humans:
Very hazardous in case of skin contact (irritant), of ingestion, of inhalation. Hazardous in case of skin contact (corrosive, permeator).

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans:

May affect genetic material. May cause cancer based on animal data. Passes through the placental barrier in animal. May cause adverse reproductive effects(paternal effects- spermatogenesis; effects on fertility - fetotoxicity, post-implantation mortality), and birth defects.

Special Remarks on other Toxic Effects on Humans:

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are less toxic than the product itself.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:
Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: Class 8: Corrosive material

Identification: : Mercury UNNA: 2809 PG: III

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require a warning under the statute: Mercury California prop. 65: This product contains the following ingredients for which the State of California has found to cause birth defects which would require a warning under the statute: Mercury Connecticut hazardous material survey.: Mercury Illinois toxic substances disclosure to employee act: Mercury Illinois chemical safety act: Mercury New York acutely hazardous substances: Mercury Rhode Island RTK hazardous substances: Mercury Pennsylvania RTK: Mercury Minnesota: Mercury Massachusetts RTK: Mercury New Jersey: Mercury New Jersey spill list: Mercury Louisiana spill reporting: Mercury California Director's List of Hazardous Substances.: Mercury TSCA 8(b) inventory: Mercury SARA 313 toxic chemical notification and release reporting: Mercury CERCLA: Hazardous substances.: Mercury: 1 lbs. (0.4536 kg)

Other Regulations:
OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada):
CLASS D-1A: Material causing immediate and serious toxic effects (VERY TOXIC). CLASS D-2A: Material causing other toxic effects (VERY TOXIC). CLASS E: Corrosive liquid.

DSCL (EEC):
R23- Toxic by inhalation. R33- Danger of cumulative effects. R38- Irritating to skin. R41- Risk of serious damage to eyes. R50/53- Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment. S2- Keep out of the

reach of children. S7- Keep container tightly closed. S26- In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. S39- Wear eye/face protection. S45- In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible). S46- If swallowed, seek medical advice immediately and show this container or label. S60- This material and its container must be disposed of as hazardous waste. S61- Avoid release to the environment. Refer to special instructions/Safety data sheets.

HMIS (U.S.A.):

Health Hazard: 3

Fire Hazard: 0

Reactivity: 0

Personal Protection:

National Fire Protection Association (U.S.A.):

Health: 3

Flammability: 0

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves. Full suit. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Face shield.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

Created: 10/10/2005 08:22 PM

Last Updated: 05/21/2013 12:00 PM

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Right to Know

Hazardous Substance Fact Sheet

Common Name: **MANGANESE**

Synonyms: Colloidal Manganese

Chemical Name: Manganese

Date: January 2007 Revision: January 2012

CAS Number: 7439-96-5

RTK Substance Number: 1155

DOT Number: UN 3089

EMERGENCY RESPONDERS >>>> SEE LAST PAGE

Description and Use

Manganese is a naturally occurring metal found in rocks. Pure **Manganese** is a silver or grey-white, brittle solid. It is used in making steel and alloying metals, and as a catalyst, gasoline additive, animal feed supplement and component of some fertilizers.

Hazard Summary

Hazard Rating	NJDHSS	NFPA
HEALTH	2	-
FLAMMABILITY	3 (powder)	-
REACTIVITY	1	-
FLAMMABLE POWDER OR DUST POISONOUS GASES ARE PRODUCED IN FIRE		

Hazard Rating Key: 0=minimal; 1=slight; 2=moderate; 3=serious; 4=severe

Reasons for Citation

- **Manganese** is on the Right to Know Hazardous Substance List because it is cited by OSHA, ACGIH, DOT, NIOSH, DEP, IRIS and EPA.
- This chemical is on the Special Health Hazard Substance List.

- **Manganese** can affect you when inhaled.
- Contact can irritate the skin and eyes.
- Inhaling **Manganese** can irritate the nose, throat and lungs causing coughing, wheezing and/or shortness of breath.
- Exposure to **Manganese** can cause a flu-like illness called "*metal fume fever*."
- Repeated exposure can cause permanent brain damage. Early symptoms include poor appetite, weakness and sleepiness. Later effects include changes in speech, balance, mood and personality, loss of facial expressions, poor muscle coordination, muscle cramps, twitching and tremors. The later symptoms are identical to Parkinson's disease.
- Prolonged or repeated exposure can lead to permanent lung damage.
- **Manganese** may affect the liver and may cause anemia.
- **Manganese** *powder* and *dust* are FLAMMABLE and DANGEROUS FIRE HAZARDS.

SEE GLOSSARY ON PAGE 5.

FIRST AID

Eye Contact

- Immediately flush with large amounts of water for at least 15 minutes, lifting upper and lower lids. Remove contact lenses, if worn, while rinsing.

Skin Contact

- Quickly remove contaminated clothing. Immediately wash contaminated skin with large amounts of soap and water.

Inhalation

- Remove the person from exposure.
- Begin rescue breathing (using universal precautions) if breathing has stopped and CPR if heart action has stopped.
- Transfer promptly to a medical facility.

EMERGENCY NUMBERS

Poison Control: 1-800-222-1222

CHEMTREC: 1-800-424-9300

NJDEP Hotline: 1-877-927-6337

National Response Center: 1-800-424-8802

Workplace Exposure Limits

OSHA: The legal airborne permissible exposure limit (PEL) is **5 mg/m^3**, not to be exceeded at any time.

NIOSH: The recommended airborne exposure limit (REL) is **1 mg/m^3** averaged over a 10-hour workshift and **3 mg/m^3**, not to be exceeded during any 5-minute work period.

ACGIH: The threshold limit value (TLV) is **0.2 mg/m^3** (as the *inhalable fraction)* and **0.02 mg/m^3** (as the *respirable fraction*) averaged over an 8-hour workshift.

Determining Your Exposure

- Read the product manufacturer's Material Safety Data Sheet (MSDS) and the label to determine product ingredients and important safety and health information about the product mixture.
- For each individual hazardous ingredient, read the New Jersey Department of Health and Senior Services Hazardous Substance Fact Sheet, available on the RTK Program website (www.nj.gov/health/eoh/rtkweb) or in your facility's RTK Central File or Hazard Communication Standard file.
- You have a right to this information under the New Jersey Worker and Community Right to Know Act and the Public Employees Occupational Safety and Health (PEOSH) Act if you are a public worker in New Jersey, and under the federal Occupational Safety and Health Act (OSHA) if you are a private worker.
- The New Jersey Right to Know Act requires most employers to label chemicals in the workplace and requires public employers to provide their employees with information concerning chemical hazards and controls. The federal OSHA Hazard Communication Standard (29 CFR 1910.1200) and the PEOSH Hazard Communication Standard (N.J.A.C. 12:100-7) require employers to provide similar information and training to their employees.

This Fact Sheet is a summary of available information regarding the health hazards that may result from exposure. Duration of exposure, concentration of the substance and other factors will affect your susceptibility to any of the potential effects described below.

Health Hazard Information

Acute Health Effects
The following acute (short-term) health effects may occur immediately or shortly after exposure to **Manganese**:

- Contact can irritate the skin and eyes.
- Inhaling **Manganese** can irritate the nose, throat and lungs causing coughing, wheezing and/or shortness of breath.
- Exposure to **Manganese** can cause *"metal fume fever."* This is a flu-like illness with symptoms of metallic taste in the mouth, headache, fever and chills, aches, chest tightness and cough. The symptoms may be delayed for several hours after exposure and usually last for a day or two.

Chronic Health Effects
The following chronic (long-term) health effects can occur at some time after exposure to **Manganese** and can last for months or years:

Cancer Hazard
- While **Manganese** has been tested, it is not classifiable as to its potential to cause cancer.

Reproductive Hazard
- **Manganese** may damage the testes (male reproductive glands) and may decrease fertility in males.

Other Effects
- Repeated exposure can cause permanent brain damage. Early symptoms include poor appetite, weakness and sleepiness. Later effects include changes in speech, balance, mood and personality, loss of facial expressions, poor muscle coordination, muscle cramps, twitching and tremors. The later symptoms are identical to Parkinson's disease.
- Prolonged or repeated exposure can lead to permanent lung damage.
- **Manganese** may affect the liver and may cause anemia.

Medical

Medical Testing
For frequent or potentially high exposure (half the TLV or greater), the following are recommended before beginning work and at regular times after that:

- Exam of the nervous system
- Chest x-ray and lung function tests

If symptoms develop or overexposure is suspected, the following are recommended:

- Liver function tests
- Complete blood count
- Evaluate for brain effects such as changes in memory, concentration, sleeping patterns and mood (especially irritability and social withdrawal), as well as for headaches and fatigue. Consider evaluations of the cerebellar, autonomic and peripheral nervous systems. Positive and borderline individuals should be referred for neuropsychological testing.

Any evaluation should include a careful history of past and present symptoms with an exam. Medical tests that look for damage already done are not a substitute for controlling exposure.

You have a legal right to request copies of your medical testing under the OSHA Access to Employee Exposure and Medical Records Standard (29 CFR 1910.1020).

Mixed Exposures
- Smoking can cause heart disease, lung cancer, emphysema, and other respiratory problems. It may worsen respiratory conditions caused by chemical exposure. Even if you have smoked for a long time, stopping now will reduce your risk of developing health problems.
- More than light alcohol consumption can cause liver damage. Drinking alcohol may increase the liver damage caused by **Manganese**.

Workplace Controls and Practices

Very toxic chemicals, or those that are reproductive hazards or sensitizers, require expert advice on control measures if a less toxic chemical cannot be substituted. Control measures include: (1) enclosing chemical processes for severely irritating and corrosive chemicals, (2) using local exhaust ventilation for chemicals that may be harmful with a single exposure, and (3) using general ventilation to control exposures to skin and eye irritants. For further information on workplace controls, consult the NIOSH document on Control Banding at www.cdc.gov/niosh/topics/ctrlbanding/.

The following work practices are also recommended:

- Label process containers.
- Provide employees with hazard information and training.
- Monitor airborne chemical concentrations.
- Use engineering controls if concentrations exceed recommended exposure levels.
- Provide eye wash fountains and emergency showers.
- Wash or shower if skin comes in contact with a hazardous material.
- Always wash at the end of the workshift.
- Change into clean clothing if clothing becomes contaminated.
- Do not take contaminated clothing home.
- Get special training to wash contaminated clothing.
- Do not eat, smoke, or drink in areas where chemicals are being handled, processed or stored.
- Wash hands carefully before eating, smoking, drinking, applying cosmetics or using the toilet.

In addition, the following may be useful or required:

- Before entering a confined space where **Manganese** *powder* and *dust* may be present, check to make sure that an explosive concentration does not exist.
- Use a vacuum or a wet method to reduce dust during clean-up. DO NOT DRY SWEEP.

Personal Protective Equipment

The OSHA Personal Protective Equipment Standard (29 CFR 1910.132) requires employers to determine the appropriate personal protective equipment for each hazard and to train employees on how and when to use protective equipment.

The following recommendations are only guidelines and may not apply to every situation.

Gloves and Clothing

- Avoid skin contact with **Manganese**. Wear personal protective equipment made from material that can not be permeated or degraded by this substance. Safety equipment suppliers and manufacturers can provide recommendations on the most protective glove and clothing material for your operation.
- The recommended glove materials for **Manganese** are Nitrile and Neoprene.
- The recommended protective clothing material for **Manganese** is Tyvek®, or the equivalent.
- All protective clothing (suits, gloves, footwear, headgear) should be clean, available each day, and put on before work.

Eye Protection

- Wear direct vent goggles when airborne particles or dust are present.

Respiratory Protection

Improper use of respirators is dangerous. Respirators should only be used if the employer has implemented a written program that takes into account workplace conditions, requirements for worker training, respirator fit testing, and medical exams, as described in the OSHA Respiratory Protection Standard (29 CFR 1910.134). **Only NIOSH approved respirators should be used.**

- Where the potential exists for exposure over **0.02 mg/m^3** (as the *respirable fraction)* or **0.2 mg/m^3** (as the *inhalable fraction),* use a negative pressure, air-purifying, particulate filter respirator with an N, R or P95 filter. More protection is provided by a full facepiece respirator than by a half-mask respirator, and even greater protection is provided by a powered-air purifying respirator.
- Leave the area immediately if (1) while wearing a filter or cartridge respirator you can smell, taste, or otherwise detect **Manganese**, (2) while wearing particulate filters abnormal resistance to breathing is experienced, or (3) eye irritation occurs while wearing a full facepiece respirator. Check to make sure the respirator-to-face seal is still good. If it is, replace the filter or cartridge. If the seal is no longer good, you may need a new respirator.
- Consider all potential sources of exposure in your workplace. You may need a combination of filters, prefilters or cartridges to protect against different forms of a chemical (such as vapor and mist) or against a mixture of chemicals.
- Where the potential for high exposure exists, use a supplied-air respirator with a full facepiece operated in a pressure-demand or other positive-pressure mode. For increased protection use in combination with an auxiliary self-contained breathing apparatus or an emergency escape air cylinder.
- Exposure to **500 mg/m^3** is immediately dangerous to life and health. If the possibility of exposure above **500 mg/m^3** exists, use a self-contained breathing apparatus with a full facepiece operated in a pressure-demand or other positive-pressure mode equipped with an emergency escape air cylinder.

Fire Hazards

If employees are expected to fight fires, they must be trained and equipped as stated in the OSHA Fire Brigades Standard (29 CFR 1910.156).

- **Manganese** *powder* and *dust* are FLAMMABLE and DANGEROUS FIRE HAZARDS.
- Use sand or dry chemicals appropriate for extinguishing metal fires.
- POISONOUS GASES ARE PRODUCED IN FIRE, including *Manganese Oxides*.
- **Manganese** *powder* and *dust* may form an ignitable vapor/air mixture in closed tanks or containers.
- Use water spray to keep fire-exposed containers cool.

Spills and Emergencies

If employees are required to clean-up spills, they must be properly trained and equipped. The OSHA Hazardous Waste Operations and Emergency Response Standard (29 CFR 1910.120) may apply.

If **Manganese** is spilled, take the following steps:

- Evacuate personnel and secure and control entrance to the area.
- Eliminate all ignition sources.
- Collect powdered material in the most convenient and safe manner and place into sealed containers for disposal.
- Ventilate and wash area after clean-up is complete.
- DO NOT wash into sewer.
- It may be necessary to contain and dispose of **Manganese** as a HAZARDOUS WASTE. Contact your state Department of Environmental Protection (DEP) or your regional office of the federal Environmental Protection Agency (EPA) for specific recommendations.

Handling and Storage

Prior to working with **Manganese** you should be trained on its proper handling and storage.

- *Finely divided* **Manganese** *dust* can ignite spontaneously in AIR.
- **Manganese** reacts with STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC), and slowly with WATER or STEAM, to produce flammable and explosive *Hydrogen gas*.
- **Manganese** may react with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); NITROGEN DIOXIDE; PHOSPHORUS; and SULFUR DIOXIDE to cause ignition and/or violent decomposition.
- Store in tightly closed containers in a cool, well-ventilated area away from WATER and MOISTURE.
- Sources of ignition, such as smoking and open flames, are prohibited where **Manganese** *powder* is used, handled, or stored.
- Ground and bond containers when transferring **Manganese** *powder*.
- Use only non-sparking tools and equipment, especially when opening and closing containers of **Manganese** *powder*.

Occupational Health Information Resources

The New Jersey Department of Health and Senior Services, Occupational Health Service, offers multiple services in occupational health. These services include providing informational resources, educational materials, public presentations, and industrial hygiene and medical investigations and evaluations.

For more information, please contact:

New Jersey Department of Health & Senior Services
Right to Know Program
PO Box 368
Trenton, NJ 08625-0368
Phone: 609-984-2202
Fax: 609-984-7407
E-mail: rtk@doh.state.nj.us
Web address: http://www.nj.gov/health/eoh/rtkweb

GLOSSARY

ACGIH is the American Conference of Governmental Industrial Hygienists. They publish guidelines called Threshold Limit Values (TLVs) for exposure to workplace chemicals.

Acute Exposure Guideline Levels (AEGLs) are established by the EPA. They describe the risk to humans resulting from once-in-a lifetime, or rare, exposure to airborne chemicals.

Boiling point is the temperature at which a substance can change its physical state from a liquid to a gas.

A **carcinogen** is a substance that causes cancer.

The **CAS number** is unique, identifying number, assigned by the Chemical Abstracts Service, to a specific chemical.

CFR is the Code of Federal Regulations, which are the regulations of the United States government.

A **combustible** substance is a solid, liquid or gas that will burn.

A **corrosive** substance is a gas, liquid or solid that causes destruction of human skin or severe corrosion of containers.

The **critical temperature** is the temperature above which a gas cannot be liquefied, regardless of the pressure applied.

DEP is the New Jersey Department of Environmental Protection.

DOT is the Department of Transportation, the federal agency that regulates the transportation of chemicals.

EPA is the Environmental Protection Agency, the federal agency responsible for regulating environmental hazards.

ERG is the Emergency Response Guidebook. It is a guide for emergency responders for transportation emergencies involving hazardous substances.

Emergency Response Planning Guideline (ERPG) values provide estimates of concentration ranges where one reasonably might anticipate observing adverse effects.

A **fetus** is an unborn human or animal.

A **flammable** substance is a solid, liquid, vapor or gas that will ignite easily and burn rapidly.

The **flash point** is the temperature at which a liquid or solid gives off vapor that can form a flammable mixture with air.

IARC is the International Agency for Research on Cancer, a scientific group.

Ionization Potential is the amount of energy needed to remove an electron from an atom or molecule. It is measured in electron volts.

IRIS is the Integrated Risk Information System database on human health effects that may result from exposure to various chemicals, maintained by federal EPA.

LEL or **Lower Explosive Limit**, is the lowest concentration of a combustible substance (gas or vapor) in the air capable of continuing an explosion.

mg/m^3 means milligrams of a chemical in a cubic meter of air. It is a measure of concentration (weight/volume).

A **mutagen** is a substance that causes mutations. A **mutation** is a change in the genetic material in a body cell. Mutations can lead to birth defects, miscarriages, or cancer.

NFPA is the National Fire Protection Association. It classifies substances according to their fire and explosion hazard.

NIOSH is the National Institute for Occupational Safety and Health. It tests equipment, evaluates and approves respirators, conducts studies of workplace hazards, and proposes standards to OSHA.

NTP is the National Toxicology Program which tests chemicals and reviews evidence for cancer.

OSHA is the federal Occupational Safety and Health Administration, which adopts and enforces health and safety standards.

PEOSHA is the New Jersey Public Employees Occupational Safety and Health Act, which adopts and enforces health and safety standards in public workplaces.

Permeated is the movement of chemicals through protective materials.

ppm means parts of a substance per million parts of air. It is a measure of concentration by volume in air.

Protective Action Criteria (PAC) are values established by the Department of Energy and are based on AEGLs and ERPGs. They are used for emergency planning of chemical release events.

A **reactive** substance is a solid, liquid or gas that releases energy under certain conditions.

STEL is a Short Term Exposure Limit which is usually a 15-minute exposure that should not be exceeded at any time during a work day.

A **teratogen** is a substance that causes birth defects by damaging the fetus.

UEL or **Upper Explosive Limit** is the highest concentration in air above which there is too much fuel (gas or vapor) to begin a reaction or explosion.

Vapor Density is the ratio of the weight of a given volume of one gas to the weight of another (usually *Air*), at the same temperature and pressure.

The **vapor pressure** is a force exerted by the vapor in equilibrium with the solid or liquid phase of the same substance. The higher the vapor pressure the higher concentration of the substance in air.

Right to Know Hazardous Substance Fact Sheet

Emergency Responders Quick Reference

Common Name: **MANGANESE**

Synonyms: Colloidal Manganese
CAS No: 7439-96-5
Molecular Formula: Mn
RTK Substance No: 1155
Description: Pure **Manganese** is a silver or grey-white, brittle solid

HAZARD DATA

Hazard Rating	Firefighting	Reactivity
2- Health **3 (powder)- Fire** **1- Reactivity** **DOT#:** UN 3089 **ERG Guide #:** 170 **Hazard Class:** 4.1 (Flammable solid)	**Manganese** *powder* and *dust* are FLAMMABLE and DANGEROUS FIRE HAZARDS. Use sand or dry chemicals appropriate for extinguishing metal fires. POISONOUS GASES ARE PRODUCED IN FIRE, including *Manganese Oxides*. **Manganese** *powder* and *dust* may form an ignitable vapor/air mixture in closed tanks or containers. Use water spray to keep fire-exposed containers cool.	*Finely divided* **Manganese** *dust* can ignite spontaneously in AIR. **Manganese** reacts with STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC), and slowly with WATER or STEAM, to produce flammable and explosive *Hydrogen gas*. **Manganese may** react with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); NITROGEN DIOXIDE; PHOSPHORUS; and SULFUR DIOXIDE to cause ignition and/or violent decomposition.

SPILL/LEAKS

Isolation Distance:

Spill: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Collect powdered material in the most convenient and safe manner and place into sealed containers for disposal.

Ground and bond containers when transferring **Manganese** *powder*.

Use only non-sparking tools and equipment.

DO NOT wash into sewer.

Manganese may be hazardous to the environment, especially to aquatic organisms.

PHYSICAL PROPERTIES

Flash Point:	Flammable *powder* and *dust*
Auto Ignition Temp:	842°F (450°C) (*Dust*)
Vapor Pressure:	0 mm Hg at 68°F (20°C)
Specific Gravity:	7.2 (water = 1)
Water Solubility:	Insoluble
Boiling Point:	3,564°F (1,962°C)
Melting Point:	2,271°F (1,244°C)
Molecular Weight:	54.9

EXPOSURE LIMITS

OSHA:	5 mg/m^3, Ceiling
NIOSH:	1 mg/m^3, 8-hr TWA; 3 mg/m^3, STEL
ACGIH:	0.2 mg/m^3 (*inhalable*); 0.02 mg/m^3 (*respirable*), 8-hr TWA
IDLH:	500 mg/m^3

The Protective Action Criteria values are:
PAC-1 = 3 mg/m^3 PAC-2 = 5 mg/m^3 PAC-3 = 500 mg/m^3

PROTECTIVE EQUIPMENT

Gloves:	Nitrile and Neoprene
Coveralls:	Tyvek® **Use turn out gear or flash protection if ignition/fire is the greatest hazard.**
Respirator:	Spill - full facepiece APR with *P100 filters* Fire - SCBA

HEALTH EFFECTS

Eyes:	Irritation
Skin:	Irritation
Inhalation:	Nose, throat and lung irritation with coughing, wheezing and shortness of breath Headache, fever and chills, aches, chest tightness and cough (*"metal fume fever"*)

FIRST AID AND DECONTAMINATION

Remove the person from exposure.

Flush eyes with large amounts of water for at least 15 minutes. Remove contact lenses.

Quickly remove contaminated clothing and wash contaminated skin with large amounts of soap and water.

Begin artificial respiration if breathing has stopped and CPR if necessary. Transfer promptly to a medical facility.

Right to Know
Hazardous Substance Fact Sheet

Common Name: **MAGNESIUM**

Synonyms: None

Chemical Name: Magnesium

Date: September 1999 Revision: June 2008

CAS Number: 7439-95-4

RTK Substance Number: 1136

DOT Number: UN 1869
UN 1418 (Powder)

EMERGENCY RESPONDERS >>>> SEE PAGE 6

Description and Use

Magnesium is a light, silvery-white metal which can be in the form of a gray powder, thin sheet or chip. It is used in making structural metals, die-cast auto parts, missiles, precision instruments and optical mirrors, flashbulbs, flares, pyrotechnics, and batteries.

Reasons for Citation

- **Magnesium** is on the Right to Know Hazardous Substance List because it is cited by DOT and NFPA.

SEE GLOSSARY ON PAGE 5.

FIRST AID

Eye Contact
- Immediately flush with large amounts of water for at least 15 minutes, lifting upper and lower lids. Remove contact lenses, if worn, while rinsing.

Skin Contact
- Remove contaminated clothing and wash contaminated skin with soap and water.

Inhalation
- Remove the person from exposure.
- Transfer promptly to a medical facility.

EMERGENCY NUMBERS

Poison Control: 1-800-222-1222

CHEMTREC: 1-800-424-9300

NJDEP Hotline: 1-877-927-6337

National Response Center: 1-800-424-8802

Hazard Summary

Hazard Rating	NJDHSS	NFPA
HEALTH	1	0
FLAMMABILITY	-	1
REACTIVITY	-	1

MAY SPONTANEOUSLY IGNITE
POISONOUS GASES ARE PRODUCED IN FIRE
DO NOT USE WATER, CO_2, FOAM OR HALOGENATED AGENTS

Hazard Rating Key: 0=minimal; 1=slight; 2=moderate; 3=serious; 4=severe

- **Magnesium** *dust* or *fume* can affect you when inhaled.
- Contact can irritate the skin and eyes.
- Inhaling **Magnesium** can irritate the nose, throat and lungs.
- Exposure to **Magnesium** may cause a flu-like illness called "*metal fume fever.*"
- Repeated exposure to the *dust* can cause **Magnesium** to accumulate in the body. This will cause an upset stomach.
- **Magnesium** POWDER, SHEETS and CHIPS may SPONTANEOUSLY IGNITE on contact with AIR or MOISTURE.

Workplace Exposure Limits

The following exposure limits are for *Magnesium Oxide*:

OSHA: The legal airborne permissible exposure limit (PEL) is **15 mg/m^3** (as *total particulate*) averaged over an 8-hour workshift.

ACGIH: The threshold limit value (TLV) is **10 mg/m^3** (as the *inhalable fraction*) averaged over an 8-hour workshift.

Determining Your Exposure

- Read the product manufacturer's Material Safety Data Sheet (MSDS) and the label to determine product ingredients and important safety and health information about the product mixture.
- For each individual hazardous ingredient, read the New Jersey Department of Health and Senior Services Hazardous Substance Fact Sheet, available on the RTK Program website (www.nj.gov/health/eoh/rtkweb) or in your facility's RTK Central File or Hazard Communication Standard file.
- You have a right to this information under the New Jersey Worker and Community Right to Know Act, the Public Employees Occupational Safety and Health (PEOSH) Act if you are a public worker in New Jersey, and under the federal Occupational Safety and Health Act (OSHA) if you are a private worker.
- The New Jersey Right to Know Act requires most employers to label chemicals in the workplace and requires public employers to provide their employees with information concerning chemical hazards and controls. The federal OSHA Hazard Communication Standard (29 CFR 1910.1200) and the PEOSH Hazard Communication Standard (N.J.A.C. 12:100-7) require employers to provide similar information and training to their employees.

This Fact Sheet is a summary of available information regarding the health hazards that may result from exposure. Duration of exposure, concentration of the substance and other factors will affect your susceptibility to any of the potential effects described below.

Health Hazard Information

Acute Health Effects

The following acute (short-term) health effects may occur immediately or shortly after exposure to **Magnesium**:

- Contact can irritate the skin and eyes.
- Inhaling **Magnesium** can irritate the nose, throat and lungs causing tightness in the chest and/or difficulty in breathing.
- Exposure to **Magnesium** may cause *"metal fume fever."* This is a flu-like illness with symptoms of metallic taste in the mouth, headache, fever and chills, aches, chest tightness and cough. The symptoms may be delayed for several hours after exposure and usually last for a day or two.

Chronic Health Effects

The following chronic (long-term) health effects can occur at some time after exposure to **Magnesium** and can last for months or years:

Cancer Hazard

- According to the information presently available to the New Jersey Department of Health and Senior Services, **Magnesium** has not been tested for its ability to cause cancer in animals.

Reproductive Hazard

- According to the information presently available to the New Jersey Department of Health and Senior Services, **Magnesium** has not been tested for its ability to affect reproduction.

Other Effects

- Repeated exposure to the *dust* can cause **Magnesium** to accumulate in the body. This will cause an upset stomach.

Medical

Medical Testing

There is no special test for this chemical. However, seek medical attention if illness occurs or overexposure is suspected.

Any evaluation should include a careful history of past and present symptoms with an exam. Medical tests that look for damage already done are not a substitute for controlling exposure.

Request copies of your medical testing. You have a legal right to this information under the OSHA Access to Employee Exposure and Medical Records Standard (29 CFR 1910.1020).

Workplace Controls and Practices

Very toxic chemicals, or those that are reproductive hazards or sensitizers, require expert advice on control measures if a less toxic chemical cannot be substituted. Control measures include: (1) enclosing chemical processes for severely irritating and corrosive chemicals, (2) using local exhaust ventilation for chemicals that may be harmful with a single exposure, and (3) using general ventilation to control exposures to skin and eye irritants. For further information on workplace controls, consult the NIOSH document on Control Banding at www.cdc.gov/niosh/topics/ctrlbanding/.

The following work practices are also recommended:

- Label process containers.
- Provide employees with hazard information and training.
- Monitor airborne chemical concentrations.
- Use engineering controls if concentrations exceed recommended exposure levels.
- Provide eye wash fountains and emergency showers.
- Wash or shower if skin comes in contact with a hazardous material.
- Always wash at the end of the workshift.
- Change into clean clothing if clothing becomes contaminated.
- Do not take contaminated clothing home.
- Get special training to wash contaminated clothing.
- Do not eat, smoke, or drink in areas where chemicals are being handled, processed or stored.
- Wash hands carefully before eating, smoking, drinking, applying cosmetics or using the toilet.

In addition, the following may be useful or required:

- Before entering a confined space where **Magnesium** *powder* may be present, check to make sure that an explosive concentration does not exist.
- Use a vacuum for **Magnesium** *powder* to reduce dust during clean-up. DO NOT DRY SWEEP.

Personal Protective Equipment

The OSHA Personal Protective Equipment Standard (29 CFR 1910.132) requires employers to determine the appropriate personal protective equipment for each hazard and to train employees on how and when to use protective equipment.

The following recommendations are only guidelines and may not apply to every situation.

Gloves and Clothing

- Avoid skin contact with **Magnesium**. Wear personal protective equipment made from material which can not be permeated or degraded by this substance. Safety equipment suppliers and manufacturers can provide recommendations on the most protective glove and clothing material for your operation.
- Safety equipment manufacturers recommend Nitrile and Natural Rubber for gloves and DuPont Tyvek®, or the equivalent, as a protective material for clothing.
- All protective clothing (suits, gloves, footwear, headgear) should be clean, available each day, and put on before work.

Eye Protection

- Wear eye protection with side shields or goggles.
- Wear a face shield along with goggles when working with corrosive, highly irritating or toxic substances.

Respiratory Protection

Improper use of respirators is dangerous. Respirators should only be used if the employer has implemented a written program that takes into account workplace conditions, requirements for worker training, respirator fit testing, and medical exams, as described in the OSHA Respiratory Protection Standard (29 CFR 1910.134).

- Where the potential exists for exposure over **10 mg/m^3** (as *Magnesium Oxide*), use a NIOSH approved air-purifying, particulate filter respirator with an N95 filter. More protection is provided by a full facepiece respirator than by a half-mask respirator, and even greater protection is provided by a powered-air purifying respirator.
- Leave the area immediately if (1) while wearing a filter or cartridge respirator you can smell, taste, or otherwise detect **Magnesium**, (2) while wearing particulate filters abnormal resistance to breathing is experienced, or (3) eye irritation occurs while wearing a full facepiece respirator. Check to make sure the respirator-to-face seal is still good. If it is, replace the filter or cartridge. If the seal is no longer good, you may need a new respirator.
- Consider all potential sources of exposure in your workplace. You may need a combination of filters, prefilters or cartridges to protect against different forms of a chemical (such as vapor and mist) or against a mixture of chemicals.
- Where the potential exists for exposure over **100 mg/m^3** (as *Magnesium Oxide*), use a NIOSH approved supplied-air respirator with a full facepiece operated in a pressure-demand or other positive-pressure mode. For increased protection use in combination with an auxiliary self-contained breathing apparatus operated in a pressure-demand or other positive-pressure mode.
- Exposure to **750 mg/m^3** (as *Magnesium Oxide*) is immediately dangerous to life and health. If the possibility of exposure above **750 mg/m^3** exists, use a NIOSH approved self-contained breathing apparatus with a full facepiece operated in a pressure-demand or other positive-pressure mode equipped with an emergency escape air cylinder.

Fire Hazards

If employees are expected to fight fires, they must be trained and equipped as stated in the OSHA Fire Brigades Standard (29 CFR 1910.156).

- **Magnesium** POWDER, SHEETS and CHIPS may SPONTANEOUSLY IGNITE on contact with AIR or MOISTURE.
- Use Class D fire extinguishers or dry sand, clay, graphite, or limestone to fight fires.
- DO NOT USE WATER, CO_2, foam or halogenated extinguishing agents.
- POISONOUS GASES ARE PRODUCED IN FIRE.
- FIRE MAY RESTART AFTER IT HAS BEEN EXTINGUISHED.
- CONTAINERS MAY EXPLODE IN FIRE.

Spills and Emergencies

If employees are required to clean-up spills, they must be properly trained and equipped. The OSHA Hazardous Waste Operations and Emergency Response Standard (29 CFR 1910.120) may apply.

If **Magnesium** is spilled, take the following steps:

- Evacuate personnel and secure and control entrance to the area.
- Eliminate all ignition sources.
- Collect powdered material in the most convenient and safe manner, or use a HEPA-filter vacuum, and deposit in sealed containers.
- DO NOT USE WATER OR WET METHOD.
- Ventilate area after clean-up is complete.
- DO NOT wash into sewer.
- It may be necessary to contain and dispose of **Magnesium** as a HAZARDOUS WASTE. Contact your state Department of Environmental Protection (DEP) or your regional office of the federal Environmental Protection Agency (EPA) for specific recommendations.

Handling and Storage

Prior to working with **Magnesium** you should be trained on its proper handling and storage.

- *Finely divided* **Magnesium** reacts with WATER, MOISTURE, STEAM and ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC) to release flammable and explosive *Hydrogen gas*.
- *Finely divided* **Magnesium** ignites on contact with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE) and AMMONIA; and reacts vigorously or explosively (and may form explosive compounds) with ACETYLENIC COMPOUNDS (such as ACETYLENE and ETHYLENE OXIDE); HALOCARBONS (such as CHLOROFORM and CHLOROMETHANE); AMMONIA NITRATE; CARBONATES; ARSENIC; METAL OXIDES; METAL SULFATES; OXYGEN; METAL CYANIDES; PHOSPHATES, and many other substances.
- **Magnesium** is AIR and MOISTURE sensitive.
- Store in tightly closed containers in a cool, well-ventilated area and protect from SHOCK and FRICTION.
- Sources of ignition, such as smoking and open flames, are prohibited where **Magnesium** is used, handled, or stored in a manner that could create a potential fire or explosion hazard.
- Use explosion-proof electrical equipment and fittings wherever **Magnesium** is used, handled, manufactured, or stored.
- Use only non-sparking tools and equipment, especially when opening and closing containers of **Magnesium**.

