Lion Oil Company

Product: PG 64-22 Asphalt **Revision No. 7**

MSDS No. LO0346 **Date of Preparation: 12-11-12**

Section 1 - Chemical Product and Company Identification

Product/Chemical Name: PG 64-22 Asphalt
CAS Number: (Mixture)
Synonyms: Asphalt Cement, Paving Asphalt
Description: Black liquid, when hot asphalt odor.
Recommended Use: Industrial intermediate used in asphalt paving industry
Manufacturer or Distributor: Lion Oil Co., 1000 McHenry St., El Dorado, AR 71730; (870) 862-8111
24-hr Emergency Phone Number: "FOR CHEMICAL EMERGENCY" Spill, Leak, Fire, Exposure or Accident
CALL CHEMTREC – Day or Night 800-424-9300
MSDS CONTACT: Beverly McFarland – 870-864-1306

Section 2 - Hazards Identification

☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆ **Emergency Overview** ☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆

WARNING
Severe burns may result from contact with hot asphalt.
Fumes from heated material may be irritating and hazardous
Avoid breathing vapors and contact with eyes and skin.
Upon heating, hydrogen sulfide gas may be released from this product.
Vapor spaces in tanks and shipping containers containing hot asphalt or asphalt products may accumulate hydrogen sulfide vapors at harmful concentrations.

HMIS®	
H	1*
F	1
PH	0
PPE†	
†Sec. 8	

Health
Flammability
Physical Haz.

☆☆ ☆☆☆☆☆ ☆☆☆☆☆ **Potential Health Effects** ☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆

Primary Entry Routes: Inhalation of fumes from heated material, eye/skin contact, ingestion. Risks are minimal when product is in the solid state.
Target Organs: eyes, skin, and respiratory system
Carcinogenicity: The International Agency for Research on Cancer (IARC) classified bitumens (such as petroleum asphalt in this product) as a Group 3 material, "not classifiable as to its carcinogenicity to humans." This classification was made based on inadequate evidence for the carcinogenicity of undiluted air refined bitumens in experimental animals and inadequate evidence that bitumens alone are carcinogenic to humans. However, asphalt does contain a trace amount of polycyclic aromatic hydrocarbons. Some polycyclic aromatic hydrocarbons have been shown to cause cancer and respiratory damage. This product may cause central nervous system depression after prolonged exposure, if ingested or inhaled.

Acute Effects

Inhalation: Because of its low vapor pressure, this product presents a minimal inhalation hazard at ambient temperature. Upon heating, fumes may be evolved. WARNING: Irritating and toxic hydrogen sulfide gas may be found in confined vapor spaces. Greater than 15 - 20 ppm continuous exposure can cause mucous membrane and respiratory tract irritation. 50 - 500 ppm can cause headache, nausea, and dizziness. Continued exposure at these levels can lead to loss of reasoning and balance, difficulty in breathing, fluid in the lungs, and possible loss of consciousness. Greater than 500 ppm can cause rapid unconsciousness due to respiratory paralysis and death by suffocation unless the victim is removed from exposure and successfully resuscitated. Hydrogen sulfide (H2S) has a characteristic rotten egg odor with an odor threshold as low as 10 parts per billion or even less. However, this odor should not be used as a warning property because H2S can deaden the sense of smell. H2S concentrations can be measured with an H2S meter or colorimetric indicating tubes. Excessive inhalation of vapors may cause nasal or respiratory irritation. Breathing of the mists, vapors or fumes may cause irritation, dizziness, headaches, and nausea.
Eye: Exposure to the mist, vapors or fumes may cause irritation.

Skin: Contact may cause moderate irritation. Prolonged exposure may cause defatting and dermatitis. Direct contact with hot asphalt may cause thermal burns. This product may be harmful if it is absorbed through the skin.
Ingestion: May cause gastrointestinal disturbances, irritation, nausea, vomiting, and diarrhea.
Chronic Effects
Skin: Absorption from prolonged or repeated skin contact may cause systemic toxicity.
Environmental Effects
See Ecological information (section 12)

Section Ref. (1, 3, 8)

☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆ **GHS CLASSIFICATION** ☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆

Classification
The substance does not meet the criteria for classification under GHS.

