



MATERIAL SAFETY DATA SHEET

No. 2 Fuel Oil

VALERO MARKETING & SUPPLY COMPANY
and Affiliates

P.O. Box 690000
San Antonio, TX 78269-6000

Emergency Phone Numbers
24 Hour Emergency: 866-565-5220
Chemtrec Emergency: 800-424-9300

General Assistance
General Assistance: 210-345-4593

BRAND NAMES: Valero, Diamond Shamrock, Shamrock, Ultramar, Beacon, Total

Section 1. Chemical Product and Company Identification

Common / Trade name : No. 2 Fuel Oil
Synonym : Fuel Oil No. 2, Home Heating Oil, X Grade Middle Distillate, Heating X-Grade Oil, Petroleum Distillate-Gas Oil & Light Gas Oil, Light Fuel Oil, Petroleum Distillate-Gas Oil #2 & #3

SYNONYMS/COMMON NAMES: This Material Safety Data Sheet applies to the listed products and synonym descriptions for Hazard Communication purposes only. Technical specifications vary greatly depending on the product and are not reflected in this document. Consult specification sheets for technical information. This product contains ingredients that are considered to be hazardous as defined by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

Material uses : Motor fuels. Heating fuels.

MSDS # : 109

CAS # : 68476-34-6

Section 2. Composition, information on ingredients

<u>Name</u>	<u>CAS number</u>	<u>Concentration (%)</u>
Distillates, petroleum residues vacuum	68965-27-1	0 - 100
Hexane (Other Isomers)	mixture	0 - 3
Naphthalene	91-20-3	0 - 3
n-Nonane	111-84-2	0 - 3
n-Heptane	142-82-5	0 - 2
n-Hexane	110-54-3	0 - 2
Octane (All Isomers)	111-65-9	0 - 1
Ethylbenzene	100-41-4	0 - 1
Cyclohexane	110-82-7	0 - 1
Hydrogen Sulfide	7783-08-4	0 - 1
Toluene	108-88-3	0 - 1
Xylene (o,m,p isomers)	1330-20-7	0 - 1
Benzene	71-43-2	0 - 0.5

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Section 3. Hazards Identification

Danger! Diesel Exhaust has been Reported to be an Occupational hazard due to NIOSH-reported potential carcinogenic properties.

May cause irritation to eyes, skin and respiratory system. Avoid liquid, mist and vapor contact. Harmful or fatal if swallowed. Aspiration hazard, can enter lungs and cause damage. May cause irritation or be harmful if inhaled or absorbed through the skin. Contains polycyclic aromatic compounds which have been shown to cause anemia, disorders of the liver, bone marrow and lymphoid tissues in rats following dermal application. Combustible Liquid. Vapors may explode. If this material is handled as a refinery intermediate stream versus sold as a finished product, the following additional health hazard warning information may be pertinent.

Danger! Untreated Product May Contain or Release Hydrogen Sulfide - a highly toxic flammable gas which can be fatal if inhaled at certain concentrations.

Physical state : Liquid. (May be dyed red.)

Emergency overview : **Danger!**

MAY BE FATAL IF INHALED.

CANCER HAZARD.

CONTAINS MATERIAL WHICH CAN CAUSE CANCER.

HARMFUL IF SWALLOWED.

CAUSES SKIN IRRITATION.

CONTAINS MATERIAL WHICH CAUSES DAMAGE TO THE FOLLOWING ORGANS: BLOOD, KIDNEYS, LIVER, PERIPHERAL NERVOUS SYSTEM, RESPIRATORY TRACT, SKIN, CENTRAL NERVOUS SYSTEM, EYE, LENS OR CORNEA.

Do not ingest. Do not get in eyes or on skin or clothing. Avoid breathing vapor or mist. Keep away from heat, sparks and flame. Keep container closed. Use only with adequate ventilation. Wash thoroughly after handling. Risk of cancer depends on duration and level of exposure.

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

Potential acute health effects

Eyes

: Corrosive to eyes. May cause severe irritation, redness, tearing, blurred vision and conjunctivitis.