Occupational Health Information Resources

The New Jersey Department of Health and Senior Services, Occupational Health Service, offers multiple services in occupational health. These services include providing informational resources, educational materials, public presentations, and industrial hygiene and medical investigations and evaluations.

For more information, please contact:

New Jersey Department of Health & Senior Services
Right to Know Program
PO Box 368
Trenton, NJ 08625-0368
Phone: 609-984-2202
Fax: 609-984-7407
E-mail: rtk@doh.state.nj.us
Web address: http://www.nj.gov/health/eoh/rtkweb

GLOSSARY

ACGIH is the American Conference of Governmental Industrial Hygienists. They publish guidelines called Threshold Limit Values (TLVs) for exposure to workplace chemicals.

Acute Exposure Guideline Levels (AEGLs) are established by the EPA. They describe the risk to humans resulting from once-in-a lifetime, or rare, exposure to airborne chemicals.

Boiling point is the temperature at which a substance can change its physical state from a liquid to a gas.

A **carcinogen** is a substance that causes cancer.

The **CAS number** is unique, identifying number, assigned by the Chemical Abstracts Service, to a specific chemical.

CFR is the Code of Federal Regulations, which are the regulations of the United States government.

A **combustible** substance is a solid, liquid or gas that will burn.

A **corrosive** substance is a gas, liquid or solid that causes destruction of human skin or severe corrosion of containers.

DEP is the New Jersey Department of Environmental Protection.

DOT is the Department of Transportation, the federal agency that regulates the transportation of chemicals.

EPA is the Environmental Protection Agency, the federal agency responsible for regulating environmental hazards.

ERG is the Emergency Response Guidebook. It is a guide for emergency responders for transportation emergencies involving hazardous substances.

Emergency Response Planning Guideline (ERPG) values are intended to provide estimates of concentration ranges where one reasonably might anticipate observing adverse effects.

A **fetus** is an unborn human or animal.

A **flammable** substance is a solid, liquid, vapor or gas that will ignite easily and burn rapidly.

The **flash point** is the temperature at which a liquid or solid gives off vapor that can form a flammable mixture with air.

IARC is the International Agency for Research on Cancer, a scientific group.

Ionization Potential is the amount of energy needed to remove an electron from an atom or molecule. It is measured in electron volts.

IRIS is the Integrated Risk Information System database maintained by federal EPA. The database contains information on human health effects that may result from exposure to various chemicals in the environment.

LEL or **Lower Explosive Limit**, is the lowest concentration of a combustible substance (gas or vapor) in the air capable of continuing an explosion.

mg/m^3 means milligrams of a chemical in a cubic meter of air. It is a measure of concentration (weight/volume).

A **mutagen** is a substance that causes mutations. A **mutation** is a change in the genetic material in a body cell. Mutations can lead to birth defects, miscarriages, or cancer.

NFPA is the National Fire Protection Association. It classifies substances according to their fire and explosion hazard.

NIOSH is the National Institute for Occupational Safety and Health. It tests equipment, evaluates and approves respirators, conducts studies of workplace hazards, and proposes standards to OSHA.

NTP is the National Toxicology Program which tests chemicals and reviews evidence for cancer.

OSHA is the federal Occupational Safety and Health Administration, which adopts and enforces health and safety standards.

PEOSHA is the New Jersey Public Employees Occupational Safety and Health Act, which adopts and enforces health and safety standards in public workplaces.

Permeated is the movement of chemicals through protective materials.

PIH is a DOT designation for chemicals which are Poison Inhalation Hazards.

ppm means parts of a substance per million parts of air. It is a measure of concentration by volume in air.

A **reactive** substance is a solid, liquid or gas that releases energy under certain conditions.

STEL is a Short Term Exposure Limit which is usually a 15-minute exposure that should not be exceeded at any time during a work day.

A **teratogen** is a substance that causes birth defects by damaging the fetus.

UEL or **Upper Explosive Limit** is the highest concentration in air above which there is too much fuel (gas or vapor) to begin a reaction or explosion.

Vapor Density is the ratio of the weight of a given volume of one gas to the weight of another (usually *Hydrogen*), at the same temperature and pressure.

The **vapor pressure** is a measure of how readily a liquid or a solid mixes with air at its surface. A higher vapor pressure indicates a higher concentration of the substance in air and therefore increases the likelihood of breathing it in.

Common Name: **MAGNESIUM**

Synonyms: None
CAS No: 7439-95-4
Molecular Formula: Mg
RTK Substance No: 1136
Description: Light, silvery-white metal which can be in the form of a gray powder, thin sheet or chip

HAZARD DATA

Hazard Rating	Firefighting	Reactivity
1 - Health **1 - Fire** **1 - Reactivity** **DOT#:** UN 1869 UN 1418 (powder) **ERG Guide #: 138** **Hazard Class:** 4.1 and 4.3 UN 1869 (Flammable) UN 1418 (Water Reactive)	**Magnesium** POWDER, SHEETS and CHIPS MAY SPONTANEOUSLY IGNITE on contact with AIR or MOISTURE. Use Class D fire extinguishers or dry sand, clay, graphite, or limestone to fight fires. DO NOT USE WATER, CO_2, foam or halogenated extinguishing agents. POISONOUS GASES ARE PRODUCED IN FIRE. FIRE MAY RESTART AFTER IT HAS BEEN EXTINGUISHED.	*Finely divided* **Magnesium** reacts with WATER, MOISTURE, STEAM and ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC) to release flammable and explosive *Hydrogen gas*. *Finely divided* **Magnesium** ignites on contact with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE) and AMMONIA; and reacts vigorously or explosively (and may form explosive compounds) with ACETYLENIC COMPOUNDS (such as ACETYLENE and ETHYLENE OXIDE); HALOCARBONS (such as CHLOROFORM and CHLOROMETHANE); AMMONIA NITRATE; CARBONATES; ARSENIC; METAL OXIDES; METAL SULFATES; OXYGEN; METAL CYANIDES; PHOSPHATES, and many other substances. **Magnesium** is AIR and MOISTURE sensitive.

SPILL/LEAKS

Isolation Distance:

Spills: 25 meters (75 feet)
Fires: 800 meters (1/2 mile)
Collect powdered material in the most convenient and safe manner, or use a HEPA-filter vacuum, and deposit in sealed containers.
DO NOT wash into sewer.

PHYSICAL PROPERTIES

Odor Threshold:	Odorless
Flash Point:	Flammable powder
Auto Ignition Temp:	883°F (473°C)
Vapor Density:	1.7 (air = 1)
Vapor Pressure:	1 mm Hg at 1,149°F (621°C)
Specific Gravity:	1.74 (water = 1)
Water Solubility:	Insoluble, Reactive
Boiling Point:	2,012°F (1,100°C)
Molecular Weight:	24.3

EXPOSURE LIMITS

OSHA:	15 mg/m^3, 8-hr TWA
NIOSH:	None
ACGIH:	10 mg/m^3, 8-hr TWA
IDLH:	750 mg/m^3

All of the above are for *Magnesium Oxide*

PROTECTIVE EQUIPMENT

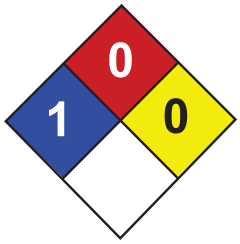
Gloves:	Nitrile and Natural Rubber
Coveralls:	DuPont Tyvek®
Respirator:	>10 mg/m^3 - APR with High efficiency filter >100 mg/m^3 - Supplied air

HEALTH EFFECTS

Eyes:	Irritation
Skin:	Irritation
Inhalation:	Nose, throat and lung irritation with coughing and difficulty in breathing Headache, fever and chills, chest tightness

FIRST AID AND DECONTAMINATION

Remove the person from exposure.
Flush eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.
Remove contaminated clothing and wash contaminated skin with soap and water.
Transfer to a medical facility.



Material Safety Data Sheet
Lead MSDS

Section 1: Chemical Product and Company Identification

Product Name: Lead

Catalog Codes: SLL1291, SLL1669, SLL1081, SLL1459, SLL1834

CAS#: 7439-92-1

RTECS: OF7525000

TSCA: TSCA 8(b) inventory: Lead

CI#: Not available.

Synonym: Lead Metal, granular; Lead Metal, foil; Lead Metal, sheet; Lead Metal, shot

Chemical Name: Lead

Chemical Formula: Pb

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call: 1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Lead	7439-92-1	100

Toxicological Data on Ingredients: Lead LD50: Not available. LC50: Not available.

Section 3: Hazards Identification

Potential Acute Health Effects: Slightly hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, of inhalation.

Potential Chronic Health Effects:
Slightly hazardous in case of skin contact (permeator). CARCINOGENIC EFFECTS: Classified A3 (Proven for animal.) by ACGIH, 2B (Possible for human.) by IARC. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to blood, kidneys, central nervous system (CNS). Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact:

Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention if irritation occurs.

Skin Contact: Wash with soap and water. Cover the irritated skin with an emollient. Get medical attention if irritation develops.

Serious Skin Contact: Not available.

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Serious Inhalation: Not available.

Ingestion:
Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: May be combustible at high temperature.

Auto-Ignition Temperature: Not available.

Flash Points: Not available.

Flammable Limits: Not available.

Products of Combustion: Some metallic oxides.

Fire Hazards in Presence of Various Substances: Non-flammable in presence of open flames and sparks, of shocks, of heat.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions:
SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray, fog or foam. Do not use water jet.

Special Remarks on Fire Hazards: When heated to decomposition it emits highly toxic fumes of lead.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill:
Use appropriate tools to put the spilled solid in a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and dispose of according to local and regional authority requirements.

Large Spill:
Use a shovel to put the material into a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and allow to evacuate through the sanitary system. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep locked up.. Keep away from heat. Keep away from sources of ignition. Empty containers pose a fire risk, evaporate the residue under a fume hood. Ground all equipment containing material. Do not ingest. Do not breathe dust. Wear suitable

protective clothing. If ingested, seek medical advice immediately and show the container or the label. Keep away from incompatibles such as oxidizing agents.

Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection: Safety glasses. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
TWA: 0.05 (mg/m3) from ACGIH (TLV) [United States] TWA: 0.05 (mg/m3) from OSHA (PEL) [United States] TWA: 0.03 (mg/m3) from NIOSH [United States] TWA: 0.05 (mg/m3) [Canada]Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid. (Metal solid.)

Odor: Not available.

Taste: Not available.

Molecular Weight: 207.21 g/mole

Color: Bluish-white. Silvery. Gray

pH (1% soln/water): Not applicable.

Boiling Point: 1740°C (3164°F)

Melting Point: 327.43°C (621.4°F)

Critical Temperature: Not available.

Specific Gravity: 11.3 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility: Insoluble in cold water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Incompatible materials, excess heat

Incompatibility with various substances: Reactive with oxidizing agents.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity:
Can react vigorously with oxidizing materials. Incompatible with sodium carbide, chlorine trifluoride, trioxane + hydrogen peroxide, ammonium nitrate, sodium azide, disodium acetylide, sodium acetylide, hot concentrated nitric acid, hot concentrated hydrochloric acid, hot concentrated sulfuric acid, zirconium.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Inhalation. Ingestion.

Toxicity to Animals:
LD50: Not available. LC50: Not available.

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: Classified A3 (Proven for animal.) by ACGIH, 2B (Possible for human.) by IARC. May cause damage to the following organs: blood, kidneys, central nervous system (CNS).

Other Toxic Effects on Humans: Slightly hazardous in case of skin contact (irritant), of ingestion, of inhalation.

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Not available.

Special Remarks on other Toxic Effects on Humans:
Acute Potential: Skin: Lead metal granules or dust: May cause skin irritation by mechanical action. Lead metal foil, shot or sheets: Not likely to cause skin irritation Eyes: Lead metal granules or dust: Can irritate eyes by mechanical action. Lead metal foil, shot or sheets: No hazard. Will not cause eye irritation. Inhalation: In an industrial setting, exposure to lead mainly occurs from inhalation of dust or fumes. Lead dust or fumes: Can irritate the upper respiratory tract (nose, throat) as well as the bronchi and lungsby mechanical action. Lead dust can be absorbed through the respiratory system. However, inhaled lead does not accumulate in the lungs. All of an inhaled dose is eventually abssorbed or transferred to the gastrointestinal tract. Inhalation effects of exposure to fumes or dust of inorganic lead may not develop quickly. Symptoms may include metallic taste, chest pain, decreased physical fitness, fatigue, sleep disturbance, headache, irritability, reduces memory, mood and personality changes, aching bones and muscles, constipation, abdominal pains, decreasing appetite. Inhalation of large amounts may lead to ataxia, deliriuim, convulsions/seizures, coma, and death. Lead metal foil, shot, or sheets: Not an inhalation hazard unless metal is heated. If metal is heated, fumes will be released. Inhalation of these fumes may cause "fume metal fever", which is characterized by flu-like symptoms. Symptoms may include metallic taste, fever, nausea, vomiting, chills, cough, weakness, chest pain, generalized muscle pain/aches, and increased white blood cell count. Ingestion: Lead metal granules or dust: The symptoms of lead poisoning include abdominal pain or cramps (lead cholic), spasms, nausea, vomiting, headache, muscle weakness, hallucinations, distorted perceptions, "lead line" on the gums, metallic taste, loss of appetite, insomnia, dizziness and other symptoms similar to that of inhalation. Acute poisoning may result in high lead levels in the blood and urine, shock, coma and death in extreme cases. Lead metal foil, shot or sheets: Not an ingestion hazard for usual industrial handling.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are less toxic than the product itself.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:
Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: Not a DOT controlled material (United States).

Identification: Not applicable.

Special Provisions for Transport: Not applicable.

Section 15: Other Regulatory Information

Federal and State Regulations:
California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require a warning under the statute: Lead California prop. 65: This product contains the following ingredients for which the State of California has found to cause reproductive harm (female) which would require a warning under the statute: Lead California prop. 65: This product contains the following ingredients for which the State of California has found to cause reproductive harm (male) which would require a warning under the statute: Lead California prop. 65 (no significant risk level): Lead: 0.0005 mg/day (value) California prop. 65: This product contains the following ingredients for which the State of California has found to cause birth defects which would require a warning under the statute: Lead California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer which would require a warning under the statute: Lead Connecticut hazardous material survey.: Lead Illinois toxic substances disclosure to employee act: Lead Illinois chemical safety act: Lead New York release reporting list: Lead Rhode Island RTK hazardous substances: Lead Pennsylvania RTK: Lead

Other Regulations:
OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada): CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

DSCL (EEC):
R20/22- Harmful by inhalation and if swallowed. R33- Danger of cumulative effects. R61- May cause harm to the unborn child. R62- Possible risk of impaired fertility. S36/37- Wear suitable protective clothing and gloves. S44- If you feel unwell, seek medical advice (show the label when possible). S53- Avoid exposure - obtain special instructions before use.

HMIS (U.S.A.):

Health Hazard: 1

Fire Hazard: 0

Reactivity: 0

Personal Protection: E

National Fire Protection Association (U.S.A.):

Health: 1

Flammability: 0

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Safety glasses.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

Created: 10/10/2005 08:21 PM

Last Updated: 06/09/2012 12:00 PM

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall ScienceLab.com be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if ScienceLab.com has been advised of the possibility of such damages.

New Jersey Department of Health and Senior Services

HAZARDOUS SUBSTANCE FACT SHEET

Common Name: **IRON OXIDE**

CAS Number: 1309-37-1
DOT Number: None
DOT Hazard Class: None

RTK Substance number: 1036
Date: August 1998 Revision: May 2007

HAZARD SUMMARY

* **Iron Oxide** can affect you when breathed in.
* Exposure to **Iron Oxide** *fumes* can cause metal fume fever. This is a flu-like illness with symptoms of metallic taste, fever and chills, aches, chest tightness and cough.
* Prolonged or repeated contact can discolor the eyes causing permanent *Iron* staining.
* Repeated exposure to **Iron Oxide** *fume* or *dust* can cause pneumoconiosis (*Siderosis*) with cough, shortness of breath and changes on chest x-ray.
* **Iron Oxide** as *Ferric Oxide* (Fe_2O_3) is not combustible, unless finely powdered. However, *Ferrous Oxide* (FeO) is extremely flammable and reactive, and may ignite spontaneously in air.

IDENTIFICATION

Iron Oxide is a black crystal or a reddish-brown powder. It is used in polishing compounds, pigments, and metallurgy. **Iron Oxide** *fume* is produced when materials containing *Iron* are heated, as in arc welding. DOT number UN 1376 refers to *Ferrous Oxide* (FeO), *Iron Oxide* (*Spent*) or *Iron Sponge*. *Ferrous Oxide* (FeO) may be formed in *Oxygen*-limited atmospheres, in flue gas, and from coal gas purification. *Iron Oxide* (*Spent*) or *Iron Sponge* is produced when *Iron Ore* is heated below the melting point of *Iron*. With further processing, they become *Wrought Iron*.

REASON FOR CITATION

* **Iron Oxide** is on the Hazardous Substance List because it is regulated by OSHA and cited by ACGIH, NIOSH and IARC.
* Definitions are provided on page 5.

HOW TO DETERMINE IF YOU ARE BEING EXPOSED

The New Jersey Right to Know Act requires most employers to label chemicals in the workplace and requires public employers to provide their employees with information and training concerning chemical hazards and controls. The federal OSHA Hazard Communication Standard (29 CFR 1910.1200) requires private employers to provide similar training and information to their employees.

* Exposure to hazardous substances should be routinely evaluated. This may include collecting personal and area air samples. You can obtain copies of sampling results from your employer. You have a legal right to this information under the OSHA Access to Employee Exposure and Medical Records Standard (29 CFR 1910.1020).
* If you think you are experiencing any work-related health problems, see a doctor trained to recognize occupational diseases. Take this Fact Sheet with you.

WORKPLACE EXPOSURE LIMITS

The following exposure limits are for **Iron Oxide** (measured as *Iron*):

OSHA: The legal airborne permissible exposure limit (PEL) is **10 mg/m^3** averaged over an 8-hour workshift.

NIOSH: The recommended airborne exposure limit is **5 mg/m^3** averaged over a 10-hour workshift.

ACGIH: The recommended airborne exposure limit is **5 mg/m^3** (as the *respirable fraction*) averaged over an 8-hour workshift.

WAYS OF REDUCING EXPOSURE

* Where possible, enclose operations and use local exhaust ventilation at the site of chemical release. If local exhaust ventilation or enclosure is not used, respirators should be worn.
* Wear protective work clothing.
* Wash thoroughly at the end of the workshift.
* Post hazard and warning information in the work area. In addition, as part of an ongoing education and training effort, communicate all information on the health and safety hazards of **Iron Oxide** to potentially exposed workers.

This Fact Sheet is a summary source of information of all potential and most severe health hazards that may result from exposure. Duration of exposure, concentration of the substance and other factors will affect your susceptibility to any of the potential effects described below.

Metal, metal compounds and alloys are often used in "hot" operations in the workplace. These may include, but are not limited to, welding, brazing, soldering, plating, cutting, and metallizing. At the high temperatures reached in these operations, metals often form metal fumes which have different health effects and exposure standards than the original metal or metal compound and require specialized controls. Your workplace can be evaluated for the presence of particular fumes which may be generated. Consult the appropriate New Jersey Department of Health and Senior Services Hazardous Substance Fact Sheets.

HEALTH HAZARD INFORMATION

Acute Health Effects

The following acute (short-term) health effects may occur immediately or shortly after exposure to **Iron Oxide**:

* Exposure to **Iron Oxide** *fumes* can cause metal fume fever. This is a flu-like illness with symptoms of metallic taste, fever and chills, aches, chest tightness and cough.

Chronic Health Effects

The following chronic (long-term) health effects can occur at some time after exposure to **Iron Oxide** and can last for months or years:

Cancer Hazard

* While **Iron Oxide** has been tested, it is not classifiable as to its potential to cause cancer.

Reproductive Hazard

* According to the information presently available to the New Jersey Department of Health and Senior Services, **Iron Oxide** has not been tested for its ability to affect reproduction.

Other Long-Term Effects

* Prolonged or repeated contact can discolor the eyes, causing permanent *Iron* staining.
* Repeated exposure to **Iron Oxide** *fume* or *dust* can cause pneumoconiosis (*Siderosis*) with cough, shortness of breath and changes on chest x-ray.

MEDICAL

Medical Testing

For those with frequent or potentially high exposure (half the PEL or greater), the following are recommended before beginning work and at regular times after that:

* Lung function tests

Any evaluation should include a careful history of past and present symptoms with an exam. Medical tests that look for damage already done are not a substitute for controlling exposure.

Request copies of your medical testing. You have a legal right to this information under the OSHA Access to Employee Exposure and Medical Records Standard (29 CFR 1910.1020).

Mixed Exposures

* Because smoking can cause heart disease, as well as lung cancer, emphysema, and other respiratory problems, it may worsen respiratory conditions caused by chemical exposure. Even if you have smoked for a long time, stopping now will reduce your risk of developing health problems.

WORKPLACE CONTROLS AND PRACTICES

Unless a less toxic chemical can be substituted for a hazardous substance, **ENGINEERING CONTROLS** are the most effective way of reducing exposure. The best protection is to enclose operations and/or provide local exhaust ventilation at the site of chemical release. Isolating operations can also reduce exposure. Using respirators or protective equipment is less effective than the controls mentioned above, but is sometimes necessary.

In evaluating the controls present in your workplace, consider: (1) how hazardous the substance is, (2) how much of the substance is released into the workplace and (3) whether harmful skin or eye contact could occur. Special controls should be in place for highly toxic chemicals or when significant skin, eye, or breathing exposures are possible.

In addition, the following controls are recommended:

* Where possible, automatically transfer **Iron Oxide** from drums or other storage containers to process containers.
* Before entering a confined space where *Ferrous Oxide* (FeO) may be present, check to make sure that an explosive concentration does not exist.

Good **WORK PRACTICES** can help to reduce hazardous exposures. The following work practices are recommended:

* Workers whose clothing has been contaminated by **Iron Oxide** should change into clean clothing promptly.
* Do not take contaminated work clothes home. Family members could be exposed.
* Contaminated work clothes should be laundered by individuals who have been informed of the hazards of exposure to **Iron Oxide**.
* Eye wash fountains should be provided in the immediate work area for emergency use.
* If there is the possibility of skin exposure, emergency shower facilities should be provided.
* On skin contact with **Iron Oxide**, immediately wash or shower to remove the chemical.

* Do not eat, smoke, or drink where **Iron Oxide** is handled, processed, or stored, since the chemical can be swallowed. Wash hands carefully before eating, drinking, applying cosmetics, smoking, or using the toilet.

PERSONAL PROTECTIVE EQUIPMENT

WORKPLACE CONTROLS ARE BETTER THAN PERSONAL PROTECTIVE EQUIPMENT. However, for some jobs (such as outside work, confined space entry, jobs done only once in a while, or jobs done while workplace controls are being installed), personal protective equipment may be appropriate.

The OSHA Personal Protective Equipment Standard (29 CFR 1910.132) requires employers to determine the appropriate personal protective equipment for each hazard and to train employees on how and when to use protective equipment.

The following recommendations are only guidelines and may not apply to every situation.

Clothing

* Avoid skin contact with **Iron Oxide**. Wear protective gloves and clothing. Safety equipment suppliers/manufacturers can provide recommendations on the most protective glove/clothing material for your operation.
* All protective clothing (suits, gloves, footwear, headgear) should be clean, available each day, and put on before work.

Eye Protection

* Wear impact resistant eye protection with side shields or goggles.

Respiratory Protection

IMPROPER USE OF RESPIRATORS IS DANGEROUS. Such equipment should only be used if the employer has a written program that takes into account workplace conditions, requirements for worker training, respirator fit testing, and medical exams, as described in the OSHA Respiratory Protection Standard (29 CFR 1910.134).

* Where the potential exists for exposure over **5 mg/m^3** (as *Iron*), use a NIOSH approved air-purifying particulate filter respirator with a N95 filter. More protection is provided by a full facepiece respirator than by a half-mask respirator, and even greater protection is provided by a powered-air purifying respirator.
* If while wearing a filter or cartridge respirator you can smell, taste, or otherwise detect **Iron Oxide**, or if while wearing particulate filters abnormal resistance to breathing is experienced, or eye irritation occurs while wearing a full facepiece respirator, leave the area immediately. Check to make sure the respirator-to-face seal is still good. If it is, replace the filter or cartridge. If the seal is no longer good, you may need a new respirator.
* Be sure to consider all potential exposures in your workplace. You may need a combination of filters, prefilters or cartridges to protect against different forms of a chemical (such as vapor and mist) or against a mixture of chemicals.
* Where the potential exists for exposure over **50 mg/m^3** (as *Iron*), use a NIOSH approved supplied-air respirator with a full facepiece operated in a pressure-demand or other positive-pressure mode. For increased protection use in combination with an auxiliary self-contained breathing apparatus operated in a pressure-demand or other positive-pressure mode.
* Exposure to **2,500 mg/m^3** (as *Iron*) is immediately dangerous to life and health. If the possibility of exposure above **2,500 mg/m^3** (as *Iron*) exists, use a NIOSH approved self-contained breathing apparatus with a full facepiece operated in a pressure-demand or other positive-pressure mode equipped with an emergency escape air cylinder.

QUESTIONS AND ANSWERS

Q: If I have acute health effects, will I later get chronic health effects?
A: Not always. Most chronic (long-term) effects result from repeated exposures to a chemical.

Q: Can I get long-term effects without ever having short-term effects?
A: Yes, because long-term effects can occur from repeated exposures to a chemical at levels not high enough to make you immediately sick.

Q: What are my chances of getting sick when I have been exposed to chemicals?
A: The likelihood of becoming sick from chemicals is increased as the amount of exposure increases. This is determined by the length of time and the amount of material to which someone is exposed.

Q: When are higher exposures more likely?
A: Conditions which increase risk of exposure include dust releasing operations (grinding, mixing, blasting, dumping, etc.), other physical and mechanical processes (heating, pouring, spraying, spills and evaporation from large surface areas such as open containers), and "confined space" exposures (working inside vats, reactors, boilers, small rooms, etc.).

Q: Is the risk of getting sick higher for workers than for community residents?
A: Yes. Exposures in the community, except possibly in cases of fires or spills, are usually much lower than those found in the workplace. However, people in the community may be exposed to contaminated water as well as to chemicals in the air over long periods. This may be a problem for children or people who are already ill.

The following information is available from:

New Jersey Department of Health and Senior Services
Occupational Health Service
PO Box 360
Trenton, NJ 08625-0360
(609) 984-1863
(609) 984-7407 (fax)

Web address: http://www.state.nj.us/health/eoh/odisweb/

Industrial Hygiene Information

Industrial hygienists are available to answer your questions regarding the control of chemical exposures using exhaust ventilation, special work practices, good housekeeping, good hygiene practices, and personal protective equipment including respirators. In addition, they can help to interpret the results of industrial hygiene survey data.

Medical Evaluation

If you think you are becoming sick because of exposure to chemicals at your workplace, you may call personnel at the Department of Health and Senior Services, Occupational Health Service, who can help you find the information you need.

Public Presentations

Presentations and educational programs on occupational health or the Right to Know Act can be organized for labor unions, trade associations and other groups.

Right to Know Information Resources

The Right to Know Infoline (609) 984-2202 can answer questions about the identity and potential health effects of chemicals, list of educational materials in occupational health, references used to prepare the Fact Sheets, preparation of the Right to Know Survey, education and training programs, labeling requirements, and general information regarding the Right to Know Act. Violations of the law should be reported to (609) 984-2202.

DEFINITIONS

ACGIH is the American Conference of Governmental Industrial Hygienists. It recommends upper limits (called TLVs) for exposure to workplace chemicals.

A **carcinogen** is a substance that causes cancer.

The **CAS number** is assigned by the Chemical Abstracts Service to identify a specific chemical.

CFR is the Code of Federal Regulations, which consists of the regulations of the United States government.

A **combustible** substance is a solid, liquid or gas that will burn.

A **corrosive** substance is a gas, liquid or solid that causes irreversible damage to human tissue or containers.

DEP is the New Jersey Department of Environmental Protection.

DOT is the Department of Transportation, the federal agency that regulates the transportation of chemicals.

EPA is the Environmental Protection Agency, the federal agency responsible for regulating environmental hazards.

A **fetus** is an unborn human or animal.

A **flammable** substance is a solid, liquid, vapor or gas that will ignite easily and burn rapidly.

The **flash point** is the temperature at which a liquid or solid gives off vapor that can form a flammable mixture with air.

IARC is the International Agency for Research on Cancer, a scientific group that classifies chemicals according to their cancer-causing potential.

IRIS is the Integrated Risk Information System database of the federal EPA.

A **miscible** substance is a liquid or gas that will evenly dissolve in another.

mg/m^3 means milligrams of a chemical in a cubic meter of air. It is a measure of concentration (weight/volume).

A **mutagen** is a substance that causes mutations. A **mutation** is a change in the genetic material in a body cell. Mutations can lead to birth defects, miscarriages, or cancer.

NAERG is the North American Emergency Response Guidebook. It was jointly developed by Transport Canada, the United States Department of Transportation and the Secretariat of Communications and Transportation of Mexico. It is a guide for first responders to quickly identify the specific or generic hazards of material involved in a transportation incident, and to protect themselves and the general public during the initial response phase of the incident.

NFPA is the National Fire Protection Association. It classifies substances according to their fire and explosion hazard.

NIOSH is the National Institute for Occupational Safety and Health. It tests equipment, evaluates and approves respirators, conducts studies of workplace hazards, and proposes standards to OSHA.

NTP is the National Toxicology Program which tests chemicals and reviews evidence for cancer.

OSHA is the Occupational Safety and Health Administration, which adopts and enforces health and safety standards.

PEL is the Permissible Exposure Limit which is enforceable by the Occupational Safety and Health Administration.

PIH is a DOT designation for chemicals which are Poison Inhalation Hazards.

ppm means parts of a substance per million parts of air. It is a measure of concentration by volume in air.

A **reactive** substance is a solid, liquid or gas that releases energy under certain conditions.

STEL is a Short Term Exposure Limit which is usually a 15-minute exposure that should not be exceeded at any time during a work day.

A **teratogen** is a substance that causes birth defects by damaging the fetus.

TLV is the Threshold Limit Value, the workplace exposure limit recommended by ACGIH.

The **vapor pressure** is a measure of how readily a liquid or a solid mixes with air at its surface. A higher vapor pressure indicates a higher concentration of the substance in air and therefore increases the likelihood of breathing it in.

>>>>>>>>>>>>>>>>>> EMERGENCY INFORMATION <<<<<<<<<<<<<<<<<<

Common Name: **IRON OXIDE**
DOT Number: **None**
DOT Hazard Class: **None**
NAERG Code: **No Citation**
CAS Number: **1309-37-1**

Hazard rating	NJDHSS	NFPA
FLAMMABILITY	0 (Fe_2O_3) 4 (FeO)	-
REACTIVITY	0 (Fe_2O_3) 2 (FeO)	-
DOES NOT BURN CONTAINERS MAY EXPLODE IN FIRE		

Hazard Rating Key: 0=minimal; 1=slight; 2=moderate; 3=serious; 4=severe

FIRE HAZARDS

* **Iron Oxide** (*Ferric Oxide* or Fe_2O_3) is not combustible. **Iron Oxide** or *Ferrous Oxide* (FeO) from coal gas purification and flue gas are flammable and spontaneously combustible in air.
* Extinguish fire using an agent suitable for type of surrounding fire.
* CONTAINERS MAY EXPLODE IN FIRE.
* Use water spray to keep fire-exposed containers cool.
* If employees are expected to fight fires, they must be trained and equipped as stated in the OSHA Fire Brigades Standard (29 CFR 1910.156).

SPILLS AND EMERGENCIES

If **Iron Oxide** is spilled, take the following steps:

* Evacuate personnel and secure and control entrance to the area.
* Collect powdered material in the most convenient and safe manner and deposit in sealed containers.
* It may be necessary to contain and dispose of **Iron Oxide** as a HAZARDOUS WASTE. Contact your state Department of Environmental Protection (DEP) or your regional office of the federal Environmental Protection Agency (EPA) for specific recommendations.
* If employees are required to clean-up spills, they must be properly trained and equipped. The OSHA Hazardous Waste Operations and Emergency Response Standard (29 CFR 1910.120) may apply.

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FOR LARGE SPILLS AND FIRES immediately call your fire department. You can request emergency information from the following:

CHEMTREC: (800) 424-9300
NJDEP HOTLINE: 1-877-WARN-DEP

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HANDLING AND STORAGE

* Prior to working with **Iron Oxide** you should be trained on its proper handling and storage.
* **Iron Oxide**, in *powdered* form, is not compatible with CALCIUM HYPOCHLORITE; CARBON MONOXIDE; NITRIC ACID; SULFUR DIOXIDE; ALUMINUM; ETHYLENE OXIDE; HYDRAZINE; HYDROGEN PEROXIDE; ACETYLIDES; HYDROGEN SULFIDE; PERFORMIC ACID; CESIUM CARBIDE; and BROMINE PENTAFLUORIDE.
* Store in tightly closed containers in a cool, well-ventilated area away from HEAT or temperatures above 140°F (60°C).

FIRST AID

For POISON INFORMATION call 1-800-222-1222

Eye Contact

* Immediately flush with large amounts of water for at least 15 minutes, occasionally lifting upper and lower lids. Seek medical attention immediately.

Skin Contact

* Remove contaminated clothing. Wash contaminated skin with soap and water.

Breathing

* Remove the person from exposure.
* Begin rescue breathing (using universal precautions) if breathing has stopped and CPR if heart action has stopped.
* Transfer promptly to a medical facility.