Hazard summary

Hazard class	Hazard Category	Hazard Statement
Not Classified	Not Classified	Not Classified

Other Hazards:

Health Hazards: Hydrogen sulfide (H2S), an extremely flammable and toxic gas, and other hazardous vapors may evolve and collect in the headspace of storage tanks, transport vessels and other enclosed containers.
Hydrogen sulfide is highly toxic and may be fatal if inhaled.
May dull the sense of smell, so do not rely on odor as an indication of hazard.
Contact with hot material can cause thermal burns which may result in permanent skin damage. Hot product may cause severe eye burns and/or blindness.
Safety Hazards: Not classified as flammable but will burn. Do not allow molten material to contact water or liquids. This can cause violent eruptions, splatter hot material, or ignite flammable material.

☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆ **LABEL ELEMENTS** ☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆

Hazard pictograms: None.

Signal word: None.

CLP Hazard Statements

Physical hazards:
Not classified for physical hazards.
Health hazards:
Not classified for health hazards.
Environmental hazards:
Not classified for hazards to the environment.

Precautionary Statements

Prevention: Observe good industrial hygiene practices.

Section 3 - Composition / Information on Ingredients

Ingredient Name	CAS Number	% wt
Asphalt	8052-42-4	97 - 98
Vegetable oil based product TS (187-161 oil)	Proprietary	3 - 2

Additional Information:
Upon heating, hydrogen sulfide gas may be released from this product. Vapor spaces in tanks and shipping containers containing hot asphalt or asphalt products may accumulate hydrogen sulfide vapors at harmful concentrations.

Section 4 - First Aid Measures

Inhalation: Move to fresh air. Use artificial respiration if necessary. **Seek Medical Attention.**
Eye Contact: Flush with large amounts of water for at least 15 minutes. **Seek Medical Attention.**
Skin Contact: For hot material, immerse and flush skin with large amounts of the coldest water possible. DO NOT try to dissolve with solvents or thinners. **Seek Medical Attention.**
For cold material, wash with soap and water.
Ingestion: Do Not Induce Vomiting, because of danger of aspiration into lungs, causing serious damage and chemical pneumonitis. If spontaneous vomiting occurs keep head below hips to prevent aspiration into lungs and monitor for breathing difficulty. **Seek medical attention.**
After first aid, get appropriate in-plant, paramedic, or community medical support. **Section Ref. (1)**

Section 5 - Fire-Fighting Measures

Flash Point: >450 °F
Flash Point Method: COC
Autoignition Temperature: 905 °F
LEL: NA
UEL: NA
Emergency Response Guide: Guide No. 128
Flammability Classification: Class IIIB Combustible Liquid

NFPA Rating ®	
H	1
F	1
R	0

Extinguishing Media: Extinguish with dry chemical, CO2, foam, and water fog. Solid streams of water may be ineffective. Cool affected containers with flooding quantities of water. Apply water from as great a distance as possible. Water or foam may cause frothing. Keep run off water out of sewers and water sources. Minimize breathing of gases, vapor, fumes, or decomposition products. Use self-contained breathing apparatus for enclosed or confined spaces or as otherwise needed.
Unusual Fire or Explosion Hazards: Do not store near strong oxidants or open flame. Smoke from fire may be hazardous.
Hazardous Combustion Products: Under fire conditions – May form toxic materials; carbon dioxide and monoxide, oxides of sulfur, H2S, and other decomposition products, in the case of incomplete combustion.
Fire-Fighting Instructions: Wear full protective clothing, including helmet, self-contained positive pressure breathing apparatus, protective clothing and face mask.
Special Fire-Fighting Procedures: Use air supplied rescue equipment. Cool exposed containers with water.
Section Ref. (4, 9)

Section 6 - Accidental Release Measures

"FOR CHEMICAL EMERGENCY" Spill, Leak, Fire, Exposure or Accident
CALL CHEMTREC – Day or Night 800-424-9300
Spill /Leak Procedures: Shut off leak, if possible without risk. Remove sources of ignition. Dike the spilled material, where this is possible. Prevent entry to sewers, or other water sources.
Small Spills: Allow material to cool, and then scrape up material for disposal. Shovel material into an appropriate container for disposal or recovery.
Large Spills: Dike ahead of spill to contain, and then take up with sand or other non-combustible, absorbent material. Dispose of in accordance with Federal, State and local regulations in a permitted waste management facility.