Skin

: Prolonged or repeated contact may cause moderate irritation, defatting (cracking), redness, itching, inflammation, dermatitis and possible secondary infection. High pressure skin injections are SERIOUS MEDICAL EMERGENCIES. Injury may not appear serious at first. Within a few hours, tissues will become swollen, discolored and extremely painful.

Inhalation

: Nasal and respiratory tract irritation, central nervous system effects including excitation, euphoria, contracted eye pupils, dizziness, drowsiness, blurred vision, fatigue, nausea, headache, loss of reflexes, tremors, convulsions, seizures, loss of consciousness, coma, respiratory arrest and sudden death could occur as a result of long term and/or high concentration exposure to vapors. May also cause anemia and irregular heart rhythm. Repeated or prolonged exposure may cause behavioral changes. NIOSH Current Intelligence Bulletin 50 reports a potential occupational carcinogenic hazard exists due to human exposure to diesel exhaust.

Ingestion

: Toxic if swallowed. May cause burns to mouth, throat and stomach. This product may be harmful or fatal if swallowed. This product may cause nausea, vomiting, diarrhea and restlessness. DO NOT INDUCE VOMITING. Aspiration into the lungs can cause severe chemical pneumonitis or pulmonary edema/hemorrhage, which can be fatal. May cause gastrointestinal disturbances. Symptoms may include irritation, depression, vomiting and diarrhea. May cause harmful central nervous system effects, similar to those listed under "inhalation".

Medical conditions aggravated by over-exposure

: Repeated or prolonged contact with spray or mist may produce chronic eye irritation and severe skin irritation. Repeated or prolonged exposure to spray or 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.

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Over-exposure signs/symptoms : Nasal and respiratory tract irritation, central nervous system effects including excitation, euphoria, contracted eye pupils, dizziness, drowsiness, blurred vision, fatigue, nausea, headache, loss of reflexes, tremors, convulsions, seizures, loss of consciousness, coma, respiratory arrest or sudden death could occur as a result of long term and/or high concentration exposure to vapors. May also cause anemia and irregular heart rhythm.

See toxicological information (section 11)

Section 4. First Aid Measures

Eye contact : Flush immediately with large amounts of water for at least 15 minutes. Eyelids should be held away from the eyeball to ensure thorough rinsing. Seek medical advice if pain or redness continues.

Skin contact : In case of contact, immediately flush skin with plenty of water. Remove contaminated clothing and shoes. Wash clothing before reuse. Clean shoes thoroughly before reuse. Get medical attention. Wash exposed area thoroughly with soap and water. Remove contaminated clothing promptly and launder before reuse. Contaminated leather goods should be discarded. If irritation persists or symptoms described in the MSDS develop, seek medical attention. High pressure skin injections are SERIOUS MEDICAL EMERGENCIES. Get immediate medical attention.

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

Ingestion : This product may be harmful or fatal if swallowed. This product may cause nausea, vomiting, diarrhea and restlessness. DO NOT INDUCE VOMITING. Aspiration into the lungs can cause severe chemical pneumonitis or pulmonary edema/hemorrhage, which can be fatal. May cause gastrointestinal disturbances. Symptoms may include irritation, depression, vomiting and diarrhea. May cause harmful central nervous system effects, similar to those listed under "inhalation".

Notes to physician : In case of ingestion, gastric lavage with activated charcoal can be used promptly to prevent absorption. Consideration should be given to the use of an intratracheal tube, to prevent aspiration. Irregular heart beat may occur, use of adrenalin is not advisable. Individuals intoxicated by the product should be hospitalized immediately, with acute and continuing attention to neurological and cardiopulmonary function. Positive pressure ventilation may be necessary. After the initial episode, individuals should be monitored for changes in blood variables and the delayed appearance of pulmonary edema and chemical pneumonitis. Such patients should be monitored for several days or weeks for delayed effects, including bone marrow toxicity, hepatic and renal impairment. Individuals with chronic pulmonary disease will be more seriously impaired, and recovery from inhalation exposure may be complicated. In case of skin injection, prompt debridement of the wound is necessary to minimize necrosis and tissue loss.