PHYSICAL DATA

Water Solubility: Insoluble

OTHER COMMONLY USED NAMES

Chemical Name:

Iron Oxide (Fe_2O_3)

Other Names:

Iron (III) Oxide; Ferric Oxide; Burnt Sienna; Jeweler's Rouge

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NEW JERSEY DEPARTMENT OF HEALTH AND SENIOR SERVICES
Right to Know Program
PO Box 368, Trenton, NJ 08625-0368
(609) 984-2202

SAFETY DATA SHEET

Version 5.3
Revision Date 01/02/2015
Print Date 04/17/2015

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name : Indeno[1,2,3-*cd*]pyrene

Product Number : 48499
Brand : Supelco

CAS-No. : 193-39-5

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses : Laboratory chemicals, Manufacture of substances

1.3 Details of the supplier of the safety data sheet

Company : Sigma-Aldrich
3050 Spruce Street
SAINT LOUIS MO 63103
USA

Telephone : +1 800-325-5832
Fax : +1 800-325-5052

1.4 Emergency telephone number

Emergency Phone # : (314) 776-6555

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)
Carcinogenicity (Category 2), H351

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram

Signal word Warning

Hazard statement(s)
H351 Suspected of causing cancer.

Precautionary statement(s)
P201 Obtain special instructions before use.
P202 Do not handle until all safety precautions have been read and understood.
P281 Use personal protective equipment as required.
P308 + P313 IF exposed or concerned: Get medical advice/ attention.
P405 Store locked up.
P501 Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Formula	:	$C_{22}H_{12}$
Molecular weight	:	276.33 g/mol
CAS-No.	:	193-39-5
EC-No.	:	205-893-2

Hazardous components

Component	Classification	Concentration
Indeno[1,2,3-cd]pyrene		
	Carc. 2; H351	<= 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice
Consult a physician. Show this safety data sheet to the doctor in attendance.Move out of dangerous area.

If inhaled
If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact
Wash off with soap and plenty of water. Consult a physician.

In case of eye contact
Flush eyes with water as a precaution.

If swallowed
Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed
No data available

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

5.2 Special hazards arising from the substance or mixture
Carbon oxides

5.3 Advice for firefighters
Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information
No data available

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures
Use personal protective equipment. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust.
For personal protection see section 8.

6.2 Environmental precautions
Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

6.3 Methods and materials for containment and cleaning up
Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.

6.4 Reference to other sections
For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling

Avoid contact with skin and eyes. Avoid formation of dust and aerosols.Further processing of solid materials may result in the formation of combustible dusts. The potential for combustible dust formation should be taken into consideration before additional processing occurs.
Provide appropriate exhaust ventilation at places where dust is formed.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place.
Storage class (TRGS 510): Non Combustible Solids

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters
Contains no substances with occupational exposure limit values.

8.2 Exposure controls

Appropriate engineering controls
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

Personal protective equipment

Eye/face protection
Safety glasses with side-shields conforming to EN166 Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection
Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Body Protection
impervious clothing, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection
Where risk assessment shows air-purifying respirators are appropriate use a full-face particle respirator type N100 (US) or type P3 (EN 143) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure
Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: solid
b)	Odour	No data available
c)	Odour Threshold	No data available
d)	pH	No data available
e)	Melting point/freezing point	163.6 °C (326.5 °F)
f)	Initial boiling point and boiling range	536.0 °C (996.8 °F)

g)	Flash point	No data available
h)	Evaporation rate	No data available
i)	Flammability (solid, gas)	No data available
j)	Upper/lower flammability or explosive limits	No data available
k)	Vapour pressure	No data available
l)	Vapour density	No data available
m)	Relative density	No data available
n)	Water solubility	No data available
o)	Partition coefficient: n-octanol/water	No data available
p)	Auto-ignition temperature	No data available
q)	Decomposition temperature	No data available
r)	Viscosity	No data available
s)	Explosive properties	No data available
t)	Oxidizing properties	No data available

9.2 Other safety information
No data available

10. STABILITY AND REACTIVITY

10.1 Reactivity
No data available

10.2 Chemical stability
Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions
No data available

10.4 Conditions to avoid
No data available

10.5 Incompatible materials
Strong oxidizing agents

10.6 Hazardous decomposition products
Other decomposition products - No data available
In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity
No data available

Inhalation: No data available

Dermal: No data available

No data available

Skin corrosion/irritation
No data available

Serious eye damage/eye irritation
No data available

Respiratory or skin sensitisation
No data available

Germ cell mutagenicity
No data available

Carcinogenicity

This product is or contains a component that has been reported to be possibly carcinogenic based on its IARC, ACGIH, NTP, or EPA classification.

Limited evidence of carcinogenicity in animal studies

IARC:	2B - Group 2B: Possibly carcinogenic to humans (Indeno[1,2,3-cd]pyrene)
ACGIH:	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH.
NTP:	Reasonably anticipated to be a human carcinogen (Indeno[1,2,3-cd]pyrene)
OSHA:	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Reproductive toxicity
No data available

No data available

Specific target organ toxicity - single exposure
No data available

Specific target organ toxicity - repeated exposure
No data available

Aspiration hazard
No data available

Additional Information
RTECS: Not available

To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

12. ECOLOGICAL INFORMATION

12.1 Toxicity
No data available

12.2 Persistence and degradability
No data available

12.3 Bioaccumulative potential
No data available

12.4 Mobility in soil
No data available

12.5 Results of PBT and vPvB assessment
PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects

No data available

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product
Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)
Not dangerous goods

IMDG
Not dangerous goods

IATA
Not dangerous goods

15. REGULATORY INFORMATION

SARA 302 Components
No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components
This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

SARA 311/312 Hazards
Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Indeno[1,2,3-cd]pyrene	193-39-5	1993-04-24

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Indeno[1,2,3-cd]pyrene	193-39-5	1993-04-24

New Jersey Right To Know Components

	CAS-No.	Revision Date
Indeno[1,2,3-cd]pyrene	193-39-5	1993-04-24

California Prop. 65 Components

WARNING! This product contains a chemical known to the State of California to cause cancer.	CAS-No.	Revision Date
Indeno[1,2,3-cd]pyrene	193-39-5	2007-09-28

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

Carc.	Carcinogenicity
H351	Suspected of causing cancer.

HMIS Rating

Health hazard:	0
Chronic Health Hazard:	*
Flammability:	0

Physical Hazard	0

NFPA Rating

Health hazard:	1
Fire Hazard:	0
Reactivity Hazard:	0

Further information

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 5.3 Revision Date: 01/02/2015 Print Date: 04/17/2015

Material Safety Data Sheet
Ethyl Benzene

ACC# 08780

Section 1 - Chemical Product and Company Identification

MSDS Name: Ethyl Benzene
Catalog Numbers: O2751 1, O2751-1, O27511
Synonyms: Ethylbenzol; Phenylethane
Company Identification:
Fisher Scientific
1 Reagent Lane
Fair Lawn, NJ 07410
For information, call: 201-796-7100
Emergency Number: 201-796-7100
For CHEMTREC assistance, call: 800-424-9300
For International CHEMTREC assistance, call: 703-527-3887

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
100-41-4	Ethylbenzene	100	202-849-4

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: clear, colorless liquid. Flash Point: 21 deg C.
Warning! Causes eye irritation. **Flammable liquid and vapor.** Causes skin irritation. May be absorbed through intact skin. Aspiration hazard if swallowed. Can enter lungs and cause damage. Causes digestive and respiratory tract irritation. May cause central nervous system depression.
Target Organs: Central nervous system.

Potential Health Effects

Eye: Causes moderate eye irritation. Vapors may cause eye irritation.
Skin: Causes skin irritation. Prolonged and/or repeated contact may cause irritation and/or dermatitis. May be absorbed through the skin. Contact with the liquid may cause erythema (redness), exfoliation and vesiculation (blistering).
Ingestion: May cause irritation of the digestive tract. May cause central nervous system depression, characterized by excitement, followed by headache, dizziness, drowsiness, and nausea. Advanced stages may cause collapse, unconsciousness, coma and possible death due to respiratory failure. Aspiration of material into the lungs may cause chemical pneumonitis, which may be fatal.
Inhalation: Inhalation of high concentrations may cause central nervous system effects characterized by nausea, headache, dizziness, unconsciousness and coma. Causes respiratory tract irritation. Vapors may cause dizziness or suffocation.
Chronic: Chronic inhalation may cause effects similar to those of acute inhalation.

Section 4 - First Aid Measures

Eyes: Flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical aid immediately.
Skin: Get medical aid. Flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes.
Ingestion: Do not induce vomiting. If victim is conscious and alert, give 2-4 cupfuls of milk or water. Never give anything by mouth to an unconscious person. Get medical aid immediately.
Inhalation: Remove from exposure and move to fresh air immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical aid.
Notes to Physician: Treat symptomatically and supportively.

Section 5 - Fire Fighting Measures

General Information: Containers can build up pressure if exposed to heat and/or fire. As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Vapors may form an explosive mixture with air. Vapors can travel to a source of ignition and flash back. Use water spray to keep fire-exposed containers cool. Flammable liquid and vapor. Vapors may be heavier than air. They can spread along the ground and collect in low or confined areas. Containers may explode when heated.
Extinguishing Media: For small fires, use dry chemical, carbon dioxide, water spray or alcohol-resistant foam. Use water spray to cool fire-exposed containers. Water may be ineffective. For large fires, use water spray, fog or alcohol-resistant foam. Contact professional fire-fighters immediately. Cool containers with flooding quantities of water until well after fire is out.
Flash Point: 21 deg C (69.80 deg F)
Autoignition Temperature: 810 deg F (432.22 deg C)
Explosion Limits, Lower:0.8
Upper: 6.7
NFPA Rating: (estimated) Health: 3; Flammability: 4; Instability: 0

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.
Spills/Leaks: Absorb spill with inert material (e.g. vermiculite, sand or earth), then place in suitable container. Remove all sources of ignition. A vapor suppressing foam may be used to reduce vapors. Water spray may reduce vapor but may not prevent ignition in closed spaces.

Section 7 - Handling and Storage

Handling: Wash thoroughly after handling. Use with adequate ventilation. Ground and bond containers when transferring material. Avoid contact with eyes, skin, and clothing. Empty containers retain product residue, (liquid and/or vapor), and can be dangerous. Keep container tightly closed. Keep away from heat, sparks and flame. Avoid ingestion and inhalation. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose empty containers to heat, sparks or open flames.
Storage: Keep away from heat, sparks, and flame. Keep away from sources of ignition. Store in a

tightly closed container. Keep from contact with oxidizing materials. Store in a cool, dry, well-ventilated area away from incompatible substances.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: Use adequate general or local exhaust ventilation to keep airborne concentrations below the permissible exposure limits.

Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Ethylbenzene	100 ppm TWA; 125 ppm STEL	100 ppm TWA; 435 mg/m3 TWA 800 ppm IDLH	100 ppm TWA; 435 mg/m3 TWA

OSHA Vacated PELs: Ethylbenzene: 100 ppm TWA; 435 mg/m3 TWA

Personal Protective Equipment

Eyes: Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

Skin: Wear appropriate protective gloves and clothing to prevent skin exposure.

Clothing: Wear appropriate protective gloves and clothing to prevent skin exposure.

Respirators: Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

Section 9 - Physical and Chemical Properties

Physical State: Liquid
Appearance: clear, colorless
Odor: aromatic odor
pH: Not available.
Vapor Pressure: 7.1 mm Hg @ 20 C
Vapor Density: 3.7
Evaporation Rate:<1 (butyl acetate=1)
Viscosity: 0.63 mPa s 20 C
Boiling Point: 277 deg F
Freezing/Melting Point:-139 deg F
Decomposition Temperature: Not available.
Solubility: Insoluble.
Specific Gravity/Density:0.9
Molecular Formula:C8H10
Molecular Weight:106.07

Section 10 - Stability and Reactivity

Chemical Stability: Stable under normal temperatures and pressures.
Conditions to Avoid: Incompatible materials, ignition sources, excess heat.
Incompatibilities with Other Materials: Oxidizing agents.
Hazardous Decomposition Products: Carbon monoxide, carbon dioxide.
Hazardous Polymerization: Has not been reported.

Section 11 - Toxicological Information

RTECS#:
CAS# 100-41-4: DA0700000
LD50/LC50:
CAS# 100-41-4:
Draize test, rabbit, eye: 500 mg Severe;
Inhalation, mouse: LC50 = 35500 mg/m3/2H;
Inhalation, rat: LC50 = 55000 mg/m3/2H;
Oral, rat: LD50 = 3500 mg/kg;
Oral, rat: LD50 = 3500 mg/kg;
Skin, rabbit: LD50 = 17800 uL/kg;
.
Oral, rat: LD50 = 5.46
Carcinogenicity:
CAS# 100-41-4:

- **ACGIH:** A3 - Confirmed animal carcinogen with unknown relevance to humans
- **California:** carcinogen, initial date 6/11/04
- **NTP:** Not listed.
- **IARC:** Group 2B carcinogen

Epidemiology: No information found
Teratogenicity: No information found
Reproductive Effects: No information found
Mutagenicity: Mutation in mammalian somatic cells(Rodent,mouse) Lymphocyte = 80 mg/L.
Neurotoxicity: No information found
Other Studies:

Section 12 - Ecological Information

Ecotoxicity: Fish: Rainbow trout: 14.0 mg/L; 96 Hr.; StaticFish: Fathead Minnow: 12.1 mg/L; 96 Hr.; Flow-throughFish: Bluegill/Sunfish: LC50 =150.0 mg/L; 96 Hr.; Flow-throughWater flea EC50 =2.1 mg/L; 48 Hr.; StaticBacteria: EC50 =9.8 mg/L; 30 minutes; Micotox TestWater flea EC50 =75.0 mg/L; 48 minutes; Static, pH6.7-8.1, 72.0 mg/L CaCO3 Shrimp (mysidoposis bahia), LC50=87.6 mg/L/96hr. Sheepshead minnow LC50=275 mg/L/96hr. Fathead minnow LC50=42.3 mg/L/96hr in hard water &48.5 mg/L/96hr in softwater.
Environmental: Experimental data on the bioconcentration of ethylbenzene include a log BCF of 1.9 in goldfish and the log BCF of 0.67 for clams exposed to the water-soluble fraction of crude oil. Using its octanol/water partition coefficient (log Kow= 3.15) and using a recommended regression equation, one can calculate a log BCF in fish of 2.16 indicating that ethylbenzene should not significantly bioconcentrate in aquatic organisms. Ethylbenzene has a moderate adsorption for soil. The measured Koc for silt loam was 164
Physical: The predominant photochemical reaction of ethylbenzene in the atmosphere is with hydroxyl radicals; the tropospheric half-life for this reaction is 5.5 and 24 hr in the summer and winter, actively. Degradation is somewhat faster under photochemical smog situations. Photooxidation products which have been identified include ethylphenol, benzaldehyde, acetophenone and m- and p-ethylnitrobenzene. Ethylbenzene is resistant to hydrolysis. Ethylbenzene does not significantly absorb light above 290 nm in methanol solution.

Other: No information available.

Section 13 - Disposal Considerations

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.
RCRA P-Series: None listed.
RCRA U-Series: None listed.

Section 14 - Transport Information

	US DOT	Canada TDG
Shipping Name:	ETHYLBENZENE	ETHYL BENZENE
Hazard Class:	3	3
UN Number:	UN1175	UN1175
Packing Group:	II	II
Additional Info:		FLASHPOINT 15C

Section 15 - Regulatory Information

US FEDERAL

TSCA
CAS# 100-41-4 is listed on the TSCA inventory.
Health & Safety Reporting List
CAS# 100-41-4: Effective 6/19/87, Sunset 6/19/97
Chemical Test Rules
None of the chemicals in this product are under a Chemical Test Rule.
Section 12b
None of the chemicals are listed under TSCA Section 12b.
TSCA Significant New Use Rule
None of the chemicals in this material have a SNUR under TSCA.
CERCLA Hazardous Substances and corresponding RQs
CAS# 100-41-4: 1000 lb final RQ; 454 kg final RQ
SARA Section 302 Extremely Hazardous Substances
None of the chemicals in this product have a TPQ.
SARA Codes
CAS # 100-41-4: immediate, delayed, fire.
Section 313
This material contains Ethylbenzene (CAS# 100-41-4, 100%),which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR Part 373.
Clean Air Act:
CAS# 100-41-4 is listed as a hazardous air pollutant (HAP).
This material does not contain any Class 1 Ozone depletors.
This material does not contain any Class 2 Ozone depletors.
Clean Water Act:
CAS# 100-41-4 is listed as a Hazardous Substance under the CWA. CAS# 100-41-4 is listed as a Priority Pollutant under the Clean Water Act. CAS# 100-41-4 is listed as a Toxic Pollutant

under the Clean Water Act.

OSHA:

None of the chemicals in this product are considered highly hazardous by OSHA.

STATE

CAS# 100-41-4 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Minnesota, Massachusetts.

California Prop 65

The following statement(s) is(are) made in order to comply with the California Safe Drinking Water Act:

WARNING: This product contains Ethylbenzene, a chemical known to the state of California to cause cancer.

California No Significant Risk Level: None of the chemicals in this product are listed.

European / International Regulations

European Labeling in Accordance with EC Directives

Hazard Symbols:

XN F

Risk Phrases:

R 11 Highly flammable.

R 20 Harmful by inhalation.

Safety Phrases:

S 16 Keep away from sources of ignition - No smoking.

S 24/25 Avoid contact with skin and eyes.

S 29 Do not empty into drains.

WGK (Water Danger/Protection)

CAS# 100-41-4: 1

Canada - DSL/NDSL

CAS# 100-41-4 is listed on Canada's DSL List.

Canada - WHMIS

This product has a WHMIS classification of B2, D2B.

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all of the information required by those regulations.

Canadian Ingredient Disclosure List

CAS# 100-41-4 is listed on the Canadian Ingredient Disclosure List.

Section 16 - Additional Information

MSDS Creation Date: 4/28/1999

Revision #4 Date: 10/03/2005

International Chemical Safety Cards

COPPER

ICSC: 0240

COPPER
(powder)
Cu
Atomic mass: 63.5

CAS # 7440-50-8
RTECS # GL5325000
ICSC # 0240

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Combustible.	NO open flames.	Special powder, dry sand, NO other agents.
EXPLOSION			
EXPOSURE		PREVENT DISPERSION OF DUST!	
• **INHALATION**	Cough. Headache. Shortness of breath. Sore throat.	Local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
• **SKIN**	Redness.	Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
• **EYES**	Redness. Pain.	Safety goggles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
• **INGESTION**	Abdominal pain. Nausea. Vomiting.	Do not eat, drink, or smoke during work.	Rinse mouth. Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Sweep spilled substance into containers. Carefully collect remainder. Then remove to safe place (extra personal protection: P2 filter respirator for harmful particles).	Separated from: see Chemical Dangers.	

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0240

International Chemical Safety Cards

COPPER

ICSC: 0240

	PHYSICAL STATE; APPEARANCE:	ROUTES OF EXPOSURE:

IMPORTANT DATA	RED POWDER, TURNS GREEN ON EXPOSURE TO MOIST AIR. **PHYSICAL DANGERS:** **CHEMICAL DANGERS:** Shock-sensitive compounds are formed with acetylenic compounds, ethylene oxides and azides. Reacts with strong oxidants like chlorates, bromates and iodates, causing explosion hazard. **OCCUPATIONAL EXPOSURE LIMITS (OELs):** TLV: ppm; 0.2 mg/m^3 fume (ACGIH 1992-1993). TLV (as Cu, dusts & mists): ppm; 1 mg/m^3 (ACGIH 1992-1993).	The substance can be absorbed into the body by inhalation and by ingestion. **INHALATION RISK:** Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly when dispersed. **EFFECTS OF SHORT-TERM EXPOSURE:** Inhalation of fume may cause metal fever (see Notes). **EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:** Repeated or prolonged contact may cause skin sensitization.
PHYSICAL PROPERTIES	Boiling point: 2595°C Melting point: 1083°C	Relative density (water = 1): 8.9 Solubility in water: none
ENVIRONMENTAL DATA		

N O T E S

The symptoms of metal fume fever do not become manifest until several hours.

ADDITIONAL INFORMATION

ICSC: 0240 **COPPER**

SAFETY DATA SHEET

Version 4.3
Revision Date 03/05/2015
Print Date 04/17/2015

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name : cis-Dichloroethylene

Product Number : 48597
Brand : Supelco
Index-No. : 602-026-00-3

CAS-No. : 156-59-2

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses : Laboratory chemicals, Manufacture of substances

1.3 Details of the supplier of the safety data sheet

Company : Sigma-Aldrich
3050 Spruce Street
SAINT LOUIS MO 63103
USA

Telephone : +1 800-325-5832
Fax : +1 800-325-5052

1.4 Emergency telephone number

Emergency Phone # : (314) 776-6555

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)
Flammable liquids (Category 2), H225
Acute toxicity, Inhalation (Category 4), H332
Acute aquatic toxicity (Category 3), H402
Chronic aquatic toxicity (Category 3), H412

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram

Signal word Danger

Hazard statement(s)
H225 Highly flammable liquid and vapour.
H332 Harmful if inhaled.
H412 Harmful to aquatic life with long lasting effects.

Precautionary statement(s)
P210 Keep away from heat/sparks/open flames/hot surfaces. - No smoking.
P233 Keep container tightly closed.
P240 Ground/bond container and receiving equipment.
P241 Use explosion-proof electrical/ ventilating/ lighting/ equipment.
P242 Use only non-sparking tools.
P243 Take precautionary measures against static discharge.

P261	Avoid breathing dust/ fume/ gas/ mist/ vapours/ spray.
P271	Use only outdoors or in a well-ventilated area.
P273	Avoid release to the environment.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P303 + P361 + P353	IF ON SKIN (or hair): Remove/ Take off immediately all contaminated clothing. Rinse skin with water/ shower.
P304 + P340	IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.
P312	Call a POISON CENTER or doctor/ physician if you feel unwell.
P370 + P378	In case of fire: Use dry sand, dry chemical or alcohol-resistant foam for extinction.
P403 + P235	Store in a well-ventilated place. Keep cool.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Formula	:	C2H2Cl2
Molecular weight	:	96.94 g/mol
CAS-No.	:	156-59-2
EC-No.	:	205-859-7
Index-No.	:	602-026-00-3

Hazardous components

Component	Classification	Concentration
cis-Dichloroethylene		
	Flam. Liq. 2; Acute Tox. 4; Aquatic Acute 3; Aquatic Chronic 3; H225, H332, H412	<= 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice
Consult a physician. Show this safety data sheet to the doctor in attendance.Move out of dangerous area.

If inhaled
If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact
Wash off with soap and plenty of water. Consult a physician.

In case of eye contact
Flush eyes with water as a precaution.

If swallowed
Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed
No data available

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

5.2 Special hazards arising from the substance or mixture
Carbon oxides, Hydrogen chloride gas

5.3 Advice for firefighters
Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information
Use water spray to cool unopened containers.

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures
Use personal protective equipment. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Remove all sources of ignition. Evacuate personnel to safe areas. Beware of vapours accumulating to form explosive concentrations. Vapours can accumulate in low areas.
For personal protection see section 8.

6.2 Environmental precautions
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

6.3 Methods and materials for containment and cleaning up
Contain spillage, and then collect with an electrically protected vacuum cleaner or by wet-brushing and place in container for disposal according to local regulations (see section 13).

6.4 Reference to other sections
For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling
Avoid contact with skin and eyes. Avoid inhalation of vapour or mist.
Use explosion-proof equipment.Keep away from sources of ignition - No smoking.Take measures to prevent the build up of electrostatic charge.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities
Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage.

Recommended storage temperature 2 - 8 °C

Handle and store under inert gas. Air and moisture sensitive. Light sensitive.

7.3 Specific end use(s)
Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
cis-Dichloroethylene	156-59-2	TWA	200 ppm	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Central Nervous System impairment Eye irritation		

8.2 Exposure controls

Appropriate engineering controls
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

Personal protective equipment

Eye/face protection
Face shield and safety glasses Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection
Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Body Protection
Complete suit protecting against chemicals, Flame retardant antistatic protective clothing., The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection
Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type AXBEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: liquid Colour: light yellow
b)	Odour	No data available
c)	Odour Threshold	No data available
d)	pH	No data available
e)	Melting point/freezing point	-80.0 °C (-112.0 °F)
f)	Initial boiling point and boiling range	60.0 - 61.0 °C (140.0 - 141.8 °F)
g)	Flash point	6.0 °C (42.8 °F) - closed cup
h)	Evaporation rate	No data available
i)	Flammability (solid, gas)	No data available
j)	Upper/lower flammability or explosive limits	No data available
k)	Vapour pressure	No data available
l)	Vapour density	No data available
m)	Relative density	1.28 g/cm3
n)	Water solubility	No data available
o)	Partition coefficient: n-octanol/water	No data available
p)	Auto-ignition temperature	No data available
q)	Decomposition temperature	No data available

r)	Viscosity	No data available
s)	Explosive properties	No data available
t)	Oxidizing properties	No data available

9.2 Other safety information
No data available

10. STABILITY AND REACTIVITY

10.1 Reactivity
No data available

10.2 Chemical stability
Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions
Vapours may form explosive mixture with air.

10.4 Conditions to avoid
Heat, flames and sparks. Extremes of temperature and direct sunlight.

10.5 Incompatible materials
Oxidizing agents

10.6 Hazardous decomposition products
Other decomposition products - No data available
In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity
LC50 Inhalation - Rat - 13700 ppm
Remarks: Behavioral:Somnolence (general depressed activity). Liver:Fatty liver degeneration.

Dermal: No data available

No data available

Skin corrosion/irritation
No data available

Serious eye damage/eye irritation
No data available

Respiratory or skin sensitisation
No data available

Germ cell mutagenicity
No data available

Carcinogenicity

IARC:	No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.
ACGIH:	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH.
NTP:	No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.
OSHA:	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Reproductive toxicity
No data available

No data available

Specific target organ toxicity - single exposure
No data available

Specific target organ toxicity - repeated exposure
No data available

Aspiration hazard
No data available

Additional Information
RTECS: KV9420000

narcosis, To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

12. ECOLOGICAL INFORMATION

12.1 Toxicity
No data available

12.2 Persistence and degradability
No data available

12.3 Bioaccumulative potential
No data available

12.4 Mobility in soil
No data available

12.5 Results of PBT and vPvB assessment
PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects
An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.
Harmful to aquatic life.

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product
Burn in a chemical incinerator equipped with an afterburner and scrubber but exert extra care in igniting as this material is highly flammable. Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material.

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)
UN number: 1150 Class: 3 Packing group: II
Proper shipping name: 1,2-Dichloroethylene

Poison Inhalation Hazard: No

IMDG
UN number: 1150 Class: 3 Packing group: II EMS-No: F-E, S-D
Proper shipping name: 1,2-DICHLOROETHYLENE

IATA
UN number: 1150 Class: 3 Packing group: II
Proper shipping name: 1,2-Dichloroethylene

15. REGULATORY INFORMATION

SARA 302 Components

No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components
This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

SARA 311/312 Hazards
Fire Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
cis-Dichloroethylene	156-59-2	1993-04-24

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
cis-Dichloroethylene	156-59-2	1993-04-24

New Jersey Right To Know Components

	CAS-No.	Revision Date
cis-Dichloroethylene	156-59-2	1993-04-24

California Prop. 65 Components
This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

Acute Tox.	Acute toxicity
Aquatic Acute	Acute aquatic toxicity
Aquatic Chronic	Chronic aquatic toxicity
Flam. Liq.	Flammable liquids
H225	Highly flammable liquid and vapour.
H332	Harmful if inhaled.
H402	Harmful to aquatic life.

HMIS Rating

Health hazard:	1
Chronic Health Hazard:	*
Flammability:	3
Physical Hazard	1

NFPA Rating

Health hazard:	2
Fire Hazard:	3
Reactivity Hazard:	0

Further information

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

Preparation Information
Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 4.3 Revision Date: 03/05/2015 Print Date: 04/17/2015

Right to Know
Hazardous Substance Fact Sheet

Common Name: **CHRYSENE**

Synonyms: Benzo(a)phenanthrene

Chemical Name: Chrysene

Date: December 1999 Revision: June 2008

CAS Number: 218-01-9

RTK Substance Number: 0441

DOT Number: UN 3077

EMERGENCY RESPONDERS >>>> SEE PAGE 6

Description and Use

Chrysene is a colorless to white, crystalline solid which is used in research laboratories. It is most often found as the gaseous by-product from the incomplete combustion of fossil fuel, wood, *Coal Tar* and *Creosote*.

Hazard Summary

Hazard Rating	NJDHSS	NFPA
HEALTH	3	-
FLAMMABILITY	0	-
REACTIVITY	1	-

CARCINOGEN
POISONOUS GASES ARE PRODUCED IN FIRE
DOES NOT BURN

Hazard Rating Key: 0=minimal; 1=slight; 2=moderate; 3=serious; 4=severe

Reasons for Citation

- **Chrysene** is on the Right to Know Hazardous Substance List because it is cited by OSHA, ACGIH, DOT, NIOSH, DEP, IARC, IRIS and EPA.
- This chemical is on the Special Health Hazard Substance List.

- **Chrysene** can affect you when inhaled and by passing through the skin.
- **Chrysene** should be handled as a CARCINOGEN--WITH EXTREME CAUTION.
- Contact can irritate the skin and eyes.
- Inhaling **Chrysene** may irritate the nose and throat.
- If skin contaminated with **Chrysene** is exposed to sunlight, a rash or sunburn effect and permanent changes in skin pigment can occur
- **Chrysene** is almost always found in *Coal Tar Pitch, Creosote*, or other *Coal Tar Products*. If you work with *Coal, Tar, Soot, Pitch, Asphalt*, etc., you may be exposed to **Chrysene**.
- *For more information, consult the Right to Know Hazardous Substance Fact Sheets on COAL TAR PITCH, CREOSOTE* and *ANTHRACENE*.

SEE GLOSSARY ON PAGE 5.

FIRST AID

Eye Contact

- Immediately flush with large amounts of water for at least 15 minutes, lifting upper and lower lids. Remove contact lenses, if worn, while rinsing.

Skin Contact

- Remove contaminated clothing and wash contaminated skin with soap and water.

Inhalation

- Remove the person from exposure.
- Transfer promptly to a medical facility.

EMERGENCY NUMBERS

Poison Control: 1-800-222-1222

CHEMTREC: 1-800-424-9300

NJDEP Hotline: 1-877-927-6337

National Response Center: 1-800-424-8802

Workplace Exposure Limits

OSHA: The legal airborne permissible exposure limit (PEL) is **0.2 mg/m^3** (as *Coal Tar Pitch Volatiles, Benzene-soluble fraction*) averaged over an 8-hour workshift.

NIOSH: The recommended airborne exposure limit (REL) is **0.1 mg/m^3** (as *Coal Tar Pitch Volatiles, Cyclohexane-extractable fraction*) averaged over a 10-hour workshift.

ACGIH: Recommends that exposure by all routes be controlled to levels as low as possible.

- **Chrysene** may be a CARCINOGEN in humans. There may be no safe level of exposure to a carcinogen, so all contact should be reduced to the lowest possible.
- The above exposure limits are for air levels only. When skin contact also occurs, you may be overexposed, even though air levels are less than the limits listed above.

Determining Your Exposure

- Read the product manufacturer's Material Safety Data Sheet (MSDS) and the label to determine product ingredients and important safety and health information about the product mixture.
- For each individual hazardous ingredient, read the New Jersey Department of Health and Senior Services Hazardous Substance Fact Sheet, available on the RTK Program website (www.nj.gov/health/eoh/rtkweb) or in your facility's RTK Central File or Hazard Communication Standard file.
- You have a right to this information under the New Jersey Worker and Community Right to Know Act, the Public Employees Occupational Safety and Health (PEOSH) Act if you are a public worker in New Jersey, and under the federal Occupational Safety and Health Act (OSHA) if you are a private worker.
- The New Jersey Right to Know Act requires most employers to label chemicals in the workplace and requires public employers to provide their employees with information concerning chemical hazards and controls. The federal OSHA Hazard Communication Standard (29 CFR 1910.1200) and the PEOSH Hazard Communication Standard (N.J.A.C. 12:100-7) require employers to provide similar information and training to their employees.

This Fact Sheet is a summary of available information regarding the health hazards that may result from exposure. Duration of exposure, concentration of the substance and other factors will affect your susceptibility to any of the potential effects described below.

Health Hazard Information

Acute Health Effects
The following acute (short-term) health effects may occur immediately or shortly after exposure to **Chrysene**:

- Contact can irritate the skin and eyes.
- Inhaling **Chrysene** may irritate the nose and throat causing coughing and wheezing.
- If skin contaminated with **Chrysene** is exposed to sunlight, a rash or sunburn effect can occur, sometimes with blisters.

Chronic Health Effects
The following chronic (long-term) health effects can occur at some time after exposure to **Chrysene** and can last for months or years:

Cancer Hazard
- **Chrysene** may be a CARCINOGEN in humans since it has been shown to cause skin, liver, and lung cancer in animals.
- Many scientists believe there is no safe level of exposure to a carcinogen. Such substance may also have the potential for causing reproductive damage in humans.

Reproductive Hazard
- According to the information presently available to the New Jersey Department of Health and Senior Services, **Chrysene** has not been tested for its ability to affect reproduction.

Other Effects
- Permanent changes in skin pigment can occur if contaminated skin is exposed to sunlight

Medical

Medical Testing
- There is no special test for this chemical. However, an exposed person should examine their skin periodically for growths, changes in warts or moles, and sores that do not heal. Skin cancer is easily cured when detected and treated early.

Any evaluation should include a careful history of past and present symptoms with an exam. Medical tests that look for damage already done are not a substitute for controlling exposure.

Request copies of your medical testing. You have a legal right to this information under the OSHA Access to Employee Exposure and Medical Records Standard (29 CFR 1910.1020).

Mixed Exposures
- Persons who smoke cigarettes and are exposed to **Chrysene** may be at increased risk for lung cancer. Even if you have smoked for a long time, stopping now will reduce your risk of developing health problems.

Workplace Controls and Practices

Very toxic chemicals, or those that are reproductive hazards or sensitizers, require expert advice on control measures if a less toxic chemical cannot be substituted. Control measures include: (1) enclosing chemical processes for severely irritating and corrosive chemicals, (2) using local exhaust ventilation for chemicals that may be harmful with a single exposure, and (3) using general ventilation to control exposures to skin and eye irritants. For further information on workplace controls, consult the NIOSH document on Control Banding at www.cdc.gov/niosh/topics/ctrlbanding/.

The following work practices are also recommended:

- Label process containers.
- Provide employees with hazard information and training.
- Monitor airborne chemical concentrations.
- Use engineering controls if concentrations exceed recommended exposure levels.
- Provide eye wash fountains and emergency showers.
- Wash or shower if skin comes in contact with a hazardous material.
- Always wash at the end of the workshift.
- Change into clean clothing if clothing becomes contaminated.
- Do not take contaminated clothing home.
- Get special training to wash contaminated clothing.
- Do not eat, smoke, or drink in areas where chemicals are being handled, processed or stored.
- Wash hands carefully before eating, smoking, drinking, applying cosmetics or using the toilet.