Section Ref. (4)

Section 7 - Handling and Storage

Handling Precautions:
Do not get this material in your eyes or on your skin and minimize exposure to fumes.
Wash exposed areas thoroughly after handling this product.
Keep this product from sparks or open flame.
Use this product with adequate ventilation.
Avoid heating asphalt within 25°F of actual flashpoint.
Stay up wind to avoid vapors. Do not store near open flames.
Ground lines and equipment used during transfer.
Hydrogen sulfide may be emitted from heated asphalt and may accumulate in storage tanks and bulk transport containers. Prolonged breathing (greater than 1 hour) of concentrations of hydrogen sulfide around 50 ppm can produce eye and respiratory tract (mouth, nose, and throat) irritation, and at high concentrations (around 300 ppm) is considered immediately dangerous to life and health.
Since the sense of smell becomes rapidly insensitive to hydrogen sulfide, its odor cannot be relied upon as an indicator of its concentration. Always use caution when working around closed bulk containers of asphalt. Use ventilation or work upwind from source of fumes or vapors. Use supplied air respirators or self-contained breathing apparatus if the PEL or TLV for hydrogen sulfide (10 ppm, 8hr TWA) is exceeded.
Storage Requirements: Do not store near strong oxidants and avoid water contamination. Store hot product in a well-ventilated area.

Section 8 - Exposure Controls / Personal Protection

	OSHA PEL		ACGIH TLV		NIOSH REL		NIOSH
Ingredient	**TWA**	**STEL**	**TWA**	**STEL**	**TWA**	**STEL**	**IDLH**
Asphalt Fumes			0.5 mg/m3 *			5 mg/m^3/ 15 min	
Polynuclear aromatics	0.2 mg/m^3		0.2 mg/m^3		0.1 mg/m^3		
Hydrogen Sulfide		C20 ppm 50ppm**	(10)ppm	(15)ppm		10 ppm	100 ppm

* As benzene –soluble aerosol - measured as inhalable faction of the aerosol
** - 10 min peak once per 8 hour shift
( ) - Values in parentheses are under review.
C - The STEL/ceiling concentration that shall not be exceeded during any part of the working exposure.

Engineering Controls
Ventilation: General mechanical with local exhaust; sufficient to maintain exposure levels below recommended ACGIH TLVs and OSHA PELs.

Protective Clothing/Equipment
Because heated asphalt will cause severe skin burns wear loose clothing, in good condition, with neck closed, and sleeves rolled down. Hand and arm protection should be worn. Safety shoes should be about 15 cm high (low cut boots), and laced. Face and eye protection is also recommended when heated asphalt is handled.
Gloves: Use chemical resistant gloves to avoid prolonged or repeated skin contact.
Goggles: Chemical-type goggles or face shield.
Respiratory: Self-contained, positive-pressure breathing apparatus when used in confined or enclosed space or when exposure limits are exceeded or hydrogen sulfide is unknown or exceeds 20 ppm. Organic vapor respirators can be used with good ventilation when organic vapors are less than 1000 ppm or ten (10) times permissible exposure limit, which ever is less. For emergency or non-routine operations (cleaning spills or storage tanks), wear an SCBA. *Warning! Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.* If respirators are used, OSHA requires a written respiratory protection program that includes: procedures for selecting respirators, medical evaluations, fit testing, use in routine and emergency situations, cleaning, disinfecting, storing, inspecting and maintaining respirators, breathing air quality, quantity and flow, training in respiratory hazards, and evaluation of effectiveness of respiratory program.
Contaminated Clothing: Launder or dry-clean contaminated clothing before reuse.
Hygiene: Never eat, drink, or smoke in work areas. Practice good personal hygiene after using this material, especially before eating, drinking, and smoking.

Section Ref. (1, 3)

Section 9 - Physical and Chemical Properties

Physical State: Liquid
Appearance and Odor: Black viscous liquid, Hydrocarbon odor.
Odor Threshold: ND
Vapor Pressure: ND
Vapor Density (Air=1): 4+
Formula Weight: ND
Density: ND
Specific Gravity (H_2O=1, at 4 °C): 1.0 – 1.1
pH: ND

Water Solubility: Negligible
Other Solubilities: ND
Boiling Point: >800°F
Melting Point: 125°F
Refractive Index: ND
Surface Tension: ND
% Volatile: < 1%
Evaporation Rate: ND

Section 10 - Stability and Reactivity

Stability: Material is stable.
Polymerization: Will not occur.
Chemical Incompatibilities: Do not store near strong oxidants.
Conditions to Avoid: Do not store near open flames.
Hazardous Decomposition Products: Under fire conditions – may produce irritation or poisonous gases. This product emits carbon monoxide, carbon dioxide and/or low molecular weight hydrocarbons.