Section 5. Fire Fighting Measures

Flammability of the product : FLAMMABLE

Auto-ignition temperature : 257.2°C (495°F)

Flash point : Closed cup: 32.2 to 121.2°C (90 to 250.2°F).

Flammable limits : Lower: 0.4% Upper: 8%

Products of combustion : These products are carbon oxides (CO, CO₂), nitrogen and sulfur oxides (NO_x, SO_x), particulate matter, VOC's.

Fire hazards in the presence of various substances : Flammable in the presence of open flames, sparks and static discharge.

Explosion hazards in the presence of various substances : Explosive in the presence of open flames, sparks and static discharge.

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Fire-fighting media and instructions	: Flammable Liquid. Use dry chemical, foam or carbon dioxide to extinguish the fire. Consult foam manufacturer for appropriate media, application rates and water/foam ratio. Water can be used to cool fire-exposed containers, structures and to protect personnel. If a leak or spill has not ignited, ventilate area and use water spray to disperse gas or vapor and to protect personnel attempting to stop a leak. Use water to flush spills away from sources of ignition. Do not flush down public sewers. Collect contaminated fire-fighting water separately. It must not enter the sewage system. Dike area of fire to prevent runoff. Decontaminate emergency personnel and equipment with soap and water. Flammable liquid and vapor. Vapor may cause flash fire. Vapors may accumulate in low or confined areas or travel a considerable distance to a source of ignition and flash back. Runoff to sewer may create fire or explosion hazard.
Special protective equipment for fire-fighters	: Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.
Special remarks on fire hazards	: No additional remark.
Special remarks on explosion hazards	: No additional remark.

Section 6. Accidental Release Measures

Personal precautions	: Immediately contact emergency personnel. Eliminate all ignition sources. Keep unnecessary personnel away. Use suitable protective equipment (section 8). Do not touch or walk through spilled material. Tanks, vessels or other confined spaces which have contained product should be freed of vapors before entering. The container should be checked to ensure a safe atmosphere before entry. Empty containers may contain toxic, flammable/combustible or explosive residues or vapors. Do not cut, grind, drill, weld or reuse empty containers that contained this product. Do not transfer this product to another container unless the container receiving the product is labeled with proper DOT shipping name, hazard class and other information that describes the product and its hazards.
Environmental precautions	: Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. If facility or operation has an "oil or hazardous substance contingency plan", activate its procedures. Stay upwind and away from spill. Wear appropriate protective equipment including respiratory protection as conditions warrant. Do not enter or stay in area unless monitoring indicates that it is safe to do so. Isolate hazard area and restrict entry to emergency crew. Extremely flammable. Review Fire and Explosion Hazard Data before proceeding with clean up. Keep all sources of ignition (flames, smoking, flares, etc.) and hot surfaces away from release. Contain spill in smallest possible area. Recover as much product as possible (e.g., by vacuuming). Stop leak if it can be done without risk. Use water spray to disperse vapors. Spilled material may be absorbed by an appropriate absorbent, and then handled in accordance with environmental regulations. Prevent spilled material from entering sewers, storm drains, other unauthorized treatment or drainage systems and natural waterways. Contact fire authorities and appropriate federal, state and local agencies. If spill of any amount is made into or upon navigable waters, the contiguous zone, or adjoining shorelines, contact the National Response Center at 800-424-8802. For highway or railway spills, contact Chemtrec at 800-424-9300.
Methods for cleaning up	: If emergency personnel are unavailable, contain spilled material. For small spills, add absorbent (soil may be used in the absence of other suitable materials) and use a non-sparking or explosion-proof means to transfer material to a sealable, appropriate container for disposal. For large spills, dike spilled material or otherwise contain it to ensure runoff does not reach a waterway. Place spilled material in an appropriate container for disposal.