In addition, the following may be useful or required:

- Use a Class I, Type B, biological safety hood when mixing, handling, or preparing **Chrysene**.
- Use a vacuum or a wet method to reduce dust during clean-up. DO NOT DRY SWEEP.
- Use a high efficiency particulate air (HEPA) filter when vacuuming. Do not use a standard shop vacuum.

Personal Protective Equipment

The OSHA Personal Protective Equipment Standard (29 CFR 1910.132) requires employers to determine the appropriate personal protective equipment for each hazard and to train employees on how and when to use protective equipment.

The following recommendations are only guidelines and may not apply to every situation.

Gloves and Clothing

- Avoid skin contact with **Chrysene**. Wear personal protective equipment made from material that can not be permeated or degraded by this substance. Safety equipment suppliers and manufacturers can provide recommendations on the most protective glove and clothing material for your operation.
- Safety equipment manufacturers recommend Nitrile or Natural Rubber for gloves and DuPont Tyvek®, or the equivalent, as protective material for clothing.
- All protective clothing (suits, gloves, footwear, headgear) should be clean, available each day, and put on before work.

Eye Protection

- Wear eye protection with side shields or goggles.
- Wear a face shield along with goggles when working with corrosive, highly irritating or toxic substances.

Respiratory Protection

Improper use of respirators is dangerous. Respirators should only be used if the employer has implemented a written program that takes into account workplace conditions, requirements for worker training, respirator fit testing, and medical exams, as described in the OSHA Respiratory Protection Standard (29 CFR 1910.134).

- Where the potential exists for exposure over **0.1 mg/m^3** (as *Coal Tar Pitch Volatiles*), use a NIOSH approved supplied-air respirator with a full facepiece operated in a pressure-demand or other positive-pressure mode. For increased protection use in combination with an auxiliary self-contained breathing apparatus operated in a pressure-demand or other positive-pressure mode.
- Where the potential for high exposure exists, use a NIOSH approved supplied-air respirator with a full facepiece operated in a pressure-demand or other positive-pressure mode. For increased protection use in combination with an auxiliary self-contained breathing apparatus operated in a pressure-demand or other positive-pressure mode.
- Exposure to **80 mg/m^3** (as *Coal Tar Pitch Volatiles*) is immediately dangerous to life and health. If the possibility of exposure above **80 mg/m^3** exists, use a NIOSH approved self-contained breathing apparatus with a full facepiece operated in a pressure-demand or other positive-pressure mode equipped with an emergency escape air cylinder.

Fire Hazards

If employees are expected to fight fires, they must be trained and equipped as stated in the OSHA Fire Brigades Standard (29 CFR 1910.156).

- DOES NOT BURN
- Use dry chemical, CO_2, water spray or foam as extinguishing agents.
- POISONOUS GASES ARE PRODUCED IN FIRE.
- Use water spray to keep fire-exposed containers cool.

Spills and Emergencies

If employees are required to clean-up spills, they must be properly trained and equipped. The OSHA Hazardous Waste Operations and Emergency Response Standard (29 CFR 1910.120) may apply.

If **Chrysene** is spilled, take the following steps:

- Evacuate personnel and secure and control entrance to the area.
- Eliminate all ignition sources.
- Moisten spilled material first or use a HEPA-filter vacuum for clean-up.
- Ventilate and wash area after clean-up is complete.
- DO NOT wash into sewer.
- It may be necessary to contain and dispose of **Chrysene** as a HAZARDOUS WASTE. Contact your state Department of Environmental Protection (DEP) or your regional office of the federal Environmental Protection Agency (EPA) for specific recommendations.

Handling and Storage

Prior to working with **Chrysene** you should be trained on its proper handling and storage.

- **Chrysene** is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE).
- Store in tightly closed containers in a cool, well-ventilated area.

Occupational Health Information Resources

The New Jersey Department of Health and Senior Services, Occupational Health Service, offers multiple services in occupational health. These services include providing informational resources, educational materials, public presentations, and industrial hygiene and medical investigations and evaluations.

For more information, please contact:

New Jersey Department of Health & Senior Services
Right to Know Program
PO Box 368
Trenton, NJ 08625-0368
Phone: 609-984-2202
Fax: 609-984-7407
E-mail: rtk@doh.state.nj.us
Web address: http://www.nj.gov/health/eoh/rtkweb

GLOSSARY

ACGIH is the American Conference of Governmental Industrial Hygienists. They publish guidelines called Threshold Limit Values (TLVs) for exposure to workplace chemicals.

Acute Exposure Guideline Levels (AEGLs) are established by the EPA. They describe the risk to humans resulting from once-in-a lifetime, or rare, exposure to airborne chemicals.

Boiling point is the temperature at which a substance can change its physical state from a liquid to a gas.

A **carcinogen** is a substance that causes cancer.

The **CAS number** is unique, identifying number, assigned by the Chemical Abstracts Service, to a specific chemical.

CFR is the Code of Federal Regulations, which are the regulations of the United States government.

A **combustible** substance is a solid, liquid or gas that will burn.

A **corrosive** substance is a gas, liquid or solid that causes destruction of human skin or severe corrosion of containers.

DEP is the New Jersey Department of Environmental Protection.

DOT is the Department of Transportation, the federal agency that regulates the transportation of chemicals.

EPA is the Environmental Protection Agency, the federal agency responsible for regulating environmental hazards.

ERG is the Emergency Response Guidebook. It is a guide for emergency responders for transportation emergencies involving hazardous substances.

Emergency Response Planning Guideline (ERPG) values are intended to provide estimates of concentration ranges where one reasonably might anticipate observing adverse effects.

A **fetus** is an unborn human or animal.

A **flammable** substance is a solid, liquid, vapor or gas that will ignite easily and burn rapidly.

The **flash point** is the temperature at which a liquid or solid gives off vapor that can form a flammable mixture with air.

IARC is the International Agency for Research on Cancer, a scientific group.

Ionization Potential is the amount of energy needed to remove an electron from an atom or molecule. It is measured in electron volts.

IRIS is the Integrated Risk Information System database maintained by federal EPA. The database contains information on human health effects that may result from exposure to various chemicals in the environment.

LEL or **Lower Explosive Limit**, is the lowest concentration of a combustible substance (gas or vapor) in the air capable of continuing an explosion.

mg/m^3 means milligrams of a chemical in a cubic meter of air. It is a measure of concentration (weight/volume).

A **mutagen** is a substance that causes mutations. A **mutation** is a change in the genetic material in a body cell. Mutations can lead to birth defects, miscarriages, or cancer.

NFPA is the National Fire Protection Association. It classifies substances according to their fire and explosion hazard.

NIOSH is the National Institute for Occupational Safety and Health. It tests equipment, evaluates and approves respirators, conducts studies of workplace hazards, and proposes standards to OSHA.

NTP is the National Toxicology Program which tests chemicals and reviews evidence for cancer.

OSHA is the federal Occupational Safety and Health Administration, which adopts and enforces health and safety standards.

PEOSHA is the New Jersey Public Employees Occupational Safety and Health Act, which adopts and enforces health and safety standards in public workplaces.

Permeated is the movement of chemicals through protective materials.

PIH is a DOT designation for chemicals which are Poison Inhalation Hazards.

ppm means parts of a substance per million parts of air. It is a measure of concentration by volume in air.

A **reactive** substance is a solid, liquid or gas that releases energy under certain conditions.

STEL is a Short Term Exposure Limit which is usually a 15-minute exposure that should not be exceeded at any time during a work day.

A **teratogen** is a substance that causes birth defects by damaging the fetus.

UEL or **Upper Explosive Limit** is the highest concentration in air above which there is too much fuel (gas or vapor) to begin a reaction or explosion.

Vapor Density is the ratio of the weight of a given volume of one gas to the weight of another (usually *Hydrogen*), at the same temperature and pressure.

The **vapor pressure** is a measure of how readily a liquid or a solid mixes with air at its surface. A higher vapor pressure indicates a higher concentration of the substance in air and therefore increases the likelihood of breathing it in.

Common Name: **CHRYSENE**

Synonyms: Benzo(a)phenanthrene
CAS No: 218-01-9
Molecular Formula: $C_{18}H_{12}$
RTK Substance No: 0441
Description: Colorless to white, crystalline solid

HAZARD DATA

Hazard Rating	Firefighting	Reactivity
3 - Health **0 - Fire** **1 - Reactivity** **DOT#:** UN 3077 **ERG Guide #:** 171 **Hazard Class:** 9 (Miscellaneous Hazardous Materials)	DOES NOT BURN Use dry chemical, CO_2, water spray or foam as extinguishing agents. POISONOUS GASES ARE PRODUCED IN FIRE. Use water spray to keep fire-exposed containers cool.	**Chrysene** is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE).

SPILL/LEAKS

Isolation Distance:
Spill: 25 meters (75 feet)
Fire: 800 meters (1/2 mile)
Moisten spilled material first or use a HEPA-filter vacuum for clean-up.
DO NOT wash into sewer.
May biodegrade in water.

PHYSICAL PROPERTIES

Odor Threshold:	Unknown
Flash Point:	Noncombustible
Vapor Pressure:	6.3 x 10.9 mm Hg at 68°F (20°C)
Specific Gravity:	1.27 (water = 1)
Water Solubility:	Insoluble
Boiling Point:	838°F (448°C)
Melting Point:	491° to 493°F (255° to 256°C)
Ionization Potential:	7.59+/-0.2 eV
Molecular Weight:	228.3

EXPOSURE LIMITS

OSHA:	0.2 mg/m^3, 8-hr TWA
NIOSH:	0.1 mg/m^3, 10-hr TWA
ACGIH:	Lowest level possible
IDLH:	80 mg/m^3
	(All of the above as *Coal Tar Pitch Volatile*)

PROTECTIVE EQUIPMENT

Gloves:	Nitrile or Natural Rubber
Coveralls:	DuPont Tyvek®
Respirator:	>0.1 mg/m^3 - Supplied air >80 mg/m3 - SCBA

HEALTH EFFECTS

Eyes:	Irritation
Skin:	Irritation, rash or sunburn with blisters can occur if contaminated skin is exposed to sunlight
Inhalation:	Nose and throat irritation with coughing and wheezing
Chronic:	Cancer (skin, liver, lungs) in animals

FIRST AID AND DECONTAMINATION

Remove the person from exposure.
Flush eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.
Remove contaminated clothing and wash contaminated skin with soap and water.
Transfer to a medical facility.

Right to Know
Hazardous Substance Fact Sheet

Common Name: **CHROMIUM**

Synonyms: Chrome; Metallic Chromium

Chemical Name: Chromium

Date: January 2000 Revision: March 2009

CAS Number: 7440-47-3

RTK Substance Number: 0432

DOT Number: UN 3089

EMERGENCY RESPONDERS >>>> SEE LAST PAGE

Description and Use

Chromium is a hard, gray, odorless solid with a metallic luster. It is used in stainless and alloy steels, in making alloys, and as an isotope in medicine and research.

Hazard Summary

Hazard Rating	NJDHSS	NFPA
HEALTH	2	-
FLAMMABILITY	3	-
REACTIVITY	0	-

FLAMMABLE POWDER
POISONOUS GASES ARE PRODUCED IN FIRE
CONTAINERS MAY EXPLODE IN FIRE

Hazard Rating Key: 0=minimal; 1=slight; 2=moderate; 3=serious; 4=severe

Reasons for Citation

- **Chromium** is on the Right to Know Hazardous Substance List because it is cited by OSHA, ACGIH, DOT, NIOSH, DEP, IARC and EPA.
- This chemical is on the Special Health Hazard Substance List.

- **Chromium** can affect you when inhaled.
- Contact can irritate and burn the skin and eyes with possible eye damage.
- Inhaling **Chromium** can irritate the nose and throat.
- Exposure to **Chromium** *fumes* can cause a flu-like illness called *metal fume fever.*
- **Chromium** may cause a skin allergy and an asthma-like allergy
- Inhaling **Chromium** can cause a sore and/or a hole in the "bone" (septum) dividing the inner nose.
- **Chromium** may affect the liver and kidneys.
- **Chromium** in *powder* form is FLAMMABLE and a DANGEROUS FIRE HAZARD. It may also spontaneously explode in air.

SEE GLOSSARY ON PAGE 5.

FIRST AID

Eye Contact
- Immediately flush with large amounts of water for at least 30 minutes, lifting upper and lower lids. Remove contact lenses, if worn, while flushing. Seek medical attention.

Skin Contact
- Quickly remove contaminated clothing. Immediately wash contaminated skin with large amounts of soap and water.

Inhalation
- Remove the person from exposure
- Begin rescue breathing (using universal precautions) if breathing has stopped and CPR if heart action has stopped.
- Transfer promptly to a medical facility.

EMERGENCY NUMBERS

Poison Control: 1-800-222-1222

CHEMTREC: 1-800-424-9300

NJDEP Hotline: 1-877-927-6337

National Response Center: 1-800-424-8802

Workplace Exposure Limits

OSHA: The legal airborne permissible exposure limit (PEL) is **1 mg/m^3** averaged over an 8-hour workshift.

NIOSH: The recommended airborne exposure limit (REL) is **0.5 mg/m^3** averaged over a 8-hour workshift.

ACGIH: The threshold limit value (TLV) is **0.5 mg/m^3** averaged over an 8-hour workshift.

Determining Your Exposure

- Read the product manufacturer's Material Safety Data Sheet (MSDS) and the label to determine product ingredients and important safety and health information about the product mixture.
- For each individual hazardous ingredient, read the New Jersey Department of Health and Senior Services Hazardous Substance Fact Sheet, available on the RTK Program website (www.nj.gov/health/eoh/rtkweb) or in your facility's RTK Central File or Hazard Communication Standard file.
- You have a right to this information under the New Jersey Worker and Community Right to Know Act, the Public Employees Occupational Safety and Health (PEOSH) Act if you are a public worker in New Jersey, and under the federal Occupational Safety and Health Act (OSHA) if you are a private worker.
- The New Jersey Right to Know Act requires most employers to label chemicals in the workplace and requires public employers to provide their employees with information concerning chemical hazards and controls. The federal OSHA Hazard Communication Standard (29 CFR 1910.1200) and the PEOSH Hazard Communication Standard (N.J.A.C. 12:100-7) require employers to provide similar information and training to their employees.

This Fact Sheet is a summary of available information regarding the health hazards that may result from exposure. Duration of exposure, concentration of the substance and other factors will affect your susceptibility to any of the potential effects described below.

Health Hazard Information

Acute Health Effects
The following acute (short-term) health effects may occur immediately or shortly after exposure to **Chromium**:

- Contact can irritate and burn the skin and eyes with possible eye damage.
- Inhaling **Chromium** can irritate the nose and throat causing coughing and wheezing.
- Exposure to **Chromium** *fumes* can cause *"metal fume fever."* This is a flu-like illness with symptoms of metallic taste in the mouth, headache, fever and chills, aches, chest tightness and cough. The symptoms may be delayed for several hours after exposure and usually last for a day or two.

Chronic Health Effects
The following chronic (long-term) health effects can occur at some time after exposure to **Chromium** and can last for months or years:

Cancer Hazard
- While **Chromium** has been tested, it is not classifiable as to its potential to cause cancer.

Reproductive Hazard
- There is no evidence that **Chromium** affects reproduction. This is based on test results presently available to the NJDHSS from published studies.

Other Effects
- Inhaling **Chromium** can cause a sore and/or a hole in the "bone" (septum) dividing the inner nose, sometimes with bleeding, discharge, and/or formation of a crust.
- **Chromium** may cause a skin allergy. If allergy develops, very low future exposure can cause itching and a skin rash.
- **Chromium** may cause an asthma-like allergy. Future exposure can cause asthma attacks with shortness of breath, wheezing, coughing, and/or chest tightness.
- Prolonged skin contact can cause burns, blisters and deep ulcers
- **Chromium** may affect the liver and kidneys.

Medical

Medical Testing
For frequent or potentially high exposure (half the TLV or greater), the following are recommended before beginning work and at regular times after that:

- Lung function tests. The results may be normal if the person is not having an attack at the time of the test.

If symptoms develop or overexposure is suspected, the following are recommended:

- Examine your skin periodically for little bumps or blisters, the first sign of "chrome ulcers." If not treated early, these can last for years after exposure.
- Evaluation by a qualified allergist can help diagnose skin allergy.
- Liver and kidney function tests

Any evaluation should include a careful history of past and present symptoms with an exam. Medical tests that look for damage already done are not a substitute for controlling exposure.

Request copies of your medical testing. You have a legal right to this information under the OSHA Access to Employee Exposure and Medical Records Standard (29 CFR 1910.1020).

Mixed Exposures
- Smoking can cause heart disease, lung cancer, emphysema, and other respiratory problems. It may worsen respiratory conditions caused by chemical exposure. Even if you have smoked for a long time, stopping now will reduce your risk of developing health problems.
- More than light alcohol consumption can cause liver damage. Drinking alcohol can increase the liver damage caused by **Chromium**.

Workplace Controls and Practices

Very toxic chemicals, or those that are reproductive hazards or sensitizers, require expert advice on control measures if a less toxic chemical cannot be substituted. Control measures include: (1) enclosing chemical processes for severely irritating and corrosive chemicals, (2) using local exhaust ventilation for chemicals that may be harmful with a single exposure, and (3) using general ventilation to control exposures to skin and eye irritants. For further information on workplace controls, consult the NIOSH document on Control Banding at www.cdc.gov/niosh/topics/ctrlbanding/.

The following work practices are also recommended:

- Label process containers.
- Provide employees with hazard information and training.
- Monitor airborne chemical concentrations.
- Use engineering controls if concentrations exceed recommended exposure levels.
- Provide eye wash fountains and emergency showers.
- Wash or shower if skin comes in contact with a hazardous material.
- Always wash at the end of the workshift.
- Change into clean clothing if clothing becomes contaminated.
- Do not take contaminated clothing home.
- Get special training to wash contaminated clothing.
- Do not eat, smoke, or drink in areas where chemicals are being handled, processed or stored.
- Wash hands carefully before eating, smoking, drinking, applying cosmetics or using the toilet.

In addition, the following may be useful or required:

- Before entering a confined space where **Chromium** *powder* may be present, check to make sure that an explosive concentration does not exist.
- Use a vacuum or a wet method to reduce dust during clean-up. DO NOT DRY SWEEP.

Personal Protective Equipment

The OSHA Personal Protective Equipment Standard (29 CFR 1910.132) requires employers to determine the appropriate personal protective equipment for each hazard and to train employees on how and when to use protective equipment.

The following recommendations are only guidelines and may not apply to every situation.

Gloves and Clothing

- Avoid skin contact with **Chromium**. Wear personal protective equipment made from material which can not be permeated or degraded by this substance. Safety equipment suppliers and manufacturers can provide recommendations on the most protective glove and clothing material for your operation.
- Safety equipment manufacturers recommend Nitrile and Natural Rubber for gloves, and Tyvek®, or the equivalent, as a protective material for clothing.
- All protective clothing (suits, gloves, footwear, headgear) should be clean, available each day, and put on before work.

Eye Protection

- Wear eye protection with side shields or goggles.
- If additional protection is needed for the entire face, use in combination with a face shield. A face shield should not be used without another type of eye protection.

Respiratory Protection

Improper use of respirators is dangerous. Respirators should only be used if the employer has implemented a written program that takes into account workplace conditions, requirements for worker training, respirator fit testing, and medical exams, as described in the OSHA Respiratory Protection Standard (29 CFR 1910.134).

- Where the potential exists for exposure over **0.5 mg/m^3**, use a NIOSH approved negative pressure, air-purifying, particulate filter respirator with an N, R or P95 filter. More protection is provided by a full facepiece respirator than by a half-mask respirator, and even greater protection is provided by a powered-air purifying respirator.
- Leave the area immediately if (1) while wearing a filter or cartridge respirator you can smell, taste, or otherwise detect **Chromium**, (2) while wearing particulate filters abnormal resistance to breathing is experienced, or (3) eye irritation occurs while wearing a full facepiece respirator. Check to make sure the respirator-to-face seal is still good. If it is, replace the filter or cartridge. If the seal is no longer good, you may need a new respirator.
- Consider all potential sources of exposure in your workplace. You may need a combination of filters, prefilters or cartridges to protect against different forms of a chemical (such as vapor and mist) or against a mixture of chemicals.
- Where the potential exists for exposure over **5 mg/m^3**, use a NIOSH approved supplied-air respirator with a full facepiece operated in a pressure-demand or other positive-pressure mode. For increased protection use in combination with an auxiliary self-contained breathing apparatus operated in a pressure-demand or other positive-pressure mode.
- Exposure to **250 mg/m^3** is immediately dangerous to life and health. If the possibility of exposure above **250 mg/m^3** exists, use a NIOSH approved self-contained breathing apparatus with a full facepiece operated in a pressure-demand or other positive-pressure mode equipped with an emergency escape air cylinder.

Fire Hazards

If employees are expected to fight fires, they must be trained and equipped as stated in the OSHA Fire Brigades Standard (29 CFR 1910.156).

- Extinguish fire using an agent suitable for type of surrounding fire. **Chromium** itself does not burn.
- **Chromium** in *powder* form is FLAMMABLE and a DANGEROUS FIRE HAZARD. It may also spontaneously explode in air.
- Use dry sand or dry chemical extinguishing agents to fight **Chromium** *powder* fires.
- POISONOUS GASES ARE PRODUCED IN FIRE.
- CONTAINERS MAY EXPLODE IN FIRE.
- DO NOT get water inside container.

Spills and Emergencies

If employees are required to clean-up spills, they must be properly trained and equipped. The OSHA Hazardous Waste Operations and Emergency Response Standard (29 CFR 1910.120) may apply.

If **Chromium** *powder* is spilled, take the following steps:

- Evacuate personnel and secure and control entrance to the area.
- Eliminate all ignition sources.
- Moisten spilled material first or use a HEPA-filter vacuum for clean-up and place into sealed containers for disposal.
- Keep **Chromium** *powder* out of confined spaces, such as sewers, because of the possibility of an explosion.
- Ventilate and wash area after clean-up is complete.
- DO NOT wash into sewer.
- It may be necessary to contain and dispose of **Chromium** as a HAZARDOUS WASTE. Contact your state Department of Environmental Protection (DEP) or your regional office of the federal Environmental Protection Agency (EPA) for specific recommendations.

Handling and Storage

Prior to working with **Chromium** you should be trained on its proper handling and storage.

- **Chromium** may react violently or explosively with AMMONIUM NITRATE; CARBON DIOXIDE ATMOSPHERES; BROMINE PENTAFLUORIDE; LITHIUM; NITROGEN OXIDES; and SULFUR DIOXIDE.
- **Chromium** is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE); STRONG ACIDS (such as HYDROCHLORIC and SULFURIC); and ALKALI METALS (such as SODIUM and POTASSIUM).
- Store in tightly closed containers in a cool, well-ventilated area.
- Sources of ignition, such as smoking and open flames, are prohibited where **Chromium** *powder* is used, handled, or stored.

Occupational Health Information Resources

The New Jersey Department of Health and Senior Services, Occupational Health Service, offers multiple services in occupational health. These services include providing informational resources, educational materials, public presentations, and industrial hygiene and medical investigations and evaluations.

For more information, please contact:

New Jersey Department of Health & Senior Services
Right to Know Program
PO Box 368
Trenton, NJ 08625-0368
Phone: 609-984-2202
Fax: 609-984-7407
E-mail: rtk@doh.state.nj.us
Web address: http://www.nj.gov/health/eoh/rtkweb

GLOSSARY

ACGIH is the American Conference of Governmental Industrial Hygienists. They publish guidelines called Threshold Limit Values (TLVs) for exposure to workplace chemicals.

Acute Exposure Guideline Levels (AEGLs) are established by the EPA. They describe the risk to humans resulting from once-in-a lifetime, or rare, exposure to airborne chemicals.

Boiling point is the temperature at which a substance can change its physical state from a liquid to a gas.

A **carcinogen** is a substance that causes cancer.

The **CAS number** is unique, identifying number, assigned by the Chemical Abstracts Service, to a specific chemical.

CFR is the Code of Federal Regulations, which are the regulations of the United States government.

A **combustible** substance is a solid, liquid or gas that will burn.

A **corrosive** substance is a gas, liquid or solid that causes destruction of human skin or severe corrosion of containers.

DEP is the New Jersey Department of Environmental Protection.

DOT is the Department of Transportation, the federal agency that regulates the transportation of chemicals.

EPA is the Environmental Protection Agency, the federal agency responsible for regulating environmental hazards.

ERG is the Emergency Response Guidebook. It is a guide for emergency responders for transportation emergencies involving hazardous substances.

Emergency Response Planning Guideline (ERPG) values provide estimates of concentration ranges where one reasonably might anticipate observing adverse effects.

A **fetus** is an unborn human or animal.

A **flammable** substance is a solid, liquid, vapor or gas that will ignite easily and burn rapidly.

The **flash point** is the temperature at which a liquid or solid gives off vapor that can form a flammable mixture with air.

IARC is the International Agency for Research on Cancer, a scientific group.

Ionization Potential is the amount of energy needed to remove an electron from an atom or molecule. It is measured in electron volts.

IRIS is the Integrated Risk Information System database on human health effects that may result from exposure to various chemicals, maintained by federal EPA.

LEL or **Lower Explosive Limit**, is the lowest concentration of a combustible substance (gas or vapor) in the air capable of continuing an explosion.

mg/m^3 means milligrams of a chemical in a cubic meter of air. It is a measure of concentration (weight/volume).

A **mutagen** is a substance that causes mutations. A **mutation** is a change in the genetic material in a body cell. Mutations can lead to birth defects, miscarriages, or cancer.

NFPA is the National Fire Protection Association. It classifies substances according to their fire and explosion hazard.

NIOSH is the National Institute for Occupational Safety and Health. It tests equipment, evaluates and approves respirators, conducts studies of workplace hazards, and proposes standards to OSHA.

NTP is the National Toxicology Program which tests chemicals and reviews evidence for cancer.

OSHA is the federal Occupational Safety and Health Administration, which adopts and enforces health and safety standards.

PEOSHA is the New Jersey Public Employees Occupational Safety and Health Act, which adopts and enforces health and safety standards in public workplaces.

Permeated is the movement of chemicals through protective materials.

ppm means parts of a substance per million parts of air. It is a measure of concentration by volume in air.

Protective Action Criteria (PAC) are values established by the Department of Energy and are based on AEGLs and ERPGs. They are used for emergency planning of chemical release events.

A **reactive** substance is a solid, liquid or gas that releases energy under certain conditions.

STEL is a Short Term Exposure Limit which is usually a 15-minute exposure that should not be exceeded at any time during a work day.

A **teratogen** is a substance that causes birth defects by damaging the fetus.

UEL or **Upper Explosive Limit** is the highest concentration in air above which there is too much fuel (gas or vapor) to begin a reaction or explosion.

Vapor Density is the ratio of the weight of a given volume of one gas to the weight of another (usually *Hydrogen*), at the same temperature and pressure.

The **vapor pressure** is a force exerted by the vapor in equilibrium with the solid or liquid phase of the same substance. The higher the vapor pressure the higher concentration of the substance in air.

Right to Know Hazardous Substance Fact Sheet

Emergency Responders Quick Reference

Common Name: **CHROMIUM**

Synonyms: Chrome; Metallic Chromium
CAS No: 7440-47-3
Molecular Formula: Cr
RTK Substance No: 0432
Description: Hard, gray, odorless solid with a metallic luster

HAZARD DATA

Hazard Rating	Firefighting	Reactivity
2 - Health **3 - Fire** **0 - Reactivity** **DOT#:** UN 3089 **ERG Guide #:** 170 **Hazard Class:** 4.1 (Flammable Solid)	Extinguish fire using an agent suitable for type of surrounding fire. **Chromium** itself does not burn. **Chromium** in *powder* form is FLAMMABLE and a DANGEROUS FIRE HAZARD. It may also spontaneously explode in air. Use dry sand or dry chemical extinguishing agents to fight **Chromium** *powder* fires. POISONOUS GASES ARE PRODUCED IN FIRE. CONTAINERS MAY EXPLODE IN FIRE. DO NOT get water inside container.	**Chromium** may react violently or explosively with AMMONIUM NITRATE; CARBON DIOXIDE ATMOSPHERES; BROMINE PENTAFLUORIDE; LITHIUM; NITROGEN OXIDES; and SULFUR DIOXIDE. **Chromium** is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE); STRONG ACIDS (such as HYDROCHLORIC and SULFURIC); and ALKALI METALS (such as SODIUM and POTASSIUM).

SPILL/LEAKS

Isolation Distance:

Spill: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Moisten spilled material first or use a HEPA-filter vacuum for clean-up and place into sealed containers for disposal.

Keep **Chromium** *powder* out of confined spaces, such as sewers, because of the possibility of an explosion.

DO NOT wash into sewer.

PHYSICAL PROPERTIES

Odor Threshold:	Odorless
Flash Point:	Noncombustible solid, Flammable *powder*
Vapor Pressure:	<0 mm Hg at 68°F (20°C) (approximate)
Specific Gravity:	7.2 (water = 1)
Water Solubility:	Insoluble
Boiling Point:	4,788°F (2,642°C)
Melting Point:	3,452°F (1,900°C)
Molecular Weight:	52

EXPOSURE LIMITS

OSHA:	1 mg/m^3, 8-hr TWA
NIOSH:	0.5 mg/m^3, 8-hr TWA
ACGIH:	0.5 mg/m^3, 8-hr TWA
IDLH:	250 mg/m^3

The Protective Action Criteria values are:

PAC-1 = 1.5 mg/m^3 PAC-3 = 250 mg/m^3

PAC-2 = 2.5 mg/m^3

PROTECTIVE EQUIPMENT

Gloves:	Nitrile or Natural Rubber
Coveralls:	Tyvek®
Respirator:	>0.5 mg/m^3 - full facepiece APR with High efficiency filters >1.5 mg/m^3 - SCBA

HEALTH EFFECTS

Eyes:	Irritation, burns and possible eye damage
Skin:	Irritation, burns, itching, rash and skin ulcers
Inhalation:	Nose and throat irritation with coughing and wheezing Headache, fever and chills

FIRST AID AND DECONTAMINATION

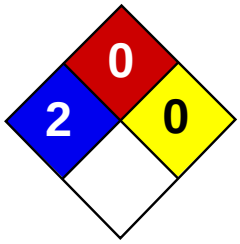
Remove the person from exposure.

Flush eyes with large amounts of water for at least 30 minutes. Remove contact lenses if worn. Seek medical attention.

Quickly remove contaminated clothing and wash contaminated skin with large amounts of soap and water.

Begin artificial respiration if breathing has stopped and CPR if necessary.

Transfer promptly to a medical facility.



Material Safety Data Sheet
Chloroform MSDS

Section 1: Chemical Product and Company Identification

Product Name: Chloroform

Catalog Codes: SLC1888, SLC5044

CAS#: 67-66-3

RTECS: FS9100000

TSCA: TSCA 8(b) inventory: Chloroform

CI#: Not available.

Synonym: Trichloromethane; Methane, trichlor-

Chemical Name: Chloroform

Chemical Formula: CHCl3

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call: 1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Chloroform	67-66-3	100

Toxicological Data on Ingredients: Chloroform: ORAL (LD50): Acute: 695 mg/kg [Rat]. 36 mg/kg [Mouse]. 820 mg/kg [Guinea pig]. DERMAL (LD50): Acute: >20000 mg/kg [Rabbit]. VAPOR (LC50): Acute: 47702 mg/m 4 hours [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects: Hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, of inhalation. Slightly hazardous in case of skin contact (permeator).

Potential Chronic Health Effects: CARCINOGENIC EFFECTS: Classified + (Proven.) by NIOSH. Classified A3 (Proven for animal.) by ACGIH, 2B (Possible for human.) by IARC. Classified 2 (Some evidence.) by NTP. MUTAGENIC EFFECTS: Mutagenic for mammalian somatic cells. Mutagenic for bacteria and/or yeast. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to kidneys, liver, heart. Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact: Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. WARM water MUST be used. Get medical attention.

Skin Contact: In case of contact, immediately flush skin with plenty of water. Cover the irritated skin with an emollient. Remove contaminated clothing and shoes. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention.

Serious Skin Contact: Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

Inhalation: If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Serious Inhalation: Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. WARNING: It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek medical attention.

Ingestion: Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Non-flammable.

Auto-Ignition Temperature: Not applicable.

Flash Points: Not applicable.

Flammable Limits: Not applicable.

Products of Combustion: Not available.

Fire Hazards in Presence of Various Substances: Not applicable.

Explosion Hazards in Presence of Various Substances: Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions: Not applicable.

Special Remarks on Fire Hazards: Not available.

Special Remarks on Explosion Hazards: May explode if it comes in contact with aluminum powder, lithium, perchlorate, pentoxide, bis(dimethylamino)dimethylstannane, potassium, potassium-sodium alloy, sodium (or sodium hydroxide or sodium methoxide), and methanol

Section 6: Accidental Release Measures

Small Spill: Absorb with an inert material and put the spilled material in an appropriate waste disposal.

Large Spill: Absorb with an inert material and put the spilled material in an appropriate waste disposal. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions: Do not ingest. Do not breathe gas/fumes/ vapor/spray. Wear suitable protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as metals, alkalis.

Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area. Sensitive to light. Store in light-resistant containers.

Section 8: Exposure Controls/Personal Protection

Engineering Controls: Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection: Splash goggles. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill: Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits: TWA: 10 (ppm) [Australia] Inhalation TWA: 2 (ppm) from OSHA (PEL) [United States] Inhalation STEL: 9.78 (mg/m3) from NIOSH Inhalation STEL: 2 (ppm) from NIOSH Inhalation TWA: 9.78 (mg/m3) from OSHA (PEL) [United States] Inhalation TWA: 10 (ppm) from ACGIH (TLV) [United States] [1999] Inhalation TWA: 2 (ppm) [United Kingdom (UK)] Inhalation TWA: 9.9 (mg/m3) [United Kingdom (UK)] InhalationConsult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid.

Odor: Pleasant. Sweetish. Etheric. Non-irritating

Taste: Burning. Sweet.

Molecular Weight: 119.38 g/mole

Color: Colorless. Clear

pH (1% soln/water): Not available.

Boiling Point: 61°C (141.8°F)

Melting Point: -63.5°C (-82.3°F)

Critical Temperature: 263.33°C (506°F)

Specific Gravity: 1.484 (Water = 1)

Vapor Pressure: 21.1 kPa (@ 20°C)

Vapor Density: 4.36 (Air = 1)

Volatility: Not available.