Section 11- Toxicological Information

Asphalt (8052-42-4)
Carcinogenicity: ACGIH: A4 - Not Classifiable as a Human Carcinogen (as benzene soluble aerosol)
IARC: Group 3 - Not Classifiable (IARC Supplement 7 [1987], Monograph 35 [1985])

Mutagenicity: No information available for the product.

Teratogenicity: No information available for the product.

Developmental Effects: No information available for the product.

Chronic Toxicity: Asphalt fumes arise from hot asphalt. Asphalt (CAS # 8052-42-4): In 1985/87, IARC (International Agency for Research on Cancer) concluded the following: (a) Bitumens are not classifiable as to their carcinogenicity to humans (Group 3). (b) Extracts of steam- and air-refined bitumens are possibly carcinogenic to humans (Group 2B). IARC found that evidence for carcinogenicity from animal studies was: inadequate for undiluted air-refined bitumens; limited for steam-refined and cracking residue bitumens; sufficient for extracts of steam-refined and air-refined bitumen. IARC found that human evidence for carcinogenicity of asphalt fumes was inadequate. Studies of roofers indicated an excess of cancers; however, IARC concluded that, since roofers may be exposed also to coal-tar pitches and other materials, "the excess cancer risk cannot be attributed specifically to bitumens." In 1994, a published review of 20 epidemiology studies of asphalt workers and roofers agreed with IARC, that current human evidence is inadequate for the carcinogenicity of asphalt fumes in humans. Trace amounts of Polynuclear aromatic hydrocarbons (PAHs) may be present in some asphalt and can be released upon excessive heating, which results in thermal cracking of the asphalt compounds. Some of these PAHs have been identified as having the potential to induce carcinogenic and reproductive health effects.

Vegetable oil based product TS
Acute Toxicity for vegetable oil based product TS is based on a similar product study
Acute oral toxicity - Oral LD50 (combined sex) is greater than 5000 mg/kg bw (limit test) is based on similar product study (Kaysen A, 1984), groups of fasted, Sprague-Dawley Crl rats (5 males and 5 females) were given a single oral dose of metiloil A (batch No. 1169) at dose of 5 000 mg/kg bw and observed for 14 days. No mortality was observed. From 10 minutes to 3 hours after administration, hypokinesia was noticed in all animals. Then,

no clinical signs were observed. No effect on body weight was observed at the end of the observation period. Metiloil A is not classified based on the LD50 combined sex. This acute oral study is classified as acceptable. It does satisfy the guideline requirement (OECD 401) for an acute oral study in the rats.

Acute dermal toxicity - LD50 at 2000 mg/kg/bw has been tested in a fixed dose test on rabbit with fatty acids C6 - C12 methyl esters following EPA OPPTS 870.1200 with no sign of toxicity.

Asphalt, petroleum

Intramuscular-Rat TDLo: 5400 mg/kg/24W-I: Neoplastic effects

Intramuscular-Mouse TDLo: 12 g/kg/12W-I: Neoplastic effects

Archives of Pathology (American Medical Association, 535 N. Dearborn St., Chicago, IL 60610) V.5, No. 3-V.50, No. 3, 1928-50; V.70-99, 1960-75ARPAAQ 70, 372, 60

Skin-Mouse TDLo: 905 g/kg/2Y-I: Neoplastic effects

Journal of the Madras Agricultural Students' Union (Madras Agricultural Journal, Tamil Nadu Agricultural University Campus, Coimbatore 641003, India) V.1-16, 1912-28JMSUAT 34, 255, 65

Section Ref. (3, 5, 8, 10)

Section 12 - Ecological Information

Ecotoxicity:
Effect of low concentrations on aquatic life is unknown.
FOULING TO SHORELINE.
May be dangerous if it enters water intakes.
Notify local health and pollution control officials.
Notify operators of nearby water intakes.
Asphalt can have disastrous effects on bottom life.

Section Ref. (10)

Section 13 - Disposal Considerations

Disposal: Local, state and federal disposal regulations must be followed.
Container Cleaning and Disposal: "Empty" Container Warning: "Empty" containers retain product residue (liquid and/or vapor) and can be dangerous. DO NOT PRESSURIZE, CUT, WELD, BRAZE, SOLDER, DRILL, GRIND, OR EXPOSE SUCH CONTAINERS TO HEAT, FLAME, SPARKS, STATIC ELECTRICITY, OR OTHER SOURCES OF IGNITION. THEY MAY EXPLODE AND CAUSE INJURY OR DEATH.

Section 14 - Transport Information

DOT Transportation Data (49 CFR 172.101):

The description shown may not apply to all shipping situations. Consult 49CFR, or appropriate Dangerous Goods Regulations, for additional description information.

Transportation Information for Bulk Shipments

DOT Shipping Name: Elevated Temperature Liquid, N.O.S., (Heavy Asphalt)
DOT Hazard Class: 9
DOT ID No.: UN3257
DOT Packing Group: PGIII
Hazard Label: Class 9
Placards Required: HOT, UN3257

Transportation Information for Non-Bulk Shipments

DOT Shipping Name: NA
DOT Hazard Class: NA
DOT ID No.: NA
DOT Packing Group: NA
Hazard Label: NA
Placards Required: NA

Section 15 - Regulatory Information

CERCLA Reportable Quantity (RQ) (40 CFR 302.4):

Compound	CAS Number	RQ
Benzo(a)pyrene	50-32-8	1
Benzo(a)anthracene	56-55-3	10
Dibenz(a,h)anthracene	53-70-3	1
3-Methylcholanthrene	56-49-5	10
7,12-Dimethylbenz(a)anthracene	57-97-6	1
Naphthalene	91-20-3	100
Biphenyl	92-52-4	100
Anthracene	120-12-7	5000
Benzo(rst)pentaphene	189-55-9	10
Phenanthrene	85-01-8	5000
Benzo(g,h,I)perylene	191-24-2	5000
Indeno(1,2,3-cd)pyrene	193-39-5	100
Benzo(b)fluoranthene	205-99-2	1
Fluoranthene	206-44-0	100
Benzo(k)fluoranthene	207-08-9	5000
Benzo(a)phenanthene	218-01-9	100

SARA 311/312 Codes (40 CFR 370 / 29 CFR 1910.1200):

Fire	No
Pressure	No
Reactivity	No
Immediate (acute)	Yes
Delayed (chronic)	Yes

SARA Toxic Chemical (40 CFR 372):

Compound	CAS Number	Concentration ug/kg	Method Detection Limit ug/kg
Benzo(a)pyrene	50-32-8	Not Detected	24300
Benzo(a)anthracene	56-55-3	Not Detected	18700
Dibenz(a,h)anthracene	53-70-3	Not Detected	105000
3-Methylcholanthrene	56-49-5	Not Detected	57200
7,12-Dimethylbenz(a)anthracene	57-97-6	Not Detected	50000
Naphthalene	91-20-3	Not Detected	18100
Biphenyl	92-52-4	Not Detected	250000
Anthracene	120-12-7	Not Detected	30300
Benzo(rst)pentaphene	189-55-9	Not Detected	50000
Dibenzo(a,h)pyrene	189-64-0	Not Detected	50000
Phenanthrene	85-01-8	Not Detected	26600
Benzo(g,h,I)perylene	191-24-2	Not Detected	45900
Dibenzo(a,l)pyrene	191-30-0	Not Detected	50000
Dibenzo(a,e)pyrene	192-65-4	Not Detected	50000
Indeno(1,2,3-cd)pyrene	193-39-5	Not Detected	80500
7,H-dibenzo(c,g)carbazole	194-59-2	Not Detected	25000
Benzo(b)fluoranthene	205-99-2	Not Detected	41900
Benzo(j)fluoranthene	205-82-3	Not Detected	50000
Fluoranthene	206-44-0	Not Detected	50000
Benzo(k)fluoranthene	207-08-9	Not Detected	26600
Benzo(a)phenanthene	218-01-9	Not Detected	50000
Dibenz(a,j)acridine	224-42-0	Not Detected	24800
Dibenz(a,h)acridine	226-36-8	Not Detected	25000
Dibenzo(a,e)fluoranthene	5385-75-1	Not Detected	50000
1-Nitropyrene	5522-43-0	Not Detected	50000
5-Methylchrysene	3697-24-3	Not Detected	50000

When the concentration of a compound is below the MDL and it is reasonably suspected to be present in the product then some companies have adopted the practice of reporting ½ the MDL.

SARA EHS (Extremely Hazardous Substance) (40 CFR 355): None

TSCA (40 CFR 710): All components of this product are listed on the TSCA Inventory.

State Regulations: The following chemicals are specifically listed by individual states, for details on each states regulatory requirements you should contact the appropriate agency in that state.