Odor Threshold: 85 ppm

Water/Oil Dist. Coeff.: The product is more soluble in oil; log(oil/water) = 2

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility: Very slightly soluble in cold water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Incompatible materials, Light

Incompatibility with various substances: Reactive with metals, alkalis.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity: Light Sensitive. Incompatible with triisopropyl phosphine, acetone, disilane, fluorine, strong bases and reactive metals (aluminum, magnesium in powdered form), light.

Special Remarks on Corrosivity: It will attack some forms of plastics, rubber, and coatings.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Eye contact. Inhalation.

Toxicity to Animals: WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE. Acute oral toxicity (LD50): 36 mg/kg [Mouse]. Acute dermal toxicity (LD50): >20000 mg/kg [Rabbit]. Acute toxicity of the vapor (LC50): 47702 mg/m 4 hours [Rat]. 3

Chronic Effects on Humans: CARCINOGENIC EFFECTS: Classified + (Proven.) by NIOSH. Classified A3 (Proven for animal.) by ACGIH, 2B (Possible for human.) by IARC. Classified 2 (Some evidence.) by NTP. MUTAGENIC EFFECTS: Mutagenic for mammalian somatic cells. Mutagenic for bacteria and/or yeast. May cause damage to the following organs: kidneys, liver, heart.

Other Toxic Effects on Humans: Hazardous in case of skin contact (irritant), of ingestion, of inhalation. Slightly hazardous in case of skin contact (permeator).

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: May affect genetic material (possible mutangen) and cause adverse reproductive effects(embryotoxicity and fetotoxicity) Suspected carcinogen (tumorigenic) and teratogen based on animal data. Human: passes the placental barrier, detected in maternal milk.

Special Remarks on other Toxic Effects on Humans: Acute Potential Health Effects: Skin: Causes skin irritation and may cause chemical burns. Eye: Causes eye irritation, burning pain and reversible injury to corneal epithelium. Inhalation: Causes irritation of the respiratory system (mucous membranes). May affect behavior/Nervous system (CNS depressant, fatigue, dizziness, nervousness, giddiness, euphoria, loss of coordination and judgement, weakness, hallucinations, muscle contraction/spasticity, general anesthetic, spastic paralysis, headache), anorexia (neurological and gastrointestinal symtoms resembling chronic alcoholism), and possibly coma and death. May affect the liver, kidneys and gastrointestinal tract (nausea, vomiting). Ingestion: Causes gastrointestinal tract irritation (nausea, vomiting). May affect the liver, urinary system (kidneys), respiration, behavior/nervous system (symptoms similar to inhalation),and heart. Chronic Potential Health Effects: Inhalation: Prolonged or repeated inhalation may affect the liver (hepatitis, jaundice, hepatocellular necrosis), metabolism (weight loss), respiration (fibrosis, pneumoconoisis), behavior/central nervous system (symptoms similar to acute inhalation), blood, musculoskeletal system, and kidneys. Ingestion: Prolonged or repeated ingestion may affect the liver, kidneys, metabolism (weight loss), endocrine system (spleen), blood (changes in cell count).

Section 12: Ecological Information

Ecotoxicity: Ecotoxicity in water (LC50): 43.8 mg/l 96 hours [Trout].

BOD5 and COD: Not available.

Products of Biodegradation: Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are as toxic as the product itself.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal: Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: CLASS 6.1: Poisonous material.

Identification: : Chloroform UNNA: UN1888 PG: III

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations: California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require a warning under the statute: Chloroform California prop. 65 (no significant risk level): Chloroform: 0.02 mg/day (value) California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer which would require a warning under the statute: Chloroform New York release reporting list: Chloroform Rhode Island RTK hazardous substances: Chloroform Pennsylvania RTK: Chloroform Massachusetts RTK: Chloroform New Jersey: Chloroform California Director's List of Hazardous Subtances (8 CCR 339): Chloroform Tennessee: Chloroform TSCA 8(b) inventory: Chloroform TSCA 8(d) H and S data reporting: Chloroform: effective: 6/1/87; sunset: 6/1/97 SARA 302/304/311/312 extremely hazardous substances: Chloroform SARA 313 toxic chemical notification and release reporting: Chloroform CERCLA: Hazardous substances.: Chloroform: 10 lbs. (4.536 kg)

Other Regulations: OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada): CLASS D-1A: Material causing immediate and serious toxic effects (VERY TOXIC). CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

DSCL (EEC): R20/22- Harmful by inhalation and if swallowed. R38- Irritating to skin. R40- Possible risks of irreversible effects. S36/37- Wear suitable protective clothing and gloves.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 0

Reactivity: 0

Personal Protection: h

National Fire Protection Association (U.S.A.):

Health: 2

Flammability: 0

Reactivity: 0

Specific hazard:

Protective Equipment: Gloves. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Splash goggles.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

Created: 10/10/2005 08:16 PM

Last Updated: 05/21/2013 12:00 PM

Material Safety Data Sheet

Cadmium metal, granular

ACC# 03720

Section 1 - Chemical Product and Company Identification

MSDS Name: Cadmium metal, granular
Catalog Numbers: 61213-5000, C3-500
Synonyms: None.
Company Identification:
Fisher Scientific
1 Reagent Lane
Fair Lawn, NJ 07410
For information, call: 201-796-7100
Emergency Number: 201-796-7100
For CHEMTREC assistance, call: 800-424-9300
For International CHEMTREC assistance, call: 703-527-3887

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
7440-43-9	Cadmium	100	231-152-8

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: silver white granules.
Danger! Flammable solid. May be fatal if inhaled. Harmful if swallowed. Causes eye, skin, and respiratory tract irritation. Contains cadmium. Cancer hazard. Avoid creating dust. Can cause lung and kidney disease. Inhalation of fumes may cause metal-fume fever. Air sensitive. May cause reproductive and fetal effects.
Target Organs: Blood, kidneys, liver, lungs, skeletal structures, prostate.

Potential Health Effects

Eye: Causes eye irritation.
Skin: Causes skin irritation.
Ingestion: Harmful if swallowed. May cause gastrointestinal irritation with nausea, vomiting and diarrhea. Ingestion may produce fluid loss, acute renal failure, and cardiopulmonary depression.
Inhalation: May be fatal if inhaled. Inhalation of fumes may cause metal fume fever, which is characterized by flu-like symptoms with metallic taste, fever, chills, cough, weakness, chest pain, muscle pain and increased white blood cell count. Damage may be delayed. May cause nausea, vomiting, abdominal pain, diarrhea, chest tightness, weakness, and delayed pulmonary edema. In humans inhalation causes proteinuria, an excess of protein in the urine.
Chronic: May cause respiratory tract cancer. Repeated inhalation may cause chronic bronchitis. Chronic inhalation may cause nasal septum ulceration and perforation. Cadmium and compounds may cause lung, liver and kidney damage and lung and prostate cancer in humans. May cause loss of smell, emphysema, anemia, bone demineralization, and lung fibrosis. The primary target organ

for chronic cadmium disease is clearly the kidney.

Section 4 - First Aid Measures

Eyes: Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical aid.
Skin: Get medical aid. Flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse.
Ingestion: Do not induce vomiting. If victim is conscious and alert, give 2-4 cupfuls of milk or water. Never give anything by mouth to an unconscious person. Get medical aid immediately.
Inhalation: POISON material. If inhaled, get medical aid immediately. Remove victim to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Attempt rescue only after notifying at least one other person of the emergency and putting into effect established emergency procedures. Do not become a casualty yourself.
Notes to Physician: Administration of calcium disodium EDTA may be useful in acute poisoning with its use at the discretion of qualified medical personnel. Persons with kidney disease, chronic respiratory disease, liver disease, or skin disease may be at increased risk from exposure to this substance.

Section 5 - Fire Fighting Measures

General Information: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Material can spontaneously ignite (pyrophoric) when exposed to air at normal or slightly elevated temperatures. Dust can be an explosion hazard when exposed to heat or flame. Flammable solid. May burn rapidly with flare burning effect. May re-ignite after fire is extinguished. Dangerous fire hazard in the form of dust when exposed to heat or flame.
Extinguishing Media: Use dry sand, graphite powder, dry sodium chloride-based extinguishers.
Flash Point: Not available.
Autoignition Temperature: Not available.
Explosion Limits, Lower: Not available.
Upper: Not available.
NFPA Rating: (estimated) Health: 4; Flammability: 2; Instability: 1

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.
Spills/Leaks: Vacuum or sweep up material and place into a suitable disposal container. Avoid generating dusty conditions. Remove all sources of ignition. Use a spark-proof tool. Provide ventilation. Place under an inert atmosphere.

Section 7 - Handling and Storage

Handling: Wash thoroughly after handling. Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Minimize dust generation and accumulation. Use spark-proof tools

and explosion proof equipment. Avoid contact with skin and eyes. Do not breathe dust, mist, or vapor. Empty containers retain product residue, (liquid and/or vapor), and can be dangerous. Keep away from heat, sparks and flame. Do not ingest or inhale. Handle under an inert atmosphere. Store protected from air. Use only in a chemical fume hood. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose empty containers to heat, sparks or open flames.
Storage: Keep away from heat and flame. Keep away from sources of ignition. Store in a tightly closed container. Store in a cool, dry, well-ventilated area away from incompatible substances. Do not expose to air. Store under an inert atmosphere.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: Use explosion-proof ventilation equipment. Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use only under a chemical fume hood. See 29CFR 1910.1027 for regulations applying to all occupational exposures to cadmium and cadmium compounds, in all forms.
Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Cadmium	0.01 mg/m3 TWA; 0.002 mg/m3 TWA (respirable fraction)	9 mg/m3 IDLH (dust)	5 æg/m3 TWA; 0.1 mg/m3 TWA (fume, applies to any operations or sectors for which the Cadmium standard is stayed or otherwise not in effect); 0.2 mg/m3 TWA (dust, applies to any operations or sectors for which the Cadmium standard is stayed or otherwise not in effect); 0.3 mg/m3 Ceiling (fume, applies to any operations or sectors for which the Cadm ium standard is stayed or otherwise not in effect); 0.6 mg/m3 Ceiling (dust, applies to any operations or sectors for which the Cadmium standard is stayed or otherwise not in effect); 2.5 æg/m3 Action Level; 5 æg/m3 TWA (Do not eat, drink or chew to bacco or gum or apply cosmetics in regulated areas. Carcinogen - dust can cause lung and kidney disease. See 29 CFR 1910.1027)

OSHA Vacated PELs: Cadmium: No OSHA Vacated PELs are listed for this chemical.
Personal Protective Equipment
Eyes: Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.
Skin: Wear appropriate protective gloves to prevent skin exposure.
Clothing: Wear appropriate protective clothing to prevent skin exposure.

Respirators: A respiratory protection program that meets OSHA's 29 CFR 1910.134 and ANSI Z88.2 requirements or European Standard EN 149 must be followed whenever workplace conditions warrant respirator use.

Section 9 - Physical and Chemical Properties

Physical State: Granules
Appearance: silver white
Odor: odorless
pH: Not available.
Vapor Pressure: Not applicable.
Vapor Density: Not available.
Evaporation Rate: Not applicable.
Viscosity: Not applicable.
Boiling Point: 765 deg C @ 760 mmHg
Freezing/Melting Point:321 deg C
Decomposition Temperature: Not available.
Solubility: Insoluble.
Specific Gravity/Density:8.64 @ 25°C
Molecular Formula: Cd
Molecular Weight:112.40

Section 10 - Stability and Reactivity

Chemical Stability: Oxidizes when exposed to air. Easily tarnishes in moist air. Powder or liquid is pyrophoric. Contact with acid liberates gas.
Conditions to Avoid: Ignition sources, dust generation, excess heat, prolonged exposure to air.
Incompatibilities with Other Materials: Strong oxidizing agents, acids, sulfur, zinc, selenium, tellurium.
Hazardous Decomposition Products: Toxic cadmium oxide fumes.
Hazardous Polymerization: Has not been reported.

Section 11 - Toxicological Information

RTECS#:
CAS# 7440-43-9: EU9800000
LD50/LC50:
CAS# 7440-43-9:
Inhalation, rat: LC50 = 25 mg/m3/30M;
Oral, mouse: LD50 = 890 mg/kg;
Oral, rat: LD50 = 2330 mg/kg;
.

Carcinogenicity:
CAS# 7440-43-9:

- **ACGIH:** A2 - Suspected Human Carcinogen

- **California:** carcinogen, initial date 10/1/87
- **NTP:** Known carcinogen
- **IARC:** Group 1 carcinogen

Epidemiology: Occupational exposure to cadmium has been implicated in a significant increase in prostate and respiratory tract cancer. There is evidence of a significant excess of respiratory cancer deaths among a cohort of cadmium production workers, and concluded that cadmium and its compounds are potential carcinogens.
Teratogenicity: Oral, rat: TDLo = 155 mg/kg (male 13 week(s) pre-mating and female 13 week (s) pre-mating - 3 week(s) after conception) Effects on Newborn - growth statistics (e.g.%, reduced weight gain) and Effects on Newborn - behavioral.; Oral, rat: TDLo = 23 mg/kg (female 1-22 day(s) after conception) Specific Developmental Abnormalities - blood and lymphatic systems (including spleen and marrow).; Oral, mouse: TDLo = 1700 mg/kg (female 8-12 day(s) after conception) Effects on Newborn - viability index (e.g., # alive at day 4 per # born alive) and Effects on Newborn - growth statis
Reproductive Effects: Oral, rat: TDLo = 21500 ug/kg (multigenerations) Fertility - pre-implantation mortality (e.g. reduction in number of implants per female; total number of implants per corpora lutea).; Intraperitoneal, rat: TDLo = 1124 ug/kg (male 1 day(s) pre-mating) Paternal Effects - spermatogenesis (incl. genetic material, sperm morphology, motility, and count).
Mutagenicity: Micronucleus Test: Mouse, Embryo = 6 umol/L.; Cytogenetic Analysis: Hamster, Ovary = 1 umol/L.
Neurotoxicity: No information found
Other Studies:

Section 12 - Ecological Information

Ecotoxicity: Fish: Rainbow trout: TLm = 30 ppm; 24 Hr; Hard waterFish: Striped bass: LC50 = 0.001 ppm; 24-48 Hr; Static bioassayFish: Fathead Minnow: TL50 = 7.2 ppm; 96 Hr; UnspecifiedFish: Bluegill/Sunfish: LCO = 0.08 ppm; 96 Hr; Static bioassay (Hard water) No data available.
Environmental: Cadmium can enter the air from natural sources.
Physical: No information available.
Other: No information available.

Section 13 - Disposal Considerations

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.
RCRA P-Series: None listed.
RCRA U-Series: None listed.

Section 14 - Transport Information

	US DOT	Canada TDG
Shipping Name:	TOXIC SOLIDS, FLAMMABLE, ORGANIC, N.O.S.	Toxic Solid, Flammable, Organic, N.O.S. (CADMIUM METAL)

Hazard Class:	6.1	6.1
UN Number:	UN2930	UN2930
Packing Group:	I	I

Section 15 - Regulatory Information

US FEDERAL

TSCA

CAS# 7440-43-9 is listed on the TSCA inventory.

Health & Safety Reporting List

None of the chemicals are on the Health & Safety Reporting List.

Chemical Test Rules

None of the chemicals in this product are under a Chemical Test Rule.

Section 12b

None of the chemicals are listed under TSCA Section 12b.

TSCA Significant New Use Rule

None of the chemicals in this material have a SNUR under TSCA.

CERCLA Hazardous Substances and corresponding RQs

CAS# 7440-43-9: 10 lb final RQ (no reporting of releases of this hazardous substance is required

SARA Section 302 Extremely Hazardous Substances

None of the chemicals in this product have a TPQ.

SARA Codes

CAS # 7440-43-9: immediate, delayed, fire.

Section 313

This material contains Cadmium (CAS# 7440-43-9, 100%),which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR Part 373.

Clean Air Act:

CAS# 7440-43-9 (listed as Cadmium compounds) is listed as a hazardous air pollutant (HAP).

This material does not contain any Class 1 Ozone depletors.

This material does not contain any Class 2 Ozone depletors.

Clean Water Act:

None of the chemicals in this product are listed as Hazardous Substances under the CWA.

CAS# 7440-43-9 is listed as a Priority Pollutant under the Clean Water Act. CAS# 7440-43-9 is listed as a Toxic Pollutant under the Clean Water Act.

OSHA:

None of the chemicals in this product are considered highly hazardous by OSHA.

STATE

CAS# 7440-43-9 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Minnesota, Massachusetts.

California Prop 65

The following statement(s) is(are) made in order to comply with the California Safe Drinking Water Act:

WARNING: This product contains Cadmium, a chemical known to the state of California to cause cancer. WARNING: This product contains Cadmium, a chemical known to the state of California to cause male reproductive toxicity.

California No Significant Risk Level: CAS# 7440-43-9: 0.05 æg/day NSRL (inhalation)

European / International Regulations

European Labeling in Accordance with EC Directives

Hazard Symbols:
T+ F
Risk Phrases:
R 11 Highly flammable.
R 25 Toxic if swallowed.
R 26 Very toxic by inhalation.
R 45 May cause cancer.

Safety Phrases:
S 36/37/39 Wear suitable protective clothing, gloves and eye/face pr otection.
S 45 In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).
S 53 Avoid exposure - obtain special instructions before use.

WGK (Water Danger/Protection)
CAS# 7440-43-9: No information available.
Canada - DSL/NDSL
CAS# 7440-43-9 is listed on Canada's DSL List.
Canada - WHMIS
This product has a WHMIS classification of D1A, B4.
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all of the information required by those regulations.
Canadian Ingredient Disclosure List
CAS# 7440-43-9 is listed on the Canadian Ingredient Disclosure List.

Section 16 - Additional Information

MSDS Creation Date: 6/28/1999
Revision #7 Date: 2/13/2008

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall Fisher be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if Fisher has been advised of the possibility of such damages.

New Jersey Department of Health and Senior Services

HAZARDOUS SUBSTANCE FACT SHEET

Common Name: **BENZO(k)FLUORANTHENE**

CAS Number: 207-08-9
DOT Number: None

RTK Substance number: 2969
Date: October 2002

HAZARD SUMMARY

* **Benzo(k)Fluoranthene** can affect you when breathed in and may be absorbed through the skin.
* **Benzo(k)Fluoranthene** should be handled as a CARCINOGEN--WITH EXTREME CAUTION.
* Contact can irritate the skin and eyes.

IDENTIFICATION

Benzo(k)Fluoranthene is a pale yellow, needle-like solid. It is primarily found in smoke from tobacco and polluted air.

REASON FOR CITATION

* **Benzo(k)Fluoranthene** is on the Hazardous Substance List because it is cited by NTP, IARC, HHAG and EPA.
* This chemical is on the Special Health Hazard Substance List because it is a **CARCINOGEN**.
* Definitions are provided on page 5.

HOW TO DETERMINE IF YOU ARE BEING EXPOSED

The New Jersey Right to Know Act requires most employers to label chemicals in the workplace and requires public employers to provide their employees with information and training concerning chemical hazards and controls. The federal OSHA Hazard Communication Standard, 1910.1200, requires private employers to provide similar training and information to their employees.

* Exposure to hazardous substances should be routinely evaluated. This may include collecting personal and area air samples. You can obtain copies of sampling results from your employer. You have a legal right to this information under OSHA 1910.1020.
* If you think you are experiencing any work-related health problems, see a doctor trained to recognize occupational diseases. Take this Fact Sheet with you.

WORKPLACE EXPOSURE LIMITS

No occupational exposure limits have been established for **Benzo(k)Fluoranthene**. This does not mean that this substance is not harmful. Safe work practices should always be followed.

* **Benzo(k)Fluoranthene** may be a CARCINOGEN in humans. There may be no safe level of exposure to a carcinogen, so all contact should be reduced to the lowest possible level.
* It should be recognized that **Benzo(k)Fluoranthene** can be absorbed through your skin, thereby increasing your exposure.

WAYS OF REDUCING EXPOSURE

* Enclose operations and use local exhaust ventilation at the site of chemical release. If local exhaust ventilation or enclosure is not used, respirators should be worn.
* Wear protective work clothing.
* Wash thoroughly immediately after exposure to **Benzo(k)Fluoranthene** and at the end of the workshift.
* Post hazard and warning information in the work area. In addition, as part of an ongoing education and training effort, communicate all information on the health and safety hazards of **Benzo(k)Fluoranthene** to potentially exposed workers.

This Fact Sheet is a summary source of information of all potential and most severe health hazards that may result from exposure. Duration of exposure, concentration of the substance and other factors will affect your susceptibility to any of the potential effects described below.

HEALTH HAZARD INFORMATION

Acute Health Effects

The following acute (short-term) health effects may occur immediately or shortly after exposure to **Benzo(k)Fluoranthene**:

* Contact can irritate the skin and eyes.

Chronic Health Effects

The following chronic (long-term) health effects can occur at some time after exposure to **Benzo(k)Fluoranthene** and can last for months or years:

Cancer Hazard

* **Benzo(k)Fluoranthene** may be a CARCINOGEN in humans since it has been shown to cause skin cancer in animals.
* Many scientists believe there is no safe level of exposure to a carcinogen. Such substances may also have the potential for causing reproductive damage in humans.

Reproductive Hazard

* According to the information presently available to the New Jersey Department of Health and Senior Services, **Benzo(k)Fluoranthene** has not been tested for its ability to affect reproduction.

Other Long-Term Effects

* **Benzo(k)Fluoranthene** has not been adequately tested for other chronic (long-term) health effects.

MEDICAL

Medical Testing

There is no special test for this chemical. However, if illness occurs or overexposure is suspected, medical attention is recommended.

Any evaluation should include a careful history of past and present symptoms with an exam. Medical tests that look for damage already done are not a substitute for controlling exposure.

Request copies of your medical testing. You have a legal right to this information under OSHA 1910.1020.

WORKPLACE CONTROLS AND PRACTICES

Unless a less toxic chemical can be substituted for a hazardous substance, **ENGINEERING CONTROLS** are the most effective way of reducing exposure. The best protection is to enclose operations and/or provide local exhaust ventilation at the site of chemical release. Isolating operations can also reduce exposure. Using respirators or protective equipment is less effective than the controls mentioned above, but is sometimes necessary.

In evaluating the controls present in your workplace, consider: (1) how hazardous the substance is, (2) how much of the substance is released into the workplace and (3) whether harmful skin or eye contact could occur. Special controls should be in place for highly toxic chemicals or when significant skin, eye, or breathing exposures are possible.

In addition, the following control is recommended:

* Where possible, automatically transfer **Benzo(k)Fluoranthene** from drums or other storage containers to process containers.

Good **WORK PRACTICES** can help to reduce hazardous exposures. The following work practices are recommended:

* Workers whose clothing has been contaminated by **Benzo(k)Fluoranthene** should change into clean clothing promptly.
* Do not take contaminated work clothes home. Family members could be exposed.
* Contaminated work clothes should be laundered by individuals who have been informed of the hazards of exposure to **Benzo(k)Fluoranthene**.
* Eye wash fountains should be provided in the immediate work area for emergency use.
* If there is the possibility of skin exposure, emergency shower facilities should be provided.
* On skin contact with **Benzo(k)Fluoranthene**, immediately wash or shower to remove the chemical. At the end of the workshift, wash any areas of the body that may have contacted **Benzo(k)Fluoranthene**, whether or not known skin contact has occurred.
* Do not eat, smoke, or drink where **Benzo(k)Fluoranthene** is handled, processed, or stored, since the chemical can be swallowed. Wash hands carefully before eating, drinking, smoking, or using the toilet.
* Use a vacuum or a wet method to reduce dust during clean-up. DO NOT DRY SWEEP.

PERSONAL PROTECTIVE EQUIPMENT

WORKPLACE CONTROLS ARE BETTER THAN PERSONAL PROTECTIVE EQUIPMENT. However, for some jobs (such as outside work, confined space entry, jobs done only once in a while, or jobs done while workplace controls are being installed), personal protective equipment may be appropriate.

OSHA 1910.132 requires employers to determine the appropriate personal protective equipment for each hazard and to train employees on how and when to use protective equipment.

The following recommendations are only guidelines and may not apply to every situation.

Clothing

* Avoid skin contact with **Benzo(k)Fluoranthene**. Wear protective gloves and clothing. Safety equipment suppliers/manufacturers can provide recommendations on the most protective glove/clothing material for your operation.
* All protective clothing (suits, gloves, footwear, headgear) should be clean, available each day, and put on before work.

Eye Protection

* Eye protection is included in the recommended respiratory protection.

Respiratory Protection

IMPROPER USE OF RESPIRATORS IS DANGEROUS. Such equipment should only be used if the employer has a written program that takes into account workplace conditions, requirements for worker training, respirator fit testing and medical exams, as described in OSHA 1910.134.

* At any exposure level, use a MSHA/NIOSH approved supplied-air respirator with a full facepiece operated in a pressure-demand or other positive-pressure mode. For increased protection use in combination with an auxiliary self-contained breathing apparatus operated in a pressure-demand or other positive-pressure mode.

QUESTIONS AND ANSWERS

Q: If I have acute health effects, will I later get chronic health effects?
A: Not always. Most chronic (long-term) effects result from repeated exposures to a chemical.

Q: Can I get long-term effects without ever having short-term effects?
A: Yes, because long-term effects can occur from repeated exposures to a chemical at levels not high enough to make you immediately sick.

Q: What are my chances of getting sick when I have been exposed to chemicals?
A: The likelihood of becoming sick from chemicals is increased as the amount of exposure increases. This is determined by the length of time and the amount of material to which someone is exposed.

Q: When are higher exposures more likely?
A: Conditions which increase risk of exposure include dust releasing operations (grinding, mixing, blasting, dumping, etc.), other physical and mechanical processes (heating, pouring, spraying, spills and evaporation from large surface areas such as open containers), and "confined space" exposures (working inside vats, reactors, boilers, small rooms, etc.).

Q: Is the risk of getting sick higher for workers than for community residents?
A: Yes. Exposures in the community, except possibly in cases of fires or spills, are usually much lower than those found in the workplace. However, people in the community may be exposed to contaminated water as well as to chemicals in the air over long periods. This may be a problem for children or people who are already ill.

Q: Don't all chemicals cause cancer?
A: No. Most chemicals tested by scientists are not cancer-causing.

Q: Should I be concerned if a chemical causes cancer in animals?
A: Yes. Most scientists agree that a chemical that causes cancer in animals should be treated as a suspected human carcinogen unless proven otherwise.

Q: But don't they test animals using much higher levels of a chemical than people usually are exposed to?
A: Yes. That's so effects can be seen more clearly using fewer animals. But high doses alone don't cause cancer unless it's a cancer agent. In fact, a chemical that causes cancer in animals at high doses could cause cancer in humans exposed to low doses.

The following information is available from:

New Jersey Department of Health and Senior Services
Occupational Health Service
PO Box 360
Trenton, NJ 08625-0360
(609) 984-1863
(609) 984-7407 (fax)

Web address: http://www.state.nj.us/health/eoh/odisweb/

Industrial Hygiene Information

Industrial hygienists are available to answer your questions regarding the control of chemical exposures using exhaust ventilation, special work practices, good housekeeping, good hygiene practices, and personal protective equipment including respirators. In addition, they can help to interpret the results of industrial hygiene survey data.

Medical Evaluation

If you think you are becoming sick because of exposure to chemicals at your workplace, you may call personnel at the Department of Health and Senior Services, Occupational Health Service, who can help you find the information you need.

Public Presentations

Presentations and educational programs on occupational health or the Right to Know Act can be organized for labor unions, trade associations and other groups.

Right to Know Information Resources

The Right to Know Infoline (609) 984-2202 can answer questions about the identity and potential health effects of chemicals, list of educational materials in occupational health, references used to prepare the Fact Sheets, preparation of the Right to Know Survey, education and training programs, labeling requirements, and general information regarding the Right to Know Act. Violations of the law should be reported to (609) 984-2202.

DEFINITIONS

ACGIH is the American Conference of Governmental Industrial Hygienists. It recommends upper limits (called TLVs) for exposure to workplace chemicals.

A **carcinogen** is a substance that causes cancer.

The **CAS number** is assigned by the Chemical Abstracts Service to identify a specific chemical.

A **combustible** substance is a solid, liquid or gas that will burn.

A **corrosive** substance is a gas, liquid or solid that causes irreversible damage to human tissue or containers.

DEP is the New Jersey Department of Environmental Protection.

DOT is the Department of Transportation, the federal agency that regulates the transportation of chemicals.

EPA is the Environmental Protection Agency, the federal agency responsible for regulating environmental hazards.

A **fetus** is an unborn human or animal.

A **flammable** substance is a solid, liquid, vapor or gas that will ignite easily and burn rapidly.

The **flash point** is the temperature at which a liquid or solid gives off vapor that can form a flammable mixture with air.

HHAG is the Human Health Assessment Group of the federal EPA.

IARC is the International Agency for Research on Cancer, a scientific group that classifies chemicals according to their cancer-causing potential.

A **miscible** substance is a liquid or gas that will evenly dissolve in another.

mg/m^3 means milligrams of a chemical in a cubic meter of air. It is a measure of concentration (weight/volume).

A **mutagen** is a substance that causes mutations. A **mutation** is a change in the genetic material in a body cell. Mutations can lead to birth defects, miscarriages, or cancer.

NAERG is the North American Emergency Response Guidebook. It was jointly developed by Transport Canada, the United States Department of Transportation and the Secretariat of Communications and Transportation of Mexico. It is a guide for first responders to quickly identify the specific or generic hazards of material involved in a transportation incident, and to protect themselves and the general public during the initial response phase of the incident.

NCI is the National Cancer Institute, a federal agency that determines the cancer-causing potential of chemicals.

NFPA is the National Fire Protection Association. It classifies substances according to their fire and explosion hazard.

NIOSH is the National Institute for Occupational Safety and Health. It tests equipment, evaluates and approves respirators, conducts studies of workplace hazards, and proposes standards to OSHA.

NTP is the National Toxicology Program which tests chemicals and reviews evidence for cancer.

OSHA is the Occupational Safety and Health Administration, which adopts and enforces health and safety standards.

PEL is the Permissible Exposure Limit which is enforceable by the Occupational Safety and Health Administration.

PIH is a DOT designation for chemicals which are Poison Inhalation Hazards.

ppm means parts of a substance per million parts of air. It is a measure of concentration by volume in air.

A **reactive** substance is a solid, liquid or gas that releases energy under certain conditions.

A **teratogen** is a substance that causes birth defects by damaging the fetus.

TLV is the Threshold Limit Value, the workplace exposure limit recommended by ACGIH.

The **vapor pressure** is a measure of how readily a liquid or a solid mixes with air at its surface. A higher vapor pressure indicates a higher concentration of the substance in air and therefore increases the likelihood of breathing it in.

>>>>>>>>>>>>>>>>>> EMERGENCY INFORMATION <<<<<<<<<<<<<<<<<<

Common Name: **BENZO(k)FLUORANTHENE**
DOT Number: **None**
NAERG Code: **No Citation**
CAS Number: **207-08-9**

Hazard rating	NJDHSS	NFPA
FLAMMABILITY	Not Found	Not Rated
REACTIVITY	Not Found	Not Rated
CARCINOGEN POISONOUS GASES ARE PRODUCED IN FIRE		

Hazard Rating Key: 0=minimal; 1=slight; 2=moderate; 3=serious; 4=severe

FIRE HAZARDS

* Use dry chemical, CO_2, water spray, or foam extinguishers.
* POISONOUS GASES ARE PRODUCED IN FIRE.
* If employees are expected to fight fires, they must be trained and equipped as stated in OSHA 1910.156.

SPILLS AND EMERGENCIES

If **Benzo(k)Fluoranthene** is spilled, take the following steps:

* Evacuate persons not wearing protective equipment from area of spill until clean-up is complete.
* Remove all ignition sources.
* Collect powdered material in the most convenient and safe manner and deposit in sealed containers.
* Ventilate and wash area after clean-up is complete.
* It may be necessary to contain and dispose of **Benzo(k)Fluoranthene** as a HAZARDOUS WASTE. Contact your state Department of Environmental Protection (DEP) or your regional office of the federal Environmental Protection Agency (EPA) for specific recommendations.
* If employees are required to clean-up spills, they must be properly trained and equipped. OSHA 1910.120(q) may be applicable.

FOR LARGE SPILLS AND FIRES immediately call your fire department. You can request emergency information from the following:

CHEMTREC: (800) 424-9300
NJDEP HOTLINE: 1-877-WARN-DEP

HANDLING AND STORAGE

* Prior to working with **Benzo(k)Fluoranthene** you should be trained on its proper handling and storage.
* **Benzo(k)Fluoranthene** is not compatible with OZONE; OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); NITROGEN; and SULFUR OXIDES.
* Store in tightly closed containers in a cool, well-ventilated area.

FIRST AID

For POISON INFORMATION call 1-800-222-1222

Eye Contact

* Immediately flush with large amounts of water for at least 15 minutes, occasionally lifting upper and lower lids.

Skin Contact

* Remove contaminated clothing. Wash contaminated skin with soap and water.

Breathing

* Remove the person from exposure.

PHYSICAL DATA

Vapor Pressure: 0 mm Hg at 68°F (20°C)
Water Solubility: Insoluble

OTHER COMMONLY USED NAMES

Chemical Name:
Benzo(k)Fluoranthene
Other Names:
8,9-Benzofluoranthene; B(k)F

NEW JERSEY DEPARTMENT OF HEALTH AND SENIOR SERVICES
Right to Know Program
PO Box 368, Trenton, NJ 08625-0368
(609) 984-2202

New Jersey Department of Health and Senior Services

HAZARDOUS SUBSTANCE FACT SHEET

Common Name: **BENZO(b)FLUORANTHENE**

CAS Number: 205-99-2
DOT Number: None

RTK Substance number: 0208
Date: September 1995 Revision: July 2001

HAZARD SUMMARY

* **Benzo(b)fluoranthene** can affect you when breathed in and may be absorbed through the skin.
* **Benzo(b)fluoranthene** is a CARCINOGEN--HANDLE WITH EXTREME CAUTION.
* Contact with **Benzo(b)fluoranthene** can cause skin and eye irritation.
* Because the major hazards associated with **Benzo(b)fluoranthene** come from exposure to *Coal Tar Pitch, CONSULT THE NEW JERSEY DEPARTMENT OF HEALTH AND SENIOR SERVICES HAZARDOUS SUBSTANCE FACT SHEET ON COAL TAR PITCH.*

IDENTIFICATION

Benzo(b)fluoranthene is a colorless, needle-shaped solid. It is used as a research chemical and is present in coal, and coke oven emissions, and petroleum products.

REASON FOR CITATION

* **Benzo(b)fluoranthene** is on the Hazardous Substance List because it is regulated by OSHA and cited by ACGIH, NIOSH, NTP, IARC, HHAG and EPA.
* This chemical is on the Special Health Hazard Substance List because it is a **CARCINOGEN**.
* Definitions are provided on page 5.

HOW TO DETERMINE IF YOU ARE BEING EXPOSED

The New Jersey Right to Know Act requires most employers to label chemicals in the workplace and requires public employers to provide their employees with information and training concerning chemical hazards and controls. The federal OSHA Hazard Communication Standard, 1910.1200, requires private employers to provide similar training and information to their employees.

* Exposure to hazardous substances should be routinely evaluated. This may include collecting personal and area air samples. You can obtain copies of sampling results from your employer. You have a legal right to this information under OSHA 1910.1020.
* If you think you are experiencing any work-related health problems, see a doctor trained to recognize occupational diseases. Take this Fact Sheet with you.

WORKPLACE EXPOSURE LIMITS

The following exposure limits are for **Benzo(b)fluoranthene** (measured as *Coal Tar Pitch volatiles*):

OSHA: The legal airborne permissible exposure limit (PEL) is **0.2 mg/m^3** averaged over an 8-hour workshift.

NIOSH: The recommended airborne exposure limit is **0.1 mg/m^3** averaged over a 10-hour workshift.

ACGIH: The recommended airborne exposure limit is **0.2 mg/m^3** averaged over an 8-hour workshift.

* **Benzo(b)fluoranthene** is a PROBABLE CARCINOGEN in humans. There may be no safe level of exposure to a carcinogen, so all contact should be reduced to the lowest possible level.
* The above exposure limits are for air levels only. When skin contact also occurs, you may be overexposed, even though air levels are less than the limits listed above.

WAYS OF REDUCING EXPOSURE

* Enclose operations and use local exhaust ventilation at the site of chemical release. If local exhaust ventilation or enclosure is not used, respirators should be worn.
* A regulated, marked area should be established where **Benzo(b)fluoranthene** is handled, used, or stored.
* Wear protective work clothing.
* Wash thoroughly immediately after exposure to **Benzo(b)fluoranthene** and at the end of the workshift.
* Post hazard and warning information in the work area. In addition, as part of an ongoing education and training effort, communicate all information on the health and safety hazards of **Benzo(b)fluoranthene** to potentially exposed workers.

This Fact Sheet is a summary source of information of all potential and most severe health hazards that may result from exposure. Duration of exposure, concentration of the substance and other factors will affect your susceptibility to any of the potential effects described below.

HEALTH HAZARD INFORMATION

Acute Health Effects

The following acute (short-term) health effects may occur immediately or shortly after exposure to **Benzo(b)fluoranthene**:

* Contact with **Benzo(b)fluoranthene** can cause skin and eye irritation.

Chronic Health Effects

The following chronic (long-term) health effects can occur at some time after exposure to **Benzo(b)fluoranthene** and can last for months or years:

Cancer Hazard

* **Benzo(b)fluoranthene** is a PROBABLE CARCINOGEN in humans. It has been shown to cause lung, liver and skin cancer in animals.
* Many scientists believe there is no safe level of exposure to a carcinogen. Such substances may also have the potential for causing reproductive damage in humans.

Reproductive Hazard

* According to the information presently available to the New Jersey Department of Health and Senior Services, **Benzo(b)fluoranthene** has not been tested for its ability to affect reproduction.

Other Long-Term Effects

* **Benzo(b)fluoranthene** has not been tested for other chronic (long-term) health effects.

MEDICAL

Medical Testing

There is no special test for this chemical. However, if illness occurs or overexposure is suspected, medical attention is recommended.

Examine your skin periodically for growths or changes in warts or moles. Skin cancers are usually easily curable when removed early.

Any evaluation should include a careful history of past and present symptoms with an exam. Medical tests that look for damage already done are not a substitute for controlling exposure.

Request copies of your medical testing. You have a legal right to this information under OSHA 1910.1020.

WORKPLACE CONTROLS AND PRACTICES

Unless a less toxic chemical can be substituted for a hazardous substance, **ENGINEERING CONTROLS** are the most effective way of reducing exposure. The best protection is to enclose operations and/or provide local exhaust ventilation at the site of chemical release. Isolating operations can also reduce exposure. Using respirators or protective equipment is less effective than the controls mentioned above, but is sometimes necessary.

In evaluating the controls present in your workplace, consider: (1) how hazardous the substance is, (2) how much of the substance is released into the workplace and (3) whether harmful skin or eye contact could occur. Special controls should be in place for highly toxic chemicals or when significant skin, eye, or breathing exposures are possible.

In addition, the following controls are recommended:

* Where possible, automatically transfer **Benzo(b)fluoranthene** from drums or other storage containers to process containers.
* A Class I, Type B, biological safety hood should be used when mixing, handling, or preparing **Benzo(b)fluoranthene**.

Good **WORK PRACTICES** can help to reduce hazardous exposures. The following work practices are recommended:

* Workers whose clothing has been contaminated by **Benzo(b)fluoranthene** should change into clean clothing promptly.
* Do not take contaminated work clothes home. Family members could be exposed.
* Contaminated work clothes should be laundered by individuals who have been informed of the hazards of exposure to **Benzo(b)fluoranthene**.
* Eye wash fountains should be provided in the immediate work area for emergency use.
* If there is the possibility of skin exposure, emergency shower facilities should be provided.
* On skin contact with **Benzo(b)fluoranthene**, immediately wash or shower to remove the chemical. At the end of the workshift, wash any areas of the body that may have contacted **Benzo(b)fluoranthene**, whether or not known skin contact has occurred.
* Do not eat, smoke, or drink where **Benzo(b)fluoranthene** is handled, processed, or stored, since the chemical can be swallowed. Wash hands carefully before eating, drinking, smoking, or using the toilet.
* Use a vacuum or a wet method to reduce dust during clean-up. DO NOT DRY SWEEP.
* When vacuuming, a high efficiency particulate air (HEPA) filter should be used, not a standard shop vacuum.

PERSONAL PROTECTIVE EQUIPMENT

WORKPLACE CONTROLS ARE BETTER THAN PERSONAL PROTECTIVE EQUIPMENT. However, for some jobs (such as outside work, confined space entry, jobs done only once in a while, or jobs done while workplace controls are being installed), personal protective equipment may be appropriate.

OSHA 1910.132 requires employers to determine the appropriate personal protective equipment for each hazard and to train employees on how and when to use protective equipment.

The following recommendations are only guidelines and may not apply to every situation.

Clothing

* Avoid skin contact with **Benzo(b)fluoranthene**. Wear protective gloves and clothing. Safety equipment suppliers/manufacturers can provide recommendations on the most protective glove/clothing material for your operation.
* All protective clothing (suits, gloves, footwear, headgear) should be clean, available each day, and put on before work.

Eye Protection

* Wear impact resistant eye protection with side shields or goggles.
* Wear a face shield along with goggles when working with corrosive, highly irritating or toxic substances.

Respiratory Protection

IMPROPER USE OF RESPIRATORS IS DANGEROUS. Such equipment should only be used if the employer has a written program that takes into account workplace conditions, requirements for worker training, respirator fit testing and medical exams, as described in OSHA 1910.134.

* Where the potential exists for exposure over **0.1 mg/m^3** (as *Coal Tar Pitch volatiles*), use a MSHA/NIOSH approved supplied-air respirator with a full facepiece operated in a pressure-demand or other positive-pressure mode. For increased protection use in combination with an auxiliary self-contained breathing apparatus operated in a pressure-demand or other positive-pressure mode.
* Exposure to **80 mg/m^3** (as *Coal Tar Pitch volatiles*) is immediately dangerous to life and health. If the possibility of exposure above **80 mg/m^3** (as *Coal Tar Pitch volatiles*) exists, use a MSHA/NIOSH approved self-contained breathing apparatus with a full facepiece operated in a pressure-demand or other positive-pressure mode.

QUESTIONS AND ANSWERS

Q: If I have acute health effects, will I later get chronic health effects?
A: Not always. Most chronic (long-term) effects result from repeated exposures to a chemical.

Q: Can I get long-term effects without ever having short-term effects?
A: Yes, because long-term effects can occur from repeated exposures to a chemical at levels not high enough to make you immediately sick.

Q: What are my chances of getting sick when I have been exposed to chemicals?
A: The likelihood of becoming sick from chemicals is increased as the amount of exposure increases. This is determined by the length of time and the amount of material to which someone is exposed.

Q: When are higher exposures more likely?
A: Conditions which increase risk of exposure include dust releasing operations (grinding, mixing, blasting, dumping, etc.), other physical and mechanical processes (heating, pouring, spraying, spills and evaporation from large surface areas such as open containers), and "confined space" exposures (working inside vats, reactors, boilers, small rooms, etc.).

Q: Is the risk of getting sick higher for workers than for community residents?
A: Yes. Exposures in the community, except possibly in cases of fires or spills, are usually much lower than those found in the workplace. However, people in the community may be exposed to contaminated water as well as to chemicals in the air over long periods. This may be a problem for children or people who are already ill.

Q: Don't all chemicals cause cancer?
A: No. Most chemicals tested by scientists are not cancer-causing.

Q: Should I be concerned if a chemical causes cancer in animals?
A: Yes. Most scientists agree that a chemical that causes cancer in animals should be treated as a suspected human carcinogen unless proven otherwise.

Q: But don't they test animals using much higher levels of a chemical than people usually are exposed to?
A: Yes. That's so effects can be seen more clearly using fewer animals. But high doses alone don't cause cancer unless it's a cancer agent. In fact, a chemical that causes cancer in animals at high doses could cause cancer in humans exposed to low doses.

The following information is available from:

New Jersey Department of Health and Senior Services
Occupational Health Service
PO Box 360
Trenton, NJ 08625-0360
(609) 984-1863
(609) 292-5677 (fax)

Web address: http://www.state.nj.us/health/eoh/odisweb/

Industrial Hygiene Information

Industrial hygienists are available to answer your questions regarding the control of chemical exposures using exhaust ventilation, special work practices, good housekeeping, good hygiene practices, and personal protective equipment including respirators. In addition, they can help to interpret the results of industrial hygiene survey data.

Medical Evaluation

If you think you are becoming sick because of exposure to chemicals at your workplace, you may call personnel at the Department of Health and Senior Services, Occupational Health Service, who can help you find the information you need.

Public Presentations

Presentations and educational programs on occupational health or the Right to Know Act can be organized for labor unions, trade associations and other groups.

Right to Know Information Resources

The Right to Know Infoline (609) 984-2202 can answer questions about the identity and potential health effects of chemicals, list of educational materials in occupational health, references used to prepare the Fact Sheets, preparation of the Right to Know Survey, education and training programs, labeling requirements, and general information regarding the Right to Know Act. Violations of the law should be reported to (609) 984-2202.

DEFINITIONS

ACGIH is the American Conference of Governmental Industrial Hygienists. It recommends upper limits (called TLVs) for exposure to workplace chemicals.

A **carcinogen** is a substance that causes cancer.

The **CAS number** is assigned by the Chemical Abstracts Service to identify a specific chemical.

A **combustible** substance is a solid, liquid or gas that will burn.

A **corrosive** substance is a gas, liquid or solid that causes irreversible damage to human tissue or containers.

DEP is the New Jersey Department of Environmental Protection.

DOT is the Department of Transportation, the federal agency that regulates the transportation of chemicals.

EPA is the Environmental Protection Agency, the federal agency responsible for regulating environmental hazards.

A **fetus** is an unborn human or animal.

A **flammable** substance is a solid, liquid, vapor or gas that will ignite easily and burn rapidly.

The **flash point** is the temperature at which a liquid or solid gives off vapor that can form a flammable mixture with air.

HHAG is the Human Health Assessment Group of the federal EPA.

IARC is the International Agency for Research on Cancer, a scientific group that classifies chemicals according to their cancer-causing potential.

A **miscible** substance is a liquid or gas that will evenly dissolve in another.

mg/m^3 means milligrams of a chemical in a cubic meter of air. It is a measure of concentration (weight/volume).

MSHA is the Mine Safety and Health Administration, the federal agency that regulates mining. It also evaluates and approves respirators.

A **mutagen** is a substance that causes mutations. A **mutation** is a change in the genetic material in a body cell. Mutations can lead to birth defects, miscarriages, or cancer.

NAERG is the North American Emergency Response Guidebook. It was jointly developed by Transport Canada, the United States Department of Transportation and the Secretariat of Communications and Transportation of Mexico. It is a guide for first responders to quickly identify the specific or generic hazards of material involved in a transportation incident, and to protect themselves and the general public during the initial response phase of the incident.

NCI is the National Cancer Institute, a federal agency that determines the cancer-causing potential of chemicals.

NFPA is the National Fire Protection Association. It classifies substances according to their fire and explosion hazard.

NIOSH is the National Institute for Occupational Safety and Health. It tests equipment, evaluates and approves respirators, conducts studies of workplace hazards, and proposes standards to OSHA.

NTP is the National Toxicology Program which tests chemicals and reviews evidence for cancer.

OSHA is the Occupational Safety and Health Administration, which adopts and enforces health and safety standards.

PEOSHA is the Public Employees Occupational Safety and Health Act, a state law which sets PELs for New Jersey public employees.

PIH is a DOT designation for chemicals which are Poison Inhalation Hazards.

ppm means parts of a substance per million parts of air. It is a measure of concentration by volume in air.

A **reactive** substance is a solid, liquid or gas that releases energy under certain conditions.

A **teratogen** is a substance that causes birth defects by damaging the fetus.

TLV is the Threshold Limit Value, the workplace exposure limit recommended by ACGIH.

The **vapor pressure** is a measure of how readily a liquid or a solid mixes with air at its surface. A higher vapor pressure indicates a higher concentration of the substance in air and therefore increases the likelihood of breathing it in.

>>>>>>>>>>>>>>>>>> EMERGENCY INFORMATION <<<<<<<<<<<<<<<<<

Common Name: **BENZO(b)FLUORANTHENE**
DOT Number: **None**
NAERG Code: **No Citation**
CAS Number: **205-99-2**

Hazard rating	NJDHSS	NFPA
FLAMMABILITY	Not Found	Not Rated
REACTIVITY	Not Found	Not Rated
CARCINOGEN POISONOUS GASES ARE PRODUCED IN FIRE		

Hazard Rating Key: 0=minimal; 1=slight; 2=moderate; 3=serious; 4=severe

FIRE HAZARDS

* **Benzo(b)fluoranthene** may burn, but does not readily ignite.
* Use dry chemical, CO_2, water spray, alcohol or polymer foam extinguishers.
* POISONOUS GASES ARE PRODUCED IN FIRE.
* If employees are expected to fight fires, they must be trained and equipped as stated in OSHA 1910.156.

SPILLS AND EMERGENCIES

If **Benzo(b)fluoranthene** is spilled, take the following steps:

* Evacuate persons not wearing protective equipment from area of spill until clean-up is complete.
* Collect powdered material in the most convenient and safe manner and deposit in sealed containers.
* Ventilate and wash area after clean-up is complete.
* It may be necessary to contain and dispose of **Benzo(b)fluoranthene** as a HAZARDOUS WASTE. Contact your state Department of Environmental Protection (DEP) or your regional office of the federal Environmental Protection Agency (EPA) for specific recommendations.
* If employees are required to clean-up spills, they must be properly trained and equipped. OSHA 1910.120(q) may be applicable.

FOR LARGE SPILLS AND FIRES immediately call your fire department. You can request emergency information from the following:

CHEMTREC: (800) 424-9300
NJDEP HOTLINE: 1-877-WARN-DEP

HANDLING AND STORAGE

* Prior to working with **Benzo(b)fluoranthene** you should be trained on its proper handling and storage.
* A regulated, marked area should be established where **Benzo(b)fluoranthene** is handled, used, or stored.
* **Benzo(b)fluoranthene** is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); OZONE; NITROGEN OXIDES; and SULFUR OXIDES.
* Store in tightly closed containers in a cool, well-ventilated area.

FIRST AID

In NJ, for POISON INFORMATION call 1-800-764-7661

Eye Contact
* Immediately flush with large amounts of water for at least 15 minutes, occasionally lifting upper and lower lids.

Skin Contact
* Quickly remove contaminated clothing. Immediately wash contaminated skin with large amounts of soap and water.

Breathing
* Remove the person from exposure.
* Begin rescue breathing (using universal precautions) if breathing has stopped and CPR if heart action has stopped.
* Transfer promptly to a medical facility.

PHYSICAL DATA

Vapor Pressure: 5×10^{-7} mm Hg at 68°F (20°C)
Water Solubility: Insoluble

OTHER COMMONLY USED NAMES

Chemical Name:
Benz(e)acephenanthrylene
Other Names:
2,3-Benzfluoranthene; 3,4-Benzfluoranthene; B(b)F

NEW JERSEY DEPARTMENT OF HEALTH AND SENIOR SERVICES
Right to Know Program
PO Box 368, Trenton, NJ 08625-0368
(609) 984-2202 H4985

Right to Know
Hazardous Substance Fact Sheet

Common Name: **BENZO(a)PYRENE**

Synonyms: 3,4-Benzopyrene; B[a]P

Chemical Name: Benzo[a]pyrene

Date: July 1998 Revision: October 2007

CAS Number: 50-32-8

RTK Substance Number: 0207

DOT Number: UN 3077

EMERGENCY RESPONDERS >>>> SEE PAGE 6

Description and Use

Benzo(a)pyrene is a pale yellow, crystalline solid or powder with a faint aromatic odor. In its pure form it is used as a laboratory reagent. It also forms as a gaseous by-product when certain carbon substances burn, such as coal tar chemicals, and is found in cigarette smoke.

Hazard Summary

Hazard Rating	NJDHSS	NFPA
HEALTH	3	-
FLAMMABILITY	1	-
REACTIVITY	0	-

CARCINOGEN
POISONOUS GASES ARE PRODUCED IN FIRE

Hazard Rating Key: 0=minimal; 1=slight; 2=moderate; 3=serious; 4=severe

Reasons for Citation

- **Benzo(a)pyrene** is on the Right to Know Hazardous Substance List because it is cited by OSHA, ACGIH, DOT, NIOSH, NTP, DEP, IARC, IRIS, and EPA.
- This chemical is on the Special Health Hazard Substance List.

- **Benzo(a)pyrene** can affect you when inhaled and by passing through the skin.
- **Benzo(a)pyrene** is a CARCINOGEN. HANDLE WITH EXTREME CAUTION.
- **Benzo(a)pyrene** may damage the developing fetus.
- Contact can irritate and burn the eyes.
- **Benzo(a)pyrene** can irritate the skin causing a rash or burning feeling on contact.
- Repeated exposure can cause thickening and darkening of the skin.
- Except in laboratories, **Benzo(a)pyrene** is usually found mixed with other "coal tar pitch" chemicals.
- *For more information, consult the Right to Know Hazardous Substance Fact Sheets on COAL TAR PITCH, CREOSOTE, CHRYSENE, and ANTHRACENE.*

SEE GLOSSARY ON PAGE 5.

FIRST AID

Eye Contact

- Immediately flush with large amounts of water for at least 15 minutes, lifting upper and lower lids. Remove contact lenses, if worn, while rinsing.

Skin Contact

- Remove contaminated clothing. Wash contaminated skin with soap and water.

Inhalation

- Remove the person from exposure.
- Transfer promptly to a medical facility.

EMERGENCY NUMBERS

Poison Control: 1-800-222-1222

CHEMTREC: 1-800-424-9300

NJDEP Hotline: 1-877-927-6337

National Response Center: 1-800-424-8802

Workplace Exposure Limits

OSHA: The legal airborne permissible exposure limit (PEL) is **0.2 mg/m^3** (as *Coal Tar Pitch Volatiles*) averaged over an 8-hour workshift.

NIOSH: The recommended airborne exposure limit (REL) is **0.1 mg/m^3** (as the *Cyclohexane-extractable fraction*) averaged over a 10-hour workshift.

ACGIH: Recommends that exposure by all routes be controlled to levels as low as possible.

- **Benzo(a)pyrene** is a PROBABLE CARCINOGEN in humans. There may be no safe level of exposure to a carcinogen, so all contact should be reduced to the lowest possible level.
- The above exposure limits are for air levels only. When skin contact also occurs, you may be overexposed, even though air levels are less than the limits listed above.

Determining Your Exposure

- Read the product manufacturer's Material Safety Data Sheet (MSDS) and the label to determine product ingredients and important safety and health information about the product mixture.
- For each individual hazardous ingredient, read the New Jersey Department of Health and Senior Services Hazardous Substance Fact Sheet, available on the RTK Program website (www.nj.gov/health/eoh/rtkweb) or in your facility's RTK Central File or Hazard Communication Standard file.
- You have a right to this information under the New Jersey Worker and Community Right to Know Act, the Public Employees Occupational Safety and Health (PEOSH) Act if you are a public worker in New Jersey, and under the federal Occupational Safety and Health Act (OSHA) if you are a private worker.
- The New Jersey Right to Know Act requires most employers to label chemicals in the workplace and requires public employers to provide their employees with information concerning chemical hazards and controls. The federal OSHA Hazard Communication Standard (29 CFR 1910.1200) and the PEOSH Hazard Communication Standard (N.J.A.C. 12:100-7) require employers to provide similar information and training to their employees.

This Fact Sheet is a summary of available information regarding the health hazards that may result from exposure. Duration of exposure, concentration of the substance and other factors will affect your susceptibility to any of the potential effects described below.

Health Hazard Information

Acute Health Effects
The following acute (short-term) health effects may occur immediately or shortly after exposure to **Benzo(a)pyrene**:

- Contact can irritate and burn the eyes.
- **Benzo(a)pyrene** can irritate the skin causing a rash or burning feeling on contact. Exposure to a combination of sunlight and this chemical can increase these effects.

Chronic Health Effects
The following chronic (long-term) health effects can occur at some time after exposure to **Benzo(a)pyrene** and can last for months or years:

Cancer Hazard
- **Benzo(a)pyrene** is a PROBABLE CARCINOGEN in humans. There is some evidence that is causes stomach, skin, lung, blood, spleen, pancreas, and mammary cancer in animals.
- Many scientists believe there is no safe level of exposure to a carcinogen.

Reproductive Hazard
- **Benzo(a)pyrene** may damage the developing fetus.
- There is limited evidence that **Benzo(a)pyrene** may damage the male and female reproductive systems.

Other Effects
- Repeated exposure can cause thickening and darkening of the skin and warts.

Medical

Medical Testing
There is no special test for this chemical. However, seek medical attention if illness occurs or overexposure is suspected.

Any evaluation should include a careful history of past and present symptoms with an exam. Medical tests that look for damage already done are not a substitute for controlling exposure.

Request copies of your medical testing. You have a legal right to this information under the OSHA Access to Employee Exposure and Medical Records Standard (29 CFR 1910.1020).

Mixed Exposures
- Sunlight may cause a rash to develop in people exposed to **Benzo(a)pyrene** and increases the risk of skin cancer.
- Tobacco smoke also contains **Benzo(a)pyrene**. Smoking may increase the risk of lung cancer with exposure to **Benzo(a)pyrene.**

Workplace Controls and Practices

Very toxic chemicals, or those that are reproductive hazards or sensitizers, require expert advice on control measures if a less toxic chemical cannot be substituted. Control measures include: (1) enclosing chemical processes for severely irritating and corrosive chemicals, (2) using local exhaust ventilation for chemicals that may be harmful with a single exposure, and (3) using general ventilation to control exposures to skin and eye irritants. For further information on workplace controls, consult the NIOSH document on Control Banding at www.cdc.gov/niosh/topics/ctrlbanding/.

The following work practices are also recommended:

- Label process containers.
- Provide employees with hazard information and training.
- Monitor airborne chemical concentrations.
- Use engineering controls if concentrations exceed recommended exposure levels.
- Provide eye wash fountains and emergency showers.
- Wash or shower if skin comes in contact with a hazardous material.
- Always wash at the end of the workshift.
- Change into clean clothing if clothing becomes contaminated.
- Do not take contaminated clothing home.
- Get special training to wash contaminated clothing.

- Do not eat, smoke, or drink in areas where chemicals are being handled, processed or stored.
- Wash hands carefully before eating, smoking, drinking, applying cosmetics or using the toilet.

In addition, the following may be useful or required:

- Use a Class I, Type B, biological safety hood when working with **Benzo(a)pyrene** in a laboratory.
- Use a vacuum or a wet method to reduce dust during clean-up. DO NOT DRY SWEEP.
- Use a high efficiency particulate air (HEPA) filter when vacuuming. Do not use a standard shop vacuum.

Personal Protective Equipment

The OSHA Personal Protective Equipment Standard (29 CFR 1910.132) requires employers to determine the appropriate personal protective equipment for each hazard and to train employees on how and when to use protective equipment.

The following recommendations are only guidelines and may not apply to every situation.

Gloves and Clothing

- Avoid skin contact with **Benzo(a)pyrene**. Wear personal protective equipment made from material which can not be permeated or degraded by this substance. Safety equipment suppliers and manufacturers can provide recommendations on the most protective glove and clothing material for your operation.
- Safety equipment manufacturers recommend DuPont *Tychem® CPF-2, SL, CPF-4* and *Responder®* as protective materials for clothing.
- All protective clothing (suits, gloves, footwear, headgear) should be clean, available each day, and put on before work.

Eye Protection

- Wear eye protection with side shields or goggles.
- Do not wear contact lenses when working with this substance.

Respiratory Protection

Improper use of respirators is dangerous. Respirators should only be used if the employer has a written program that takes into account workplace conditions, requirements for worker training, respirator fit testing, and medical exams, as described in the OSHA Respiratory Protection Standard (29 CFR 1910.134).

- Where the potential exists for exposure over **0.1 mg/m^3**, use a NIOSH approved supplied-air respirator with a full facepiece operated in a pressure-demand or other positive-pressure mode. For increased protection use in combination with an auxiliary self-contained breathing apparatus operated in a pressure-demand or other positive-pressure mode.
- Exposure to **80 mg/m^3** (as *Coal Tar Pitch Volatiles*) is immediately dangerous to life and health. If the possibility of exposure above **80 mg/m^3** (as *Coal Tar Pitch Volatiles*) exists, use a NIOSH approved self-contained breathing apparatus with a full facepiece operated in a pressure-demand or other positive-pressure mode equipped with an emergency escape air cylinder.

Fire Hazards

If employees are expected to fight fires, they must be trained and equipped as stated in the OSHA Fire Brigades Standard (29 CFR 1910.156).

- **Benzo(a)pyrene** may burn, but does not readily ignite.
- Use dry chemical, CO_2, water spray or foam as extinguishing agents.
- POISONOUS GASES ARE PRODUCED IN FIRE.

Spills and Emergencies

If employees are required to clean-up spills, they must be properly trained and equipped. The OSHA Hazardous Waste Operations and Emergency Response Standard (29 CFR 1910.120) may apply.

If **Benzo(a)pyrene** is spilled, take the following steps:

- Evacuate personnel and secure and control entrance to the area.
- Eliminate all ignition sources.
- Moisten spilled material first to reduce dust or use a HEPA-filter vacuum for clean-up.
- Ventilate and wash area after clean-up is complete.
- It may be necessary to contain and dispose of **Benzo(a)pyrene** as a HAZARDOUS WASTE. Contact your state Department of Environmental Protection (DEP), Nuclear Regulatory Commission (NRC) or your regional office of the federal Environmental Protection Agency (EPA) for specific recommendations.

Handling and Storage

Prior to working with **Benzo(a)pyrene** you should be trained on its proper handling and storage.

- A regulated, marked area should be established where **Benzo(a)pyrene** is handled, used, or stored.
- **Benzo(a)pyrene** reacts with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE).
- Store in tightly closed containers in a cool, well-ventilated area.
- Sources of ignition, such as smoking and open flames, are prohibited where **Benzo(a)pyrene** is used, handled, or stored in a manner that could create a potential fire or explosion hazard.

Occupational Health Information Resources

The New Jersey Department of Health and Senior Services, Occupational Health Service, offers multiple services in occupational health. These services include providing informational resources, educational materials, public presentations, and industrial hygiene and medical investigations and evaluations.

For more information, please contact:

New Jersey Department of Health & Senior Services
Right to Know Program
PO Box 368
Trenton, NJ 08625-0368
Phone: 609-984-2202
Fax: 609-984-7407
E-mail: rtk@doh.state.nj.us
Web address: http://www.nj.gov/health/eoh/rtkweb

GLOSSARY

ACGIH is the American Conference of Governmental Industrial Hygienists. They publish guidelines called Threshold Limit Values (TLVs) for exposure to workplace chemicals.

Acute Exposure Guideline Levels (AEGLs) are established by the EPA. They describe the risk to humans resulting from once-in-a lifetime, or rare, exposure to airborne chemicals.

Boiling point is the temperature at which a substance can change its physical state from a liquid to a gas.

A **carcinogen** is a substance that causes cancer.

The **CAS number** is unique, identifying number, assigned by the Chemical Abstracts Service, to a specific chemical.

CFR is the Code of Federal Regulations, which are the regulations of the United States government.

A **combustible** substance is a solid, liquid or gas that will burn.

A **corrosive** substance is a gas, liquid or solid that causes destruction of human skin or severe corrosion of containers.

DEP is the New Jersey Department of Environmental Protection.

DOT is the Department of Transportation, the federal agency that regulates the transportation of chemicals.

EPA is the Environmental Protection Agency, the federal agency responsible for regulating environmental hazards.

ERG is the Emergency Response Guidebook. It is a guide for emergency responders for transportation emergencies involving hazardous substances.

Emergency Response Planning Guideline (ERPG) values are intended to provide estimates of concentration ranges where one reasonably might anticipate observing adverse effects.

A **fetus** is an unborn human or animal.

A **flammable** substance is a solid, liquid, vapor or gas that will ignite easily and burn rapidly.

The **flash point** is the temperature at which a liquid or solid gives off vapor that can form a flammable mixture with air.

IARC is the International Agency for Research on Cancer, a scientific group.

Ionization Potential is the amount of energy needed to remove an electron from an atom or molecule. It is measured in electron volts.

IRIS is the Integrated Risk Information System database maintained by federal EPA. The database contains information on human health effects that may result from exposure to various chemicals in the environment.

LEL or **Lower Explosive Limit**, is the lowest concentration of a combustible substance (gas or vapor) in the air capable of continuing an explosion.

mg/m^3 means milligrams of a chemical in a cubic meter of air. It is a measure of concentration (weight/volume).

A **mutagen** is a substance that causes mutations. A **mutation** is a change in the genetic material in a body cell. Mutations can lead to birth defects, miscarriages, or cancer.

NFPA is the National Fire Protection Association. It classifies substances according to their fire and explosion hazard.

NIOSH is the National Institute for Occupational Safety and Health. It tests equipment, evaluates and approves respirators, conducts studies of workplace hazards, and proposes standards to OSHA.

NTP is the National Toxicology Program which tests chemicals and reviews evidence for cancer.

OSHA is the federal Occupational Safety and Health Administration, which adopts and enforces health and safety standards.

PEOSHA is the New Jersey Public Employees Occupational Safety and Health Act, which adopts and enforces health and safety standards in public workplaces.

Permeated is the movement of chemicals through protective materials.

PIH is a DOT designation for chemicals which are Poison Inhalation Hazards.

ppm means parts of a substance per million parts of air. It is a measure of concentration by volume in air.

A **reactive** substance is a solid, liquid or gas that releases energy under certain conditions.

STEL is a Short Term Exposure Limit which is usually a 15-minute exposure that should not be exceeded at any time during a work day.

A **teratogen** is a substance that causes birth defects by damaging the fetus.

UEL or **Upper Explosive Limit** is the highest concentration in air above which there is too much fuel (gas or vapor) to begin a reaction or explosion.

Vapor Density is the ratio of the weight of a given volume of one gas to the weight of another (usually *Hydrogen*), at the same temperature and pressure.

The **vapor pressure** is a measure of how readily a liquid or a solid mixes with air at its surface. A higher vapor pressure indicates a higher concentration of the substance in air and therefore increases the likelihood of breathing it in.

Common Name: **BENZO(a)PYRENE**

Synonyms: 3,4-Benzopyrene; B[a]P
CAS No: 50-32-8
Molecular Formula: $C_{20}H_{12}$
RTK Substance No: 0207
Description: Pale yellow, crystalline solid or powder

HAZARD DATA

Hazard Rating	Firefighting	Reactivity
3 - Health **1 - Fire** **0 - Reactivity** **DOT#:** UN 3077 **ERG Guide #:** 171 **Hazard Class:** 9 (Miscellaneous Hazardous Materials)	**Benzo(a)pyrene** may burn, but does not readily ignite. Use dry chemical, CO_2, water spray or foam as extinguishing agents. POISONOUS GASES ARE PRODUCED IN FIRE.	**Benzo(a)pyrene** reacts with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE) to cause fires and explosions.

SPILL/LEAKS

Isolation Distance: 50 meters (150 feet)

Moisten spilled material first or use a HEPA-filter vacuum for clean-up.

Toxic to aquatic organisms.

PHYSICAL PROPERTIES

Odor Threshold:	Faint aromatic odor
Flash Point:	No information
Specific Gravity:	1.35
Vapor Density:	8.7 (air = 1)
Vapor Pressure:	5.49 X 10^9 mm Hg at 77°F (25°C)
Water Solubility:	Insoluble
Boiling Point:	590° - 594°F (310° - 312°C)
Melting Point:	347° - 354 F (175 ° - 179°C)

EXPOSURE LIMITS

OSHA:	0.2 mg/m^3, 8-hr TWA
NIOSH:	0.1 mg/m^3, 10-hr TWA
ACGIH:	lowest level possible
IDLH LEVEL:	80 mg/m^3 (as *Coal Tar Pitch Volatiles*)

PROTECTIVE EQUIPMENT

Gloves:	No information
Coveralls:	DuPont Tychem®, CPF-2, SL, CPF-4, Responder® (all >8-hr permeation time)
Boots:	No information
Respirator:	>0.1 mg/m^3 - Supplied air

HEALTH EFFECTS

Eyes:	Irritation and burns
Skin:	Irritation, rash and burning feeling
Chronic:	Cancer (stomach, skin, lung, blood, spleen, pancreas, and mammary) in animals. May affect the developing fetus Thickening and darkening of the skin and warts

FIRST AID AND DECONTAMINATION

Remove the person from exposure.