Compound	CAS Number	States
Asphalt Fumes	8052-42-4	CA, CA 1, CA65, TX, FL, MA, PA

CA CALIFORNIA DIRECTOR'S LIST OF HAZARDOUS SUBSTANCES
CA 1 CALIFORNIA OSHA WORKPLACE AIRBORNE CONTAMINANTS
CA65 CALIFORNIA PROPOSITION 65 CARCINOGENS OR REPRODUCTIVE TOXINS
TX TEXAS AIR CONTAMINANTS WITH HEALTH EFFECTS SCREENING LEVELS
FL FLORIDA TOXIC SUBSTANCE IN THE WORKPLACE
MA MASSACHUSETTS HAZARDOUS SUBSTANCE LIST
PA PENNSYLVANIA HAZARDOUS SUBSTANCES

Section Ref. (6)

SECTION 16 - Other Information

Prepared By: Lion Oil Control Lab 12-11-12
Revision Notes: (05-22-09) - Moved Hazard Identification to Section 2 and Composition/ Information on Ingredients to Section 3. Updated Sections 7, 8 and 16.

Hazardous Materials Information System (U.S.A.)

HMIS	
H	1*
F	1
PH	0
PPE†	
†Sec. 8	

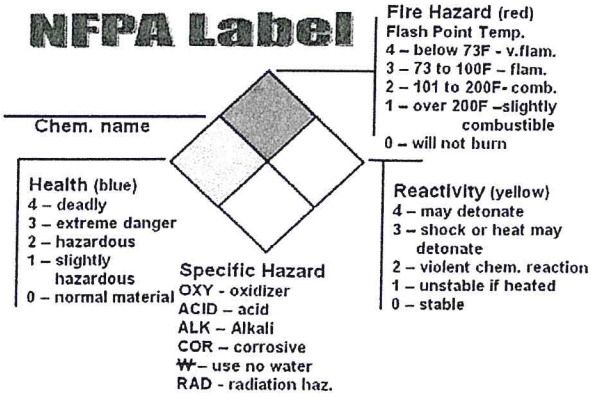
Hazard Ratings

H – Health
F – Fire Hazard
PH – Physical Hazard

4 – Extreme
3 – Serious
2 – Moderate
1 – Slight
0 – Minimal

*** Chronic Hazard** - Chronic (long-term) health effects may result from repeated over exposure.

National Fire Protection Association



Disclaimer: LION OIL COMPANY PROVIDES THIS INFORMATION FOR THE USER'S CONSIDERATION. LION OIL COMPANY BELIEVES THIS INFORMATION IS ACCURATE, BUT NOT ALL INCLUSIVE IN ALL CIRCUMSTANCES. USER SHOULD ENSURE THAT USER HAS CURRENT DATA RELEVANT FOR ITS PURPOSES. NO WARRANTY, EXPRESSED OR IMPLIED, INCLUDING MERCHANTABILITY, FITNESS OR OTHERWISE IS GIVEN.

Reference and research:

(1) The International Chemical Safety Card - http://www.cdc.gov/niosh/ipcs/icstart.html

(2) NIOSH Pocket Guide to Chemical Hazards - http://www.cdc.gov/niosh/npg/

(3) 2007 Guide to Occupational Exposure Values – Compiled by ACGIH

(4) 2008 Emergency Response Guidebook - http://hazmat.dot.gov/pubs/erg/unidnum.htm

(5) Sax's Dangerous Properties of Industrial Materials, 9th Edition; Edited by Richard J. Lewis, Sr.; Version 1.6; copyright © 1997 by John Wiley & Sons, Inc.

(6) Touchstone Environmental, Inc.; Chemcheck Handbook (educational reference)

(7) Hawley's Condensed Chemical Dictionary, 13th Edition; Edited by Richard J. Lewis, Sr.; Version 1.1 copyright© 1997 by John Wiley & Sons, Inc.

(8) Environmental Contaminant Reference Databook; VOLUMES I, II and III; by Jan. C. Prager; Version 2.0; copyright © 1997 by John Wiley & Sons, Inc.

(9) Fire Protection Guide to Hazardous Materials, Twelfth Edition; National Fire Protection Association (NFPA 325) Guide to Hazardous Chemical Properties of Flammable Liquids, Gases, and Volatile Solids. 1994 edition.

(10) Hazardous Materials Handbook; Richard P. Pohanish and Stanley A. Greene, Version 1.3 Copyright© 1997 by Richard P. Pohanish and Stanley A. Greene