Flush eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.

Remove contaminated clothing and wash contaminated skin with soap and water.

Transfer to a medical facility.

Right to Know

Hazardous Substance Fact Sheet

Common Name: **BENZ(a)ANTHRACENE**

Synonyms: Naphthanthracene; Tetraphene

Chemical Name: Benz[a]Anthracene

Date: September 1998 Revision: August 2008

CAS Number: 56-55-3

RTK Substance Number: 0193

DOT Number: UN 3077

EMERGENCY RESPONDERS >>>> SEE PAGE 6

Description and Use

Benz(a)Anthracene is an odorless, colorless to yellow brown flake, plate or powder. It is not produced commercially, but is used in research laboratories. It is also found in *Coal Tar*, roasted coffee, smoked foods, and automobile exhaust, and is formed as an intermediate during chemical manufacturing.

Hazard Summary

Hazard Rating	NJDHSS	NFPA
HEALTH	3	-
FLAMMABILITY	1	-
REACTIVITY	0	-

CARCINOGEN
POISONOUS GASES ARE PRODUCED IN FIRE

Hazard Rating Key: 0=minimal; 1=slight; 2=moderate; 3=serious; 4=severe

Reasons for Citation

- **Benz(a)Anthracene** is on the Right to Know Hazardous Substance List because it is cited by OSHA, ACGIH, DOT, NIOSH, NTP, DEP, IARC, IRIS and EPA.
- This chemical is on the Special Health Hazard Substance List.

- **Benz(a)Anthracene** can affect you when inhaled.
- **Benz(a)Anthracene** should be handled as a CARCINOGEN and MUTAGEN--WITH EXTREME CAUTION.
- *For more information, consult the Right to Know Hazardous Substance Fact Sheet on COAL TAR PITCH.*

Workplace Exposure Limits

OSHA: The legal airborne permissible exposure limit (PEL) is **0.2 mg/m^3** (as *Coal Tar Pitch Volatiles, Benzene-soluble fraction*) averaged over an 8-hour workshift.

NIOSH: The recommended airborne exposure limit (REL) is **0.1 mg/m^3** (as *Coal Tar Pitch Volatiles, Cyclohexane-extractable fraction*) averaged over a 10-hour workshift.

ACGIH: Recommends that exposure by all routes be controlled to levels as low as possible.

- **Benz(a)Anthracene** is a PROBABLE CARCINOGEN in humans. There may be no safe level of exposure to a carcinogen, so all contact should be reduced to the lowest possible level.

SEE GLOSSARY ON PAGE 5.

FIRST AID

Eye Contact

- Immediately flush with large amounts of water for at least 15 minutes, lifting upper and lower lids. Remove contact lenses, if worn, while rinsing.

Skin Contact

- Remove contaminated clothing and wash contaminated skin with soap and water.

Inhalation

- Remove the person from exposure.
- Transfer promptly to a medical facility.

EMERGENCY NUMBERS

Poison Control: 1-800-222-1222

CHEMTREC: 1-800-424-9300

NJDEP Hotline: 1-877-927-6337

National Response Center: 1-800-424-8802

Determining Your Exposure

- Read the product manufacturer's Material Safety Data Sheet (MSDS) and the label to determine product ingredients and important safety and health information about the product mixture.
- For each individual hazardous ingredient, read the New Jersey Department of Health and Senior Services Hazardous Substance Fact Sheet, available on the RTK Program website (www.nj.gov/health/eoh/rtkweb) or in your facility's RTK Central File or Hazard Communication Standard file.
- You have a right to this information under the New Jersey Worker and Community Right to Know Act, the Public Employees Occupational Safety and Health (PEOSH) Act if you are a public worker in New Jersey, and under the federal Occupational Safety and Health Act (OSHA) if you are a private worker.
- The New Jersey Right to Know Act requires most employers to label chemicals in the workplace and requires public employers to provide their employees with information concerning chemical hazards and controls. The federal OSHA Hazard Communication Standard (29 CFR 1910.1200) and the PEOSH Hazard Communication Standard (N.J.A.C. 12:100-7) require employers to provide similar information and training to their employees.

This Fact Sheet is a summary of available information regarding the health hazards that may result from exposure. Duration of exposure, concentration of the substance and other factors will affect your susceptibility to any of the potential effects described below.

Health Hazard Information

Acute Health Effects
The following acute (short-term) health effects may occur immediately or shortly after exposure to **Benz(a)Anthracene**:

- No acute (short-term) health effects are known at this time.

Chronic Health Effects
The following chronic (long-term) health effects can occur at some time after exposure to **Benz(a)Anthracene** and can last for months or years:

Cancer Hazard
- **Benz(a)Anthracene** is a PROBABLE CARCINOGEN in humans. There is evidence that it causes cancer in humans and it has been shown to cause liver and lung cancer in animals.
- Many scientists believe there is no safe level of exposure to a carcinogen. Such substance may also have the potential for causing reproductive damage in humans.

Reproductive Hazard
- According to the information presently available to the New Jersey Department of Health and Senior Services, **Benz(a)Anthracene** has not been tested for its ability to affect reproduction.

Other Effects
- No chronic (long-term) health effects are known at this time.

Medical

Medical Testing
There is no special test for this chemical. However, seek medical attention if illness occurs or overexposure is suspected.

Any evaluation should include a careful history of past and present symptoms with an exam. Medical tests that look for damage already done are not a substitute for controlling exposure.

Request copies of your medical testing. You have a legal right to this information under the OSHA Access to Employee Exposure and Medical Records Standard (29 CFR 1910.1020).

Workplace Controls and Practices

Very toxic chemicals, or those that are reproductive hazards or sensitizers, require expert advice on control measures if a less toxic chemical cannot be substituted. Control measures include: (1) enclosing chemical processes for severely irritating and corrosive chemicals, (2) using local exhaust ventilation for chemicals that may be harmful with a single exposure, and (3) using general ventilation to control exposures to skin and eye irritants. For further information on workplace controls, consult the NIOSH document on Control Banding at www.cdc.gov/niosh/topics/ctrlbanding/.

The following work practices are also recommended:

- Label process containers.
- Provide employees with hazard information and training.
- Monitor airborne chemical concentrations.
- Use engineering controls if concentrations exceed recommended exposure levels.
- Provide eye wash fountains and emergency showers.
- Wash or shower if skin comes in contact with a hazardous material.
- Always wash at the end of the workshift.
- Change into clean clothing if clothing becomes contaminated.
- Do not take contaminated clothing home.
- Get special training to wash contaminated clothing.
- Do not eat, smoke, or drink in areas where chemicals are being handled, processed or stored.
- Wash hands carefully before eating, smoking, drinking, applying cosmetics or using the toilet.

In addition, the following may be useful or required:

- Use a Class I, Type B, biological safety hood when mixing, handling, or preparing **Benz(a)Anthracene**.
- Use a vacuum or a wet method to reduce dust during clean-up. DO NOT DRY SWEEP.
- Use a high efficiency particulate air (HEPA) filter when vacuuming. Do not use a standard shop vacuum.

Personal Protective Equipment

The OSHA Personal Protective Equipment Standard (29 CFR 1910.132) requires employers to determine the appropriate personal protective equipment for each hazard and to train employees on how and when to use protective equipment.

The following recommendations are only guidelines and may not apply to every situation.

Gloves and Clothing

- Avoid skin contact with **Benz(a)Anthracene**. Wear personal protective equipment made from material that can not be permeated or degraded by this substance. Safety equipment suppliers and manufacturers can provide recommendations on the most protective glove and clothing material for your operation.
- Safety equipment manufacturers recommend Nitrile or Natural Rubber for gloves and DuPont Tyvek®, or the equivalent, as a protective material for clothing.

Eye Protection

- Wear eye protection with side shields or goggles.

Respiratory Protection

Improper use of respirators is dangerous. Respirators should only be used if the employer has implemented a written program that takes into account workplace conditions, requirements for worker training, respirator fit testing, and medical exams, as described in the OSHA Respiratory Protection Standard (29 CFR 1910.134).

- Where the potential exists for exposure over **0.1 mg/m^3** (as *Coal Tar Pitch Volatiles*), use a NIOSH approved supplied-air respirator with a full facepiece operated in a pressure-demand or other positive-pressure mode. For increased protection use in combination with an auxiliary self-contained breathing apparatus operated in a pressure-demand or other positive-pressure mode.
- Exposure to **80 mg/m^3** (as *Coal Tar Pitch Volatiles*) is immediately dangerous to life and health. If the possibility of exposure above **80 mg/m^3** exists, use a NIOSH approved self-contained breathing apparatus with a full facepiece operated in a pressure-demand or other positive-pressure mode equipped with an emergency escape air cylinder.

Fire Hazards

If employees are expected to fight fires, they must be trained and equipped as stated in the OSHA Fire Brigades Standard (29 CFR 1910.156).

- **Benz(a)Anthracene** may burn, but does not readily ignite.
- Use dry chemical, CO_2, water spray or foam as extinguishing agents.
- POISONOUS GASES ARE PRODUCED IN FIRE.
- Use water spray to keep fire-exposed containers cool.

Spills and Emergencies

If employees are required to clean-up spills, they must be properly trained and equipped. The OSHA Hazardous Waste Operations and Emergency Response Standard (29 CFR 1910.120) may apply.

If **Benz(a)Anthracene** is spilled, take the following steps:

- Evacuate personnel and secure and control entrance to the area.
- Eliminate all ignition sources.
- Moisten spilled material first or use a HEPA-filter vacuum for clean-up and deposit in sealed containers.
- Ventilate and wash area after clean-up is complete.
- DO NOT wash into sewer.
- It may be necessary to contain and dispose of **Benz(a)Anthracene** as a HAZARDOUS WASTE. Contact your state Department of Environmental Protection (DEP) or your regional office of the federal Environmental Protection Agency (EPA) for specific recommendations.

Handling and Storage

Prior to working with **Benz(a)Anthracene** you should be trained on its proper handling and storage.

- A regulated, marked area should be established where **Benz(a)Anthracene** is handled, used, or stored.
- **Benz(a)Anthracene** is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE).
- Store in tightly closed containers in a cool, well-ventilated area.

Occupational Health Information Resources

The New Jersey Department of Health and Senior Services, Occupational Health Service, offers multiple services in occupational health. These services include providing informational resources, educational materials, public presentations, and industrial hygiene and medical investigations and evaluations.

For more information, please contact:

New Jersey Department of Health & Senior Services
Right to Know Program
PO Box 368
Trenton, NJ 08625-0368
Phone: 609-984-2202
Fax: 609-984-7407
E-mail: rtk@doh.state.nj.us
Web address: http://www.nj.gov/health/eoh/rtkweb

GLOSSARY

ACGIH is the American Conference of Governmental Industrial Hygienists. They publish guidelines called Threshold Limit Values (TLVs) for exposure to workplace chemicals.

Acute Exposure Guideline Levels (AEGLs) are established by the EPA. They describe the risk to humans resulting from once-in-a lifetime, or rare, exposure to airborne chemicals.

Boiling point is the temperature at which a substance can change its physical state from a liquid to a gas.

A **carcinogen** is a substance that causes cancer.

The **CAS number** is unique, identifying number, assigned by the Chemical Abstracts Service, to a specific chemical.

CFR is the Code of Federal Regulations, which are the regulations of the United States government.

A **combustible** substance is a solid, liquid or gas that will burn.

A **corrosive** substance is a gas, liquid or solid that causes destruction of human skin or severe corrosion of containers.

DEP is the New Jersey Department of Environmental Protection.

DOT is the Department of Transportation, the federal agency that regulates the transportation of chemicals.

EPA is the Environmental Protection Agency, the federal agency responsible for regulating environmental hazards.

ERG is the Emergency Response Guidebook. It is a guide for emergency responders for transportation emergencies involving hazardous substances.

Emergency Response Planning Guideline (ERPG) values are intended to provide estimates of concentration ranges where one reasonably might anticipate observing adverse effects.

A **fetus** is an unborn human or animal.

A **flammable** substance is a solid, liquid, vapor or gas that will ignite easily and burn rapidly.

The **flash point** is the temperature at which a liquid or solid gives off vapor that can form a flammable mixture with air.

IARC is the International Agency for Research on Cancer, a scientific group.

Ionization Potential is the amount of energy needed to remove an electron from an atom or molecule. It is measured in electron volts.

IRIS is the Integrated Risk Information System database maintained by federal EPA. The database contains information on human health effects that may result from exposure to various chemicals in the environment.

LEL or **Lower Explosive Limit**, is the lowest concentration of a combustible substance (gas or vapor) in the air capable of continuing an explosion.

mg/m^3 means milligrams of a chemical in a cubic meter of air. It is a measure of concentration (weight/volume).

A **mutagen** is a substance that causes mutations. A **mutation** is a change in the genetic material in a body cell. Mutations can lead to birth defects, miscarriages, or cancer.

NFPA is the National Fire Protection Association. It classifies substances according to their fire and explosion hazard.

NIOSH is the National Institute for Occupational Safety and Health. It tests equipment, evaluates and approves respirators, conducts studies of workplace hazards, and proposes standards to OSHA.

NTP is the National Toxicology Program which tests chemicals and reviews evidence for cancer.

OSHA is the federal Occupational Safety and Health Administration, which adopts and enforces health and safety standards.

PEOSHA is the New Jersey Public Employees Occupational Safety and Health Act, which adopts and enforces health and safety standards in public workplaces.

Permeated is the movement of chemicals through protective materials.

PIH is a DOT designation for chemicals which are Poison Inhalation Hazards.

ppm means parts of a substance per million parts of air. It is a measure of concentration by volume in air.

A **reactive** substance is a solid, liquid or gas that releases energy under certain conditions.

STEL is a Short Term Exposure Limit which is usually a 15-minute exposure that should not be exceeded at any time during a work day.

A **teratogen** is a substance that causes birth defects by damaging the fetus.

UEL or **Upper Explosive Limit** is the highest concentration in air above which there is too much fuel (gas or vapor) to begin a reaction or explosion.

Vapor Density is the ratio of the weight of a given volume of one gas to the weight of another (usually *Hydrogen*), at the same temperature and pressure.

The **vapor pressure** is a measure of how readily a liquid or a solid mixes with air at its surface. A higher vapor pressure indicates a higher concentration of the substance in air and therefore increases the likelihood of breathing it in.

Common Name: **BENZ(a)ANTHRACENE**

Synonyms: Naphthanthracene; Tetraphene
CAS No: 56-55-3
Molecular Formula: $C_{18}H_{12}$
RTK Substance No: 0193
Description: Odorless, colorless to yellow brown flake, plate or powder

HAZARD DATA

Hazard Rating	Firefighting	Reactivity
3 - Health **1 - Fire** **0 - Reactivity** **DOT#:** UN 3077 **ERG Guide #:** 171 **Hazard Class**: 9 (Environmentally hazardous substance)	**Benz(a)Anthracene** may burn, but does not readily ignite. Use dry chemical, CO_2, water spray or foam as extinguishing agents. POISONOUS GASES ARE PRODUCED IN FIRE. Use water spray to keep fire-exposed containers cool.	**Benz(a)Anthracene** is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE).

SPILL/LEAKS

Isolation Distance:

Small Spill: 50 meters (150 feet)

Fire: 800 meters (1/2 mile)

Moisten spilled material first or use a HEPA-filter vacuum for clean-up and deposit in sealed containers.

Bioaccumulation may occur in seafood**.**

PHYSICAL PROPERTIES

Odor Threshold:	Odorless
Flash Point:	May burn
Vapor Pressure:	2 mm Hg at 68°F (20°C)
Specific Gravity:	1.3 (water = 1)
Water Solubility:	Insoluble
Boiling Point:	820°F (438°C)
Melting Point:	324°F (162°C)
Molecular Weight:	228.3

EXPOSURE LIMITS

OSHA:	0.2 mg/m^3, 8-hr TWA (as *Coal Tar Pitch Volatiles*, *Benzene soluble fraction*)
NIOSH:	0.1 mg/m^3, 10-hr TWA (as *Coal Tar Pitch Volatiles*, *Cyclohexane-extractable fraction*)
ACGIH:	Lowest level possible
IDLH:	80 mg/m^3 (as *Coal Tar Pitch Volatiles*)

PROTECTIVE EQUIPMENT

Gloves:	Nitrile and Natural Rubber
Coveralls:	DuPont Tyvek®
Respirator:	>0.1 mg/m^3 - Supplied Air

HEALTH EFFECTS

Eyes:	No information available
Skin:	No information available
Inhalation:	No information available
Chronic:	Cancer (liver and lung) in animals

FIRST AID AND DECONTAMINATION

Remove the person from exposure.

Flush eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.

Remove contaminated clothing and wash contaminated skin with soap and water.

Transfer to a medical facility.

Material Safety Data Sheet
Benzene

ACC# 02610

Section 1 - Chemical Product and Company Identification

MSDS Name: Benzene
Catalog Numbers: AC167660000, AC167660010, AC167660025, AC167660250, AC167665000, AC168650250, AC295330000, AC295330010, AC295330025, AC295330250, AC296880000, AC296880010, AC296880025, AC296880250, AC610230010, AC610231000, AC611001000, B243-4, B245-4, B245-500, B411-1, B411-4, B412-1, S79920ACS
Synonyms: Benzol; Cyclohexatriene; Phenyl hydride.
Company Identification:

Fisher Scientific
1 Reagent Lane
Fair Lawn, NJ 07410

For information, call: 201-796-7100
Emergency Number: 201-796-7100
For CHEMTREC assistance, call: 800-424-9300
For International CHEMTREC assistance, call: 703-527-3887

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
71-43-2	Benzene	> 99	200-753-7

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: clear colorless liquid. Flash Point: -11 deg C.
Danger! Extremely flammable liquid and vapor. Vapor may cause flash fire. Harmful if swallowed, inhaled, or absorbed through the skin. Causes eye, skin, and respiratory tract irritation. Contains benzene. Benzene can cause cancer. Aspiration hazard if swallowed. Can enter lungs and cause damage. May cause blood abnormalities. May cause central nervous system effects.
Target Organs: Blood, central nervous system, respiratory system, eyes, bone marrow, immune system, skin.

Potential Health Effects

Eye: Causes eye irritation.
Skin: Causes skin irritation. Harmful if absorbed through the skin. Prolonged and/or repeated contact may cause defatting of the skin and dermatitis.
Ingestion: May cause central nervous system depression, characterized by excitement, followed by headache, dizziness, drowsiness, and nausea. Advanced stages may cause collapse, unconsciousness, coma and possible death due to respiratory failure. May cause effects similar to those for inhalation exposure. Aspiration of material into the lungs may cause chemical pneumonitis, which may be fatal.
Inhalation: Causes respiratory tract irritation. May cause drowsiness, unconsciousness, and

central nervous system depression. Exposure may lead to irreversible bone marrow injury. Exposure may lead to aplastic anemia. Potential symptoms of overexposure by inhalation are dizziness, headache, vomiting, visual disturbances, staggering gait, hilarity, fatigue, and other symptoms of CNS depression.
Chronic: May cause bone marrow abnormalities with damage to blood forming tissues. May cause anemia and other blood cell abnormalities. Chronic exposure to benzene has been associated with an increased incidence of leukemia and multiple myeloma (tumor composed of cells of the type normally found in the bone marrow). Immunodepressive effects have been reported. This substance has caused adverse reproductive and fetal effects in laboratory animals.

Section 4 - First Aid Measures

Eyes: In case of contact, immediately flush eyes with plenty of water for a t least 15 minutes. Get medical aid.
Skin: In case of contact, flush skin with plenty of water. Remove contaminated clothing and shoes. Get medical aid if irritation develops and persists. Wash clothing before reuse.
Ingestion: Potential for aspiration if swallowed. Get medical aid immediately. Do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If vomiting occurs naturally, have victim lean forward.
Inhalation: If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical aid.
Notes to Physician: Treat symptomatically and supportively.

Section 5 - Fire Fighting Measures

General Information: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Use water spray to keep fire-exposed containers cool. Extremely flammable liquid and vapor. Vapor may cause flash fire. Approach fire from upwind to avoid hazardous vapors and toxic decomposition products. Vapors are heavier than air and may travel to a source of ignition and flash back. Vapors can spread along the ground and collect in low or confined areas. This liquid floats on water and may travel to a source of ignition and spread fire. May accumulate static electricity.
Extinguishing Media: Use water spray, dry chemical, carbon dioxide, or appropriate foam.
Flash Point: -11 deg C (12.20 deg F)
Autoignition Temperature: 498 deg C (928.40 deg F)
Explosion Limits, Lower:1.3 vol %
Upper: 7.1 vol %
NFPA Rating: (estimated) Health: 2; Flammability: 3; Instability: 0

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.
Spills/Leaks: Absorb spill with inert material (e.g. vermiculite, sand or earth), then place in suitable container. Avoid runoff into storm sewers and ditches which lead to waterways. Remove all sources of ignition. Provide ventilation. Approach spill from upwind. Use water spray to cool and disperse vapors, protect personnel, and dilute spills to form nonflammable mixtures.

Section 7 - Handling and Storage

Handling: Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Ground and bond containers when transferring material. Avoid contact with eyes, skin, and clothing. Empty containers retain product residue, (liquid and/or vapor), and can be dangerous. Take precautionary measures against static discharges. Keep container tightly closed. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose empty containers to heat, sparks or open flames. Use only with adequate ventilation. Keep away from heat, sparks and flame. Avoid breathing vapor.
Storage: Keep away from sources of ignition. Store in a tightly closed container. Keep from contact with oxidizing materials. Store in a cool, dry, well-ventilated area away from incompatible substances.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: Use process enclosure, local exhaust ventilation, or other engineering controls to control airborne levels below recommended exposure limits. Use explosion-proof ventilation equipment. Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. See 29CFR 1910.1028 for the regulatory requirements for the control of employee exposure to benzene.
Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Benzene	0.5 ppm TWA; 2.5 ppm STEL; Skin - potential significant contribution to overall exposure by the cutaneous r oute	0.1 ppm TWA 500 ppm IDLH	1 ppm TWA; 10 ppm TWA (applies to industry segments exempt from the benzene stan dard at 29 CFR 1910.1028); 25 ppm Ceiling (applies to industry segments exempt from the 1 ppm TWA and 5 ppm STEL of th e benzene standard); 0.5 ppm Action Level; 1 ppm TWA; 5 ppm STEL (Cancer hazard, Flammable - see 29 C FR 1910.1028)

OSHA Vacated PELs: Benzene: 10 ppm TWA (unless specified in 1910.1028)
Personal Protective Equipment
Eyes: Wear chemical splash goggles.
Skin: Wear appropriate protective gloves to prevent skin exposure.
Clothing: Wear appropriate protective clothing to prevent skin exposure.
Respirators: A respiratory protection program that meets OSHA's 29 CFR 1910.134 and ANSI Z88.2 requirements or European Standard EN 149 must be followed whenever workplace conditions warrant respirator use.

Section 9 - Physical and Chemical Properties

Physical State: Liquid

Appearance: clear colorless
Odor: sweetish odor - aromatic odor
pH: Not applicable.
Vapor Pressure: 75 mm Hg @ 20 deg C
Vapor Density: 2.8 (air=1)
Evaporation Rate: Not available.
Viscosity: 0.647mPa @ 20 deg C
Boiling Point: 80.1 deg C
Freezing/Melting Point:5.5 deg C
Decomposition Temperature: Not available.
Solubility: 0.180 g/100 ml @ 25°C
Specific Gravity/Density:0.8765 @ 20°C
Molecular Formula:C6H6
Molecular Weight:78.11

Section 10 - Stability and Reactivity

Chemical Stability: Stable under normal temperatures and pressures.
Conditions to Avoid: Ignition sources, excess heat, confined spaces.
Incompatibilities with Other Materials: Strong oxidizing agents.
Hazardous Decomposition Products: Carbon monoxide, carbon dioxide.
Hazardous Polymerization: Has not been reported.

Section 11 - Toxicological Information

RTECS#:
CAS# 71-43-2: CY1400000
LD50/LC50:
CAS# 71-43-2:
Dermal, guinea pig: LD50 = >9400 uL/kg;
Draize test, rabbit, eye: 88 mg Moderate;
Draize test, rabbit, eye: 2 mg/24H Severe;
Draize test, rabbit, skin: 20 mg/24H Moderate;
Inhalation, mouse: LC50 = 9980 ppm;
Inhalation, mouse: LC50 = 24 mL/kg/2H;
Inhalation, rat: LC50 = 10000 ppm/7H;
Inhalation, rat: LC50 = 34 mL/kg/2H;
Inhalation, rat: LC50 = 6.5 mL/kg/4H;
Oral, mouse: LD50 = 4700 mg/kg;
Oral, rat: LD50 = 930 mg/kg;
Oral, rat: LD50 = 1 mL/kg;
Oral, rat: LD50 = 1800 Benzene is considered very toxic; probable human oral lethal dose would be 50-500 mg/kg. Human inhalation of approximately 20,000 ppm (2% in air) was fatal in 5-10 minutes.While percutaneous absorption of liquid benzene through intact human skin can be limited (e.g., 0.05% of the applied dose), the absorbed dose via direct dermal contact combined with that received from body surface exposure to benzene in workplace air is such that a substantial fraction (20-40%) of the total exposure is due to skin absorption.
Carcinogenicity:
CAS# 71-43-2:

- **ACGIH:** A1 - Confirmed Human Carcinogen
- **California:** carcinogen, initial date 2/27/87
- **NTP:** Known carcinogen
- **IARC:** Group 1 carcinogen

Epidemiology: IARC has concluded that epidemiological studies have established the relationship between benzene exposure and the development of acute myelogenous leukemia, and that there is sufficient evidence that benzene is carcinogenic to humans.
Teratogenicity: Inhalation, rat: TCLO = 50 ppm/24H (female 7-14 day(s) after conception) Effects on Embryo or Fetus - extra-embryonic structures (e.g., placenta, umbilical cord) and Effects on Embryo or Fetus - fetotoxicity (except death, e.g., stunted fetus).; Inhalation,mouse: TCLo = 5 ppm (female 6-15 day(s) after conception) Effects on Embryo or Fetus - cytological changes (including somatic cell genetic material) and Specific Developmental Abnormalities - blood and lymphatic systems (including spleen and marrow).
Reproductive Effects: Inhalation, rat: TCLO = 670 mg/m3/24H (female 15 day(s) pre-mating and female 1-22 day(s) after conception) female fertility index (e.g. # females pregnant per # sperm positive females; # females pregnant per # females mated).; Oral, mouse: TDLo = 12 gm/kg (female 6-15 day(s) after conception) Fertility - post-implantation mortality (e.g. dead and/or resorbed implants per total number of implants).
Mutagenicity: DNA Inhibition: Human, Leukocyte = 2200 umol/L.; DNA Inhibition: Human, HeLa cell = 2200 umol/L.; Mutation Test Systems - not otherwise specified: Human, Lymphocyte = 5 umol/L.; Cytogenetic Analysis: Inhalation, Human = 125 ppm/1Y.; Cytogenetic Analysis: Human, Leukocyte = 1 mmol/L/72H.; Cytogenetic Analysis: Human, Lymphocyte = 1 mg/L.
Neurotoxicity: See actual entry in RTECS for complete information.
Other Studies:

Section 12 - Ecological Information

Ecotoxicity: Fish: Mosquito Fish: TLm = 395 mg/L; 24 Hr; UnspecifiedFish: Goldfish: LC50 =46 mg/L; 24 Hr; Modified ASTM D 1345Fish: Fathead Minnow: LC50 = 15.1 mg/L; 96 Hr; Flow-through at 25°C (pH 7.9-8.0)Fish: Rainbow trout: LC50 = 5.3 mg/L; 96 Hr; Flow-through at 25°C (pH 7.9-8.0)Fish: Bluegill/Sunfish: LD50 = 20 mg/L; 24-48 Hr; Unspecified If benzene is released to soil, it will be subject to rapid volatilization near the surface and that which does not evaporate will be highly to very highly mobile in the soil and may leach to groundwater. If benzene is released to water, it will be subject to rapid volatilization. It will not be expected to significantly adsorb to sediment, bioconcentrate in aquatic organisms or hydrolyze. It may be subject to biodegradation.
Environmental: If benzene is released to the atmosphere, it will exist predominantly in the vapor phase. Gas-phase benzene will not be subject to direct photolysis but it will react with photochemically produced hydroxyl radicals with a half-life of 13.4 days. The reaction time in polluted atmospheres which contain nitrogen oxides or sulfur dioxide is accelerated with the half-life being reported as 4-6 hours. Benzene is fairly soluble in water and is removed from the atmosphere in rain.
Physical: Products of photooxidation include phenol, nitrophenols, nitrobenzene, formic acid, and peroxyacetyl nitrate.
Other: No information available.

Section 13 - Disposal Considerations

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts

261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.
RCRA P-Series: None listed.
RCRA U-Series:
CAS# 71-43-2: waste number U019 (Ignitable waste, Toxic waste).

Section 14 - Transport Information

	US DOT	Canada TDG
Shipping Name:	BENZENE	BENZENE
Hazard Class:	3	3
UN Number:	UN1114	UN1114
Packing Group:	II	II
Additional Info:		FLASHPOINT -11 C

Section 15 - Regulatory Information

US FEDERAL

TSCA
CAS# 71-43-2 is listed on the TSCA inventory.
Health & Safety Reporting List
None of the chemicals are on the Health & Safety Reporting List.
Chemical Test Rules
None of the chemicals in this product are under a Chemical Test Rule.
Section 12b
None of the chemicals are listed under TSCA Section 12b.
TSCA Significant New Use Rule
None of the chemicals in this material have a SNUR under TSCA.
CERCLA Hazardous Substances and corresponding RQs
CAS# 71-43-2: 10 lb final RQ (received an adjusted RQ of 10 lbs based on potential carcinogeni

SARA Section 302 Extremely Hazardous Substances
None of the chemicals in this product have a TPQ.
SARA Codes
CAS # 71-43-2: immediate, delayed, fire.
Section 313
This material contains Benzene (CAS# 71-43-2, > 99%),which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR Part 373.
Clean Air Act:
CAS# 71-43-2 is listed as a hazardous air pollutant (HAP).
This material does not contain any Class 1 Ozone depletors.
This material does not contain any Class 2 Ozone depletors.
Clean Water Act:
CAS# 71-43-2 is listed as a Hazardous Substance under the CWA. CAS# 71-43-2 is listed as a Priority Pollutant under the Clean Water Act. CAS# 71-43-2 is listed as a Toxic Pollutant under the Clean Water Act.
OSHA:
None of the chemicals in this product are considered highly hazardous by OSHA.
STATE
CAS# 71-43-2 can be found on the following state right to know lists: California, New Jersey,

Pennsylvania, Minnesota, Massachusetts.

California Prop 65
The following statement(s) is(are) made in order to comply with the California Safe Drinking Water Act:
WARNING: This product contains Benzene, a chemical known to the state of California to cause cancer. WARNING: This product contains Benzene, a chemical known to the state of California to cause male reproductive toxicity.
California No Significant Risk Level: CAS# 71-43-2: 6.4 æg/day NSRL (oral); 13 æg/day NSRL (inhalation)

European / International Regulations

European Labeling in Accordance with EC Directives
Hazard Symbols:
T F
Risk Phrases:
R 11 Highly flammable.
R 36/38 Irritating to eyes and skin.
R 45 May cause cancer.
R 46 May cause heritable genetic damage.
R 48/23/24/25 Toxic : danger of serious damage to health by prolonged exposure through inhalation, contact with skin and if swallowed.
R 65 Harmful: may cause lung damage if swallowed.

Safety Phrases:
S 45 In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).
S 53 Avoid exposure - obtain special instructions before use.

WGK (Water Danger / Protection)
CAS# 71-43-2: 3
Canada - DSL / NDSL
CAS# 71-43-2 is listed on Canada's DSL List.
Canada - WHMIS
This product has a WHMIS classification of B2, D2A, D2B.
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all of the information required by those regulations.
Canadian Ingredient Disclosure List
CAS# 71-43-2 is listed on the Canadian Ingredient Disclosure List.

Section 16 - Additional Information

MSDS Creation Date: 6/11/1999
Revision #8 Date: 9/11/2008

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall Fisher be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if Fisher has been advised of the possibility of such damages.

Right to Know

Hazardous Substance Fact Sheet

Common Name: **ANTIMONY**

Synonyms: Antimony Metal; Antimony Powder

Chemical Name: Antimony

Date: June 2004 Revision: February 2012

CAS Number: 7440-36-0

RTK Substance Number: 0141

DOT Number: UN 2871

EMERGENCY RESPONDERS >>>> SEE LAST PAGE

Description and Use

Antimony is a naturally occurring, silvery-white, hard, brittle metal. It is also formed as a by-product of smelting *Lead* and other metals. It is used in alloys with *Lead* and other metals, electric storage batteries, solder, sheet and pipe metal, castings and pewter.

Reasons for Citation

- **Antimony** is on the Right to Know Hazardous Substance List because it is cited by OSHA, ACGIH, DOT, NIOSH, DEP, IRIS, and EPA.

Hazard Summary

Hazard Rating	NJDHSS	NFPA
HEALTH	2	-
FLAMMABILITY	2	-
REACTIVITY	0	-

COMBUSTIBLE POWDER
POISONOUS GASES ARE PRODUCED IN FIRE

Hazard Rating Key: 0=minimal; 1=slight; 2=moderate; 3=serious; 4=severe

- **Antimony** can affect you when inhaled and by passing through the skin.
- Contact can irritate the skin and eyes. Prolonged or repeated contact may cause redness and itchy skin rash (dermatitis).
- Inhaling **Antimony** can irritate the nose, throat and lungs causing coughing, wheezing and/or shortness of breath.
- Exposure to **Antimony** can cause headache, dizziness, nausea and vomiting, abdominal pain, and loss of sleep.
- Inhaling **Antimony** can cause an ulcer or hole in the "bone" (septum) dividing the inner nose.
- Repeated exposure can affect the lungs and cause an abnormal chest x-ray to develop.
- **Antimony** may damage the liver and kidneys and may affect the heart.

SEE GLOSSARY ON PAGE 5.

FIRST AID

Eye Contact

- Immediately flush with large amounts of water for at least 15 minutes, lifting upper and lower lids. Remove contact lenses, if worn, while rinsing.

Skin Contact

- Quickly remove contaminated clothing. Immediately wash contaminated skin with large amounts of soap and water.

Inhalation

- Remove the person from exposure.
- Begin rescue breathing (using universal precautions) if breathing has stopped and CPR if heart action has stopped.
- Transfer promptly to a medical facility.

EMERGENCY NUMBERS

Poison Control: 1-800-222-1222

CHEMTREC: 1-800-424-9300

NJDEP Hotline: 1-877-927-6337

National Response Center: 1-800-424-8802

Workplace Exposure Limits

OSHA: The legal airborne permissible exposure limit (PEL) is **0.5 mg/m^3** averaged over an 8-hour workshift.

NIOSH: The recommended airborne exposure limit (REL) is **0.5 mg/m^3** averaged over a 10-hour workshift.

ACGIH: The threshold limit value (TLV) is **0.5 mg/m^3** averaged over an 8-hour workshift.

Determining Your Exposure

- Read the product manufacturer's Material Safety Data Sheet (MSDS) and the label to determine product ingredients and important safety and health information about the product mixture.
- For each individual hazardous ingredient, read the New Jersey Department of Health and Senior Services Hazardous Substance Fact Sheet, available on the RTK Program website (www.nj.gov/health/eoh/rtkweb) or in your facility's RTK Central File or Hazard Communication Standard file.
- You have a right to this information under the New Jersey Worker and Community Right to Know Act and the Public Employees Occupational Safety and Health (PEOSH) Act if you are a public worker in New Jersey, and under the federal Occupational Safety and Health Act (OSHA) if you are a private worker.
- The New Jersey Right to Know Act requires most employers to label chemicals in the workplace and requires public employers to provide their employees with information concerning chemical hazards and controls. The federal OSHA Hazard Communication Standard (29 CFR 1910.1200) and the PEOSH Hazard Communication Standard (N.J.A.C. 12:100-7) require employers to provide similar information and training to their employees.

This Fact Sheet is a summary of available information regarding the health hazards that may result from exposure. Duration of exposure, concentration of the substance and other factors will affect your susceptibility to any of the potential effects described below.

Health Hazard Information

Acute Health Effects
The following acute (short-term) health effects may occur immediately or shortly after exposure to **Antimony**:

- Contact can irritate the skin and eyes. Prolonged or repeated contact may cause redness and itchy skin rash (dermatitis).
- Inhaling **Antimony** can irritate the nose, throat and lungs causing coughing, wheezing and/or shortness of breath.
- Exposure to **Antimony** can cause headache, dizziness, nausea and vomiting, abdominal pain, and loss of sleep.

Chronic Health Effects
The following chronic (long-term) health effects can occur at some time after exposure to **Antimony** and can last for months or years:

Cancer Hazard
- According to the information presently available to the New Jersey Department of Health and Senior Services, **Antimony** has been tested and has not been shown to cause cancer in animals.

Reproductive Hazard
- There is limited evidence that **Antimony** may affect female fertility.

Other Effects
- Inhaling **Antimony** can cause an ulcer or a hole in the "bone" (septum) dividing the inner nose, sometimes with bleeding, discharge, and/or formation of a crust.
- Repeated exposure can affect the lungs, cause an abnormal chest x-ray to develop, and lead to permanent lung damage.
- **Antimony** may damage the liver and kidneys and may affect the heart.

Medical

Medical Testing
For frequent or potentially high exposure (half the PEL or greater), the following is recommended before beginning work and at regular times after that:

- Urine test for **Antimony**

If symptoms develop or overexposure is suspected, the following are recommended:

- Chest x-ray and lung function tests
- Liver and kidney function tests
- EKG

Any evaluation should include a careful history of past and present symptoms with an exam. Medical tests that look for damage already done are not a substitute for controlling exposure.

You have a legal right to request copies of your medical testing under the OSHA Access to Employee Exposure and Medical Records Standard (29 CFR 1910.1020).

Mixed Exposures
- Smoking can cause heart disease, lung cancer, emphysema, and other respiratory problems. It may worsen respiratory conditions caused by chemical exposure. Even if you have smoked for a long time, stopping now will reduce your risk of developing health problems.
- More than light alcohol consumption can cause liver damage. Drinking alcohol can increase the liver damage caused by **Antimony**.

Workplace Controls and Practices

Very toxic chemicals, or those that are reproductive hazards or sensitizers, require expert advice on control measures if a less toxic chemical cannot be substituted. Control measures include: (1) enclosing chemical processes for severely irritating and corrosive chemicals, (2) using local exhaust ventilation for chemicals that may be harmful with a single exposure, and (3) using general ventilation to control exposures to skin and eye irritants. For further information on workplace controls, consult the NIOSH document on Control Banding at www.cdc.gov/niosh/topics/ctrlbanding/.

The following work practices are also recommended:

- Label process containers.
- Provide employees with hazard information and training.
- Monitor airborne chemical concentrations.
- Use engineering controls if concentrations exceed recommended exposure levels.
- Provide eye wash fountains and emergency showers.
- Wash or shower if skin comes in contact with a hazardous material.
- Always wash at the end of the workshift.
- Change into clean clothing if clothing becomes contaminated.
- Do not take contaminated clothing home.
- Get special training to wash contaminated clothing.
- Do not eat, smoke, or drink in areas where chemicals are being handled, processed or stored.
- Wash hands carefully before eating, smoking, drinking, applying cosmetics or using the toilet.

In addition, the following may be useful or required:

- Before entering a confined space where **Antimony** *powder* and *dust* may be present, check to make sure that an explosive concentration does not exist.
- Use a vacuum or a wet method to reduce dust during clean-up. DO NOT DRY SWEEP.
- Use a high efficiency particulate air (HEPA) filter when vacuuming. Do not use a standard shop vacuum.

Personal Protective Equipment

The OSHA Personal Protective Equipment Standard (29 CFR 1910.132) requires employers to determine the appropriate personal protective equipment for each hazard and to train employees on how and when to use protective equipment.

The following recommendations are only guidelines and may not apply to every situation.

Gloves and Clothing

- Avoid skin contact with **Antimony**. Wear personal protective equipment made from material that can not be permeated or degraded by this substance. Safety equipment suppliers and manufacturers can provide recommendations on the most protective glove and clothing material for your operation.
- The recommended glove materials for **Antimony** are Nitrile, Neoprene and Natural Rubber.
- The recommended protective clothing material for **Antimony** is Tyvek® or the equivalent.
- All protective clothing (suits, gloves, footwear, headgear) should be clean, available each day, and put on before work.

Eye Protection

- Wear direct vent goggles when airborne particles or dust are present.

Respiratory Protection

Improper use of respirators is dangerous. Respirators should only be used if the employer has implemented a written program that takes into account workplace conditions, requirements for worker training, respirator fit testing, and medical exams, as described in the OSHA Respiratory Protection Standard (29 CFR 1910.134). **Only NIOSH approved respirators should be used.**

- Where the potential exists for exposure over **0.5 mg/m^3**, use a negative pressure, air-purifying, particulate filter respirator with an N, R or P95 filter. More protection is provided by a full facepiece respirator than by a half-mask respirator, and even greater protection is provided by a powered-air purifying respirator.
- Leave the area immediately if (1) while wearing a filter or cartridge respirator you can smell, taste, or otherwise detect **Antimony**, (2) while wearing particulate filters abnormal resistance to breathing is experienced, or (3) eye irritation occurs while wearing a full facepiece respirator. Check to make sure the respirator-to-face seal is still good. If it is, replace the filter or cartridge. If the seal is no longer good, you may need a new respirator.
- Consider all potential sources of exposure in your workplace. You may need a combination of filters, prefilters or cartridges to protect against different forms of a chemical (such as vapor and mist) or against a mixture of chemicals.
- Where the potential exists for exposure over **5 mg/m^3**, use a supplied-air respirator with a full facepiece operated in a pressure-demand or other positive-pressure mode. For increased protection use in combination with an auxiliary self-contained breathing apparatus or an emergency escape air cylinder.
- Exposure to **50 mg/m^3** is immediately dangerous to life and health. If the possibility of exposure above **50 mg/m^3** exists, use a self-contained breathing apparatus with a full facepiece operated in a pressure-demand or other positive-pressure mode equipped with an emergency escape air cylinder.

Fire Hazards

If employees are expected to fight fires, they must be trained and equipped as stated in the OSHA Fire Brigades Standard (29 CFR 1910.156).

- **Antimony** is not combustible in bulk form. However, **Antimony** *powder* and *dust* may be COMBUSTIBLE.
- Use sand, dry chemical, CO_2, water spray or foam as extinguishing agents.
- DO NOT USE WATER on *molten* **Antimony**.
- POISONOUS GASES ARE PRODUCED IN FIRE, including *Antimony Oxide* and *Antimony Hydride* (*Stibine*).
- **Antimony** may form an ignitable dust/air mixture in closed tanks or containers.
- *Finely dispersed* **Antimony** *powder* and *dust* may form explosive mixtures in air.

Spills and Emergencies

If employees are required to clean-up spills, they must be properly trained and equipped. The OSHA Hazardous Waste Operations and Emergency Response Standard (29 CFR 1910.120) may apply.

If **Antimony** is spilled, take the following steps:

- Evacuate personnel and secure and control entrance to the area.
- Eliminate all ignition sources.
- Moisten *solid* spilled material first or use a HEPA-filter vacuum for clean-up and place into sealed containers for disposal.
- Ventilate and wash area after clean-up is complete.
- DO NOT wash into sewer.
- It may be necessary to contain and dispose of **Antimony** as a HAZARDOUS WASTE. Contact your state Department of Environmental Protection (DEP) or your regional office of the federal Environmental Protection Agency (EPA) for specific recommendations.

Handling and Storage

Prior to working with **Antimony** you should be trained on its proper handling and storage.

- **Antimony** reacts violently with HALOGENS (such as FLUORINE, CHLORINE and BROMINE) and STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC) to cause fires and explosions.
- Contact with STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC) and freshly formed (nascent) HYDROGEN can also form toxic *Antimony Hydride* (*Stibine) gas*.
- **Antimony** is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, and NITRATES); STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE); IODINE; and POWDERED METALS.
- Store in tightly closed containers in a cool, well-ventilated area.
- Sources of ignition, such as smoking and open flames, are prohibited where **Antimony** *powder* is used, handled, or stored.
- Ground and bond containers when transferring **Antimony** *powder.*
- Use only non-sparking tools and equipment, especially when opening and closing containers of **Antimony** *powder*.

Occupational Health Information Resources

The New Jersey Department of Health and Senior Services, Occupational Health Service, offers multiple services in occupational health. These services include providing informational resources, educational materials, public presentations, and industrial hygiene and medical investigations and evaluations.

For more information, please contact:

New Jersey Department of Health & Senior Services
Right to Know Program
PO Box 368
Trenton, NJ 08625-0368
Phone: 609-984-2202
Fax: 609-984-7407
E-mail: rtk@doh.state.nj.us
Web address: http://www.nj.gov/health/eoh/rtkweb

GLOSSARY

ACGIH is the American Conference of Governmental Industrial Hygienists. They publish guidelines called Threshold Limit Values (TLVs) for exposure to workplace chemicals.

Acute Exposure Guideline Levels (AEGLs) are established by the EPA. They describe the risk to humans resulting from once-in-a lifetime, or rare, exposure to airborne chemicals.

Boiling point is the temperature at which a substance can change its physical state from a liquid to a gas.

A **carcinogen** is a substance that causes cancer.

The **CAS number** is unique, identifying number, assigned by the Chemical Abstracts Service, to a specific chemical.

CFR is the Code of Federal Regulations, which are the regulations of the United States government.

A **combustible** substance is a solid, liquid or gas that will burn.

A **corrosive** substance is a gas, liquid or solid that causes destruction of human skin or severe corrosion of containers.

The **critical temperature** is the temperature above which a gas cannot be liquefied, regardless of the pressure applied.

DEP is the New Jersey Department of Environmental Protection.

DOT is the Department of Transportation, the federal agency that regulates the transportation of chemicals.

EPA is the Environmental Protection Agency, the federal agency responsible for regulating environmental hazards.

ERG is the Emergency Response Guidebook. It is a guide for emergency responders for transportation emergencies involving hazardous substances.

Emergency Response Planning Guideline (ERPG) values provide estimates of concentration ranges where one reasonably might anticipate observing adverse effects.

A **fetus** is an unborn human or animal.

A **flammable** substance is a solid, liquid, vapor or gas that will ignite easily and burn rapidly.

The **flash point** is the temperature at which a liquid or solid gives off vapor that can form a flammable mixture with air.

IARC is the International Agency for Research on Cancer, a scientific group.

Ionization Potential is the amount of energy needed to remove an electron from an atom or molecule. It is measured in electron volts.

IRIS is the Integrated Risk Information System database on human health effects that may result from exposure to various chemicals, maintained by federal EPA.

LEL or **Lower Explosive Limit**, is the lowest concentration of a combustible substance (gas or vapor) in the air capable of continuing an explosion.

mg/m^3 means milligrams of a chemical in a cubic meter of air. It is a measure of concentration (weight/volume).

A **mutagen** is a substance that causes mutations. A **mutation** is a change in the genetic material in a body cell. Mutations can lead to birth defects, miscarriages, or cancer.

NFPA is the National Fire Protection Association. It classifies substances according to their fire and explosion hazard.

NIOSH is the National Institute for Occupational Safety and Health. It tests equipment, evaluates and approves respirators, conducts studies of workplace hazards, and proposes standards to OSHA.

NTP is the National Toxicology Program which tests chemicals and reviews evidence for cancer.

OSHA is the federal Occupational Safety and Health Administration, which adopts and enforces health and safety standards.

PEOSHA is the New Jersey Public Employees Occupational Safety and Health Act, which adopts and enforces health and safety standards in public workplaces.

Permeated is the movement of chemicals through protective materials.

ppm means parts of a substance per million parts of air. It is a measure of concentration by volume in air.

Protective Action Criteria (PAC) are values established by the Department of Energy and are based on AEGLs and ERPGs. They are used for emergency planning of chemical release events.

A **reactive** substance is a solid, liquid or gas that releases energy under certain conditions.

STEL is a Short Term Exposure Limit which is usually a 15-minute exposure that should not be exceeded at any time during a work day.

A **teratogen** is a substance that causes birth defects by damaging the fetus.

UEL or **Upper Explosive Limit** is the highest concentration in air above which there is too much fuel (gas or vapor) to begin a reaction or explosion.

Vapor Density is the ratio of the weight of a given volume of one gas to the weight of another (usually *Air*), at the same temperature and pressure.

The **vapor pressure** is a force exerted by the vapor in equilibrium with the solid or liquid phase of the same substance. The higher the vapor pressure the higher concentration of the substance in air.

Right to Know Hazardous Substance Fact Sheet

Emergency Responders Quick Reference

Common Name: **ANTIMONY**

Synonyms: Antimony Metal; Antimony Powder
CAS No: 7440-36-0
Molecular Formula: Sb
RTK Substance No: 0141
Description: Naturally occurring, silvery-white, hard, brittle metal that is also formed from smelting *Lead* and other metals

HAZARD DATA

Hazard Rating	Firefighting	Reactivity
2 - Health **2 - Fire** **0 - Reactivity** **DOT#:** UN 2871 **ERG Guide #:** 170 **Hazard Class:** 6.1 (Toxic)	**Antimony** is not combustible in bulk form. However, **Antimony** *powder* and *dust* may be COMBUSTIBLE. Use sand, dry chemical, CO_2, water spray or foam as extinguishing agents. DO NOT USE WATER on *molten* **Antimony**. POISONOUS GASES ARE PRODUCED IN FIRE, including *Antimony Oxide* and *Antimony Hydride* (*Stibine*). **Antimony** may form an ignitable dust/air mixture in closed tanks or containers. *Finely dispersed* **Antimony** *powder* and *dust* may form explosive mixtures in air.	**Antimony** reacts violently with HALOGENS (such as FLUORINE, CHLORINE and BROMINE) and STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC) to cause fires and explosions. Contact with STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC) and freshly formed (nascent) HYDROGEN can also form toxic *Antimony Hydride* (*Stibine) gas*. **Antimony** is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, and NITRATES); STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE); IODINE; and POWDERED METALS.

SPILL/LEAKS

Isolation Distance:

Spill: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Moisten *solid* spilled material first or use a HEPA-filter vacuum for clean-up and place into sealed containers for disposal.

Ground and bond containers when transferring **Antimony** *powder*.

Use only non-sparking tools and equipment.

DO NOT wash into sewer.

PHYSICAL PROPERTIES

Flash Point:	Noncombustible (*bulk form*) Combustible (*powder* and *dust*)
Vapor Pressure:	1 mm Hg at 1,627°F (886°C)
Specific Gravity:	6.69 (water = 1)
Water Solubility:	Insoluble
Boiling Point:	2,975°F (1,635°C)
Melting Point:	1,166°F (630°C)
Molecular Weight:	121.8

EXPOSURE LIMITS

OSHA: 0.5 mg/m^3, 8-hr TWA
NIOSH: 0.5 mg/m^3, 10-hr TWA
ACGIH: 0.5 mg/m^3, 8-hr TWA
IDLH: 50 mg/m^3

The Protective Action Criteria values are:
PAC-1 = 1.5 mg/m^3 PAC-2 = 20 mg/m^3
PAC-3 = 50 mg/m^3

PROTECTIVE EQUIPMENT

Gloves:	Nitrile, Neoprene and Natural Rubber
Coveralls:	Tyvek
Respirator:	Spill or >0.5 mg/m^3: full facepiece APR with *P100 filters* Fire or >5 mg/m^3: SCBA

HEALTH EFFECTS

Eyes:	Irritation
Skin:	Irritation, redness and itchy skin rash
Inhalation:	Nose, throat and lung irritation, with coughing, wheezing and shortness of breath Headache, dizziness, nausea, vomiting, and abdominal pain

FIRST AID AND DECONTAMINATION

Remove the person from exposure.

Flush eyes with large amounts of water for at least 15 minutes. Remove contact lenses.

Quickly remove contaminated clothing and wash contaminated skin with large amounts of soap and water.

Begin artificial respiration if breathing has stopped and CPR if necessary.

Transfer promptly to a medical facility.

APPENDIX D

HEAT AND COLD STRESS FACT SHEETS

Protecting Yourself from
Cold Stress

Workers who are exposed to extreme cold or work in cold environments may be at risk of cold stress. Extremely cold or wet weather is a dangerous situation that can cause occupational illness and injuries such as hypothermia, frostbite, trench foot, and chilblains.

Hypothermia

A condition in which the body uses up its stored energy and can no longer produce heat. Often occurs after prolonged exposure to cold temperature.

Early symptoms

- Shivering
- Fatigue
- Loss of coordination
- Confusion and disorientation

Late symptoms

- No shivering
- Blue skin
- Dilated pupils
- Slowed pulse and breathing
- Loss of consciousness

First Aid

- Request immediate medical assistance.
- Move the victim into a warm room or shelter.
- Remove wet clothing.
- Warm the center of their body first—chest, neck, head, and groin—using an electric blanket; or use skin-to-skin contact under loose, dry layers of blankets, clothing, or towels.
- If conscious, warm beverages may help increase the body temperature. Do not give alcohol.
- Once temperature has increased keep them dry and wrapped in a warm blanket, including the head and neck.
- If no pulse, begin CPR.

Frostbite

An injury to the body that is caused by freezing, which most often affects the nose, ears, cheeks, chin, fingers, or toes.

Symptoms

- Reduced blood flow to hands and feet
- Numbness
- Aching
- Tingling or stinging
- Bluish or pale, waxy skin

First Aid

- Get into a warm room as soon as possible.
- Unless necessary, do not walk on frostbitten feet or toes.
- Immerse the affected area in warm (not hot) water, or warm the affected area using body heat. Do not use a heating pad, fireplace, or radiator for warming.
- Do not massage the frostbitten area; doing so may cause more damage.

Trench Foot

An injury of the feet resulting from prolonged exposure to wet and cold conditions that can occur at temperatures as high as 60 °F if the feet are constantly wet.

Symptoms

- Reddening of the skin
- Numbness
- Leg cramps
- Swelling
- Tingling pain
- Blisters or ulcers
- Bleeding under the skin
- Gangrene (foot may turn dark purple, blue, or gray)

First Aid

- Remove shoes/boots and wet socks.
- Dry feet.
- Avoid walking on feet, as this may cause tissue damage.

Chilblains

Ulcers formed by damaged small blood vessels in the skin, caused by the repeated exposure of skin to temperatures just above freezing to as high as 60 °F.

Symptoms

- Redness
- Itching
- Possible blistering
- Inflammation
- Possible ulceration in severe cases

First Aid

- Avoid scratching.
- Slowly warm the skin.
- Use corticosteroid creams to relieve itching and swelling
- Keep blisters and ulcers clean and covered.

Protect Yourself

- Monitor your physical condition and that of your coworkers.
- Wear appropriate clothing.
  - Wear several layers of loose clothing for insulation.
  - Tight clothing reduces blood circulation to the extremities.
- Be aware that some clothing may restrict movement resulting in a hazardous situation.
- Protect the ears, face, hands and feet in extremely cold or wet weather.
  - Boots should be waterproof and insulated.
  - Wear a hat to reduce the loss of body heat from your head.
- Move into warm locations during breaks; limit the amount of time outside.
- Carry extra socks, gloves, hats, jacket, blankets, a change of clothes and a thermos of hot liquid.
- Include chemical hot packs in your first aid kit.
- Avoid touching cold metal surfaces with bare skin.

DEPARTMENT OF HEALTH AND HUMAN SERVICES
Centers for Disease Control and Prevention
National Institute for Occupational Safety and Health

www.cdc.gov/niosh/topics/outdoor/

DHHS (NIOSH) Publication No. 2010–115

Telephone: 1–800–CDC–INFO
TTY: 1–888–232–6348
E-mail: cdcinfo@cdc.gov

NIOSH

Fast Facts

Protecting Yourself from

Heat Stress

Heat stress, from exertion or hot environments, places workers at risk for illnesses such as heat stroke, heat exhaustion, or heat cramps.

Heat Stroke

A condition that occurs when the body becomes unable to control its temperature, and can cause death or permanent disability.

Symptoms

- High body temperature
- Confusion
- Loss of coordination
- Hot, dry skin or profuse sweating
- Throbbing headache
- Seizures, coma

First Aid

- Request immediate medical assistance.
- Move the worker to a cool, shaded area.
- Remove excess clothing and apply cool water to their body.

Heat Exhaustion

The body's response to an excessive loss of water and salt, usually through sweating.

Symptoms

- Rapid heart beat
- Heavy sweating
- Extreme weakness or fatigue
- Dizziness
- Nausea, vomiting
- Irritability
- Fast, shallow breathing
- Slightly elevated body temperature

First Aid

- Rest in a cool area.
- Drink plenty of water or other cool beverages.
- Take a cool shower, bath, or sponge bath.

Heat Cramps

Affect workers who sweat a lot during strenuous activity. Sweating depletes the body's salt and moisture levels.

Symptoms

- Muscle cramps, pain, or spasms in the abdomen, arms or legs

First Aid

- Stop all activity, and sit in a cool place.
- Drink clear juice or a sports beverage, or drink water with food.
  - Avoid salt tablets.
- Do not return to strenuous work for a few hours after the cramps subside.
- Seek medical attention if you have the following: heart problems, are on a low-sodium diet, or if the cramps do not subside within one hour.

Protect Yourself

Avoid heavy exertion, extreme heat, sun exposure, and high humidity when possible. When these cannot be avoided, take the following preventative steps:

- Monitor your physical condition and that of your coworkers for signs or symptoms of heat illnesses.
- Wear light-colored, loose-fitting, breathable clothing such as cotton.
  - Avoid non-breathable synthetic clothing.
- Gradually build up to heavy work.
- Schedule heavy work during the coolest parts of day.
- Take more breaks when doing heavier work, and in high heat and humidity.
  - Take breaks in the shade or a cool area.
- Drink water frequently. Drink enough water that you never become thirsty.
- Be aware that protective clothing or personal protective equipment may increase the risk of heat-related illnesses.

DEPARTMENT OF HEALTH AND HUMAN SERVICES
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www.cdc.gov/niosh/topics/outdoor/

DHHS (NIOSH) Publication No. 2010–114

Telephone: 1–800–CDC–INFO
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APPENDIX E

JOBSITE SAFETY INSPECTION FORM

LANGAN
ENGINEERING & ENVIRONMENTAL SERVICES

Client: _____ Inspection Date: _____

Site: _____ Inspector: _____

Project Number: _____

Check one of the following: **A:** Acceptable **NA**: Not Applicable **D**: Deficiency

	A	NA	D	Remarks
1. HASP available on site for inspection?				
2. Health & Safety Compliance agreement (in HASP) appropriately signed by Langan employees and subcontractors?				
3. Hospital route map with directions posted on site?				
4. Emergency Notification List posted on site?				
5. First Aid kit available and properly stocked?				
6. Personnel trained in CPR/First Aid on site?				
7. MSDSs readily available, and all workers knowledgeable about the specific chemicals and compounds to which they may be exposed?				
8 Appropriate PPE being worn by Langan employees and subcontractors?				
9. Project site safe practices ("Standing Orders") posted?				
10. Project staff have 40-hr./8-hr./Supervisor HAZWOPER training?				
11. Project staff medically cleared to work in hazardous waste sites and fit-tested to wear respirators, if needed?				
12. Respiratory protection readily available?				
13. Health & Safety Incident Report forms available?				
14. Air monitoring instruments calibrated daily and results recorded on the Daily Instrument Calibration check sheet?				
15. Air monitoring readings recorded on the air monitoring data sheet/field log book?				
16. Subcontract workers have received 40-hr./8-hr./Spvsr. HAZWOPER training, as appropriate?				
17. Subcontract workers medically cleared to work on site, and fit-tested for respirator wear?				
18. Subcontract workers have respirators readily available?				
19. Markouts of underground utilities done prior to initiating any subsurface activities?				
20. Decontamination procedures being followed as outlined in HASP?				
21. Are tools in good condition and properly used?				
22. Drilling performed in areas free from underground objects including utilities?				
23. Adequate size/type fire extinguisher supplied?				
24. Equipment at least 20 feet from overhead powerlines?				
25. Evidence that drilling operator is responsible for the safety of his rig.				
26. Trench sides shored, layed back, or boxed?				
27. Underground utilities located and authorities contacted before digging?				

28. Ladders in trench (25-foot spacing)?					
29. Excavated material placed more than 2 feet away from excavation edge?					
30. Public protected from exposure to open excavation?					
31. People entering the excavation regarding it as a permit-required confined space and following appropriate procedures?					
32. Confined space entry permit is completed and posted?					
33. All persons knowledgable about the conditions and characteristics of the confined space?					
34. All persons engaged in confined space operations have been trained in safe entry and rescue (non-entry)?					
35. Full body harnesses, lifelines, and hoisting apparatus available for rescue needs?					
36. Attendant and/or supervisor certified in basic first aid and CPR?					
37. Confined space atmosphere checked before entry and continuously while the work is going on?					
38. Results of confined space atmosphere testing recorded?					
39. Evidence of coordination with off-site rescue services to perform entry rescue, if needed?					
40. Are extension cords rated for this work being used and are they properly maintained?					
41. Are GFCIs provided and being used?					

Unsafe acts observed? _____

_____

_____

_____

Additional remarks _____

_____

_____

_____

Distribution: Project Manager (for information and follow-up) Name: _____
Health & Safety Officer (for corrective action) Name: _____
Health & Safety Coordinator (resource for corrective action and follow-up)

APPENDIX F

SITE SAFETY BRIEFING FORM

SAFETY BRIEFING

Date: _____Time: _____Leader: _____Location: _____

Work Task: _____

SAFETY TOPICS (*provide some detail of discussion points*)

Chemical Exposure Hazards and Control _____

Physical Hazards and Control _____

Air Monitoring _____

PPE _____

Communications _____

Safe Work Practices _____

Emergency Response _____

Hospital/Medical Center Location _____

Phone Nos. _____

Other _____

FOR FOLLOW-UP (the issues, responsibilities, due dates, etc.)

_____
_____
_____

ATTENDEES

PRINT NAME	COMPANY	SIGNATURE

Briefing Conducted By: _____

APPENDIX G

DECONTAMINATION PROCEDURES

PERSONNEL DECONTAMINATION

LEVEL A DECONTAMINATION

Station 1:	Equipment Drop	1. Deposit equipment used on-site (tools, sampling devices and containers, monitoring instruments, radios, clipboards, etc.) on plastic drop cloths. Segregation at the drop reduces the probability of cross contamination. During hot weather operations, cool down stations may be set up within this area.
Station 2:	Outer Garment, Boots, and Gloves Wash and Rinse	2. Scrub outer boots, outer gloves and fully-encapsulating suit with decon solution or detergent and water. Rinse off using copious amounts of water.
Station 3:	Outer Boot and Glove Removal	3. Remove outer boots and gloves. Deposit in container with plastic liner.
Station 4:	Tank Change	4. If worker leaves Exclusion Zone to change air tank, this is the last step in the decontamination procedure. Worker's air tank is exchanged, new outer gloves and boot covers donned, joints taped, and worker returns to duty.
Station 5:	Boot, Gloves and Outer Garment Removal	5. Boots, fully-encapsulating suit, inner gloves removed and deposited in separate containers lined with plastic.
Station 6:	SCBA Removal	6. SCBA backpack and facepiece is removed (avoid touching face with fingers). SCBA deposited on plastic sheets.
Station 7:	Field Wash	7. Hands and face are thoroughly washed. Shower as soon as possible.

LEVEL B DECONTAMINATION

Station 1:	Equipment Drop	1. Deposit equipment used on-site (tools, sampling devices and containers, monitoring instruments, radios, clipboards, etc.) on plastic drop cloths. Segregation at the drop reduces the probability of cross contamination. During hot weather operations, cool down stations may be set up within this area.
Station 2:	Outer Garment, Boots, and Gloves Wash and Rinse	2. Scrub outer boots, outer gloves and chemical-resistant splash suit with decon solution or detergent and water. Rinse off using copious amounts of water.
Station 3:	Outer Boot and Glove Removal	3. Remove outer boots and gloves. Deposit in container with plastic liner.
Station 4:	Tank Change	4. If worker leaves Exclusion Zone to change air tank, this is the last step in the decontamination procedure. Worker's air tank is exchanged, new outer gloves and boot covers donned, joints taped, and worker returns to duty.
Station 5:	Boot, Gloves and Outer Garment Removal	5. Boots, chemical-resistant splash suit, inner gloves removed and deposited in separate containers lined with plastic.
Station 6:	SCBA Removal	6. SCBA backpack and facepiece is removed (avoid touching face with fingers). SCBA deposited on plastic sheets.
Station 7:	Field Wash	7. Hands and face are thoroughly washed. Shower as soon as possible.

LEVEL C DECONTAMINATION

Station 1:	Equipment Drop	1. Deposit equipment used on-site (tools, sampling devices and containers, monitoring instruments, radios, clipboards, etc.) on plastic drop cloths. Segregation at the drop reduces the probability of cross contamination. During hot weather operations, cool down stations may be set up within this area.
Station 2:	Outer Garment, Boots, and Gloves Wash and Rinse	2. Scrub outer boots, outer gloves and chemical-resistant splash suit with decon solution or detergent and water. Rinse off using copious amounts of water.
Station 3:	Outer Boot and Glove Removal	3. Remove outer boots and gloves. Deposit in container with plastic liner.
Station 4:	Canister or Mask Change	4. If worker leaves Exclusion Zone to change canister (or mask), this is the last step in the decontamination procedure. Worker's canister is exchanged, new outer gloves and boot covers donned, joints taped, and worker returns to duty.
Station 5:	Boot, Gloves and Outer Garment Removal	5. Boots, chemical-resistant splash suit, inner gloves removed and deposited in separate containers lined with plastic.
Station 6:	Facepiece Removal	6. Facepiece is removed (avoid touching face with fingers). Facepiece deposited on plastic sheets.
Station 7:	Field Wash	7. Hands and face are thoroughly washed. Shower as soon as possible.

LEVEL D DECONTAMINATION

Station 1:	Equipment Drop	1. Deposit equipment used on-site (tools, sampling devices and containers, monitoring instruments, radios, clipboards, etc.) on plastic drop cloths. Segregation at the drop reduces the probability of cross contamination. During hot weather operations, cool down stations may be set up within this area.
Station 2:	Outer Garment, Boots, and Gloves Wash and Rinse	2. Scrub outer boots, outer gloves and chemical-resistant splash suit with decon solution or detergent and water. Rinse off using copious amounts of water.
Station 3:	Outer Boot and Glove Removal	3. Remove outer boots and gloves. Deposit in container with plastic liner.
Station 4:	Boot, Gloves and Outer Garment Removal	4. Boots, chemical-resistant splash suit, inner gloves removed and deposited in separate containers lined with plastic.
Station 5:	Field Wash	5. Hands and face are thoroughly washed. Shower as soon as possible.

EQUIPMENT DECONTAMINATION

GENERAL:

Equipment to be decontaminated during the project may include tools, monitoring equipment, respirators, sampling containers, laboratory equipment and drilling equipment.

All decontamination will be done by personnel in protective gear, appropriate for the level of decontamination, as determined by the site HSO. The decontamination work tasks will be split or rotated among support and work crews.

Depending on site conditions, backhoe and pumps may be decontaminated over a portable decontamination pad to contain wash water; or, wash water may be allowed to run off into a storm sewer system. Equipment needed may include a steam generator with high-pressure water, empty drums, screens, screen support structures, and shovels. Drums will be used to hold contaminated wash water pumped from the lined pit. These drums will be labeled as such.

Miscellaneous tools and equipment will be dropped into a plastic pail, tub, or other container. They will be brushed off and rinsed with a detergent solution, and finally rinsed with clean water.

MONITORING EQUIPMENT:

Monitoring equipment will be protected as much as possible from contamination by draping, masking, or otherwise covering as much of the instruments as possible with plastic without hindering the operation of the unit. The HNu or OVA meter, for example, can be placed in a clear plastic bag, which allows reading of the scale and operation of knobs. The probes can be partially wrapped keeping the sensor tip and discharge port clear.

The contaminated equipment will be taken from the drop area and the protective coverings removed and disposed in the appropriate containers. Any dirt or obvious contamination will be brushed or wiped with a disposable paper wipe.

RESPIRATORS:

Respirators will be cleaned and disinfected after every use. Taken from the drop area, the masks (with the cartridges removed and disposed of with other used disposable gear) will be immersed in a cleaning solution and scrubbed gently with a soft brush, followed by a rinse in plain warm water, and then allowed to air dry. In the morning, new cartridges will be installed. Personnel will inspect their own masks for serviceability prior to donning them. And, once the mask is on, the wearer will check the respirator for leakage using the negative and positive pressure fit check techniques.