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Section 7. Handling and Storage

Handling

- : Do not ingest. Do not get in eyes, on skin or on clothing. Keep container closed. Use only with adequate ventilation. Avoid breathing vapor or mist. Keep away from heat, sparks and flame. To avoid fire or explosion, dissipate static electricity during transfer by grounding and bonding containers and equipment before transferring material. Use explosion-proof electrical (ventilating, lighting and material handling) equipment. Wash thoroughly after handling. Use only in well ventilated locations. Keep away from heat, spark and flames. In case of fire, use water spray, foam, dry chemical or carbon dioxide as described in the Fire and Explosion Hazard Data section of the MSDS. Do not pressurize, cut, weld, braze, solder, drill on or near this container. "Empty" container contains residue (liquid and/or vapor) and may explode in heat of a fire.

Keep out of reach of children. Failure to use caution may cause serious injury or illness. Never siphon by mouth. For use as a motor fuel only. Do not use as a cleaning solvent or for other non-motor fuel uses. Wash thoroughly after handling. To prevent ingestion and exposure - Do not siphon by mouth to transfer product between containers. Use good personal hygiene practices. After handling this product, wash hands before eating, drinking, or using toilet facilities.

Storage

- : Store in a segregated and approved area. Keep container in a cool, well-ventilated area. Keep container tightly closed and sealed until ready for use. Avoid all possible sources of ignition (spark or flame).

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 occupational exposure limits. Ensure that eyewash stations and safety showers are close to the workstation location.

Personal protection

Eyes

- : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists or dusts.

Skin

- : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product. Flame Retardant Clothing is recommended.

Respiratory

- : Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

Hands

- : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary.

Personal protective equipment (Pictograms)

- : Consult your supervisor or S.O.P. for special handling direction.



Personal protection in case of a large spill

- : Splash goggles. Full suit. Vapor respirator. Boots. Gloves. Self-contained breathing apparatus (SCBA) should be used to avoid inhalation of the product. Suggested protective clothing might not be adequate. Consult a specialist before handling this product.

Component

Exposure limits

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Hexane (Other Isomers)	ACGIH TLV (United States, 9/2004). STEL: 1000 ppm 15 minute/minutes. Form: All forms TWA: 500 ppm 8 hour/hours. Form: All forms NIOSH REL (United States, 6/2001). CEIL: 510 ppm 15 minute/minutes. Form: All forms NIOSH REL (United States, 6/2001). STEL: 15 ppm 15 minute/minutes. Form: All forms TWA: 10 ppm 10 hour/hours. Form: All forms OSHA PEL (United States, 6/1993). TWA: 10 ppm 8 hour/hours. Form: All forms ACGIH TLV (United States, 6/2004). Notes: 1996 Adoption Refers to Appendix A - Carcinogens. STEL: 15 ppm 15 minute/minutes. Form: All forms TWA: 10 ppm 8 hour/hours. Form: All forms NIOSH REL (United States, 6/2001). TWA: 200 ppm 10 hour/hours. Form: All forms ACGIH TLV (United States, 9/2004). TWA: 200 ppm 8 hour/hours. Form: All forms ACGIH TLV (United States, 9/2004). STEL: 500 ppm 15 minute/minutes. Form: All forms TWA: 400 ppm 8 hour/hours. Form: All forms NIOSH REL (United States, 6/2001). TWA: 350 mg/m³ 10 hour/hours. Form: All forms OSHA PEL (United States, 6/1993). TWA: 500 ppm 8 hour/hours. Form: All forms OSHA PEL (United States, 6/1993). TWA: 500 ppm 8 hour/hours. Form: All forms ACGIH TLV (United States, 9/2004). Skin TWA: 50 ppm 8 hour/hours. Form: All forms NIOSH REL (United States, 6/2001). TWA: 50 ppm 10 hour/hours. Form: All forms NIOSH REL (United States, 6/2001). CEIL: 385 ppm 15 minute/minutes. Form: All forms TWA: 75 ppm 10 hour/hours. Form: All forms OSHA PEL (United States, 6/1993). TWA: 500 ppm 8 hour/hours. Form: All forms ACGIH TLV (United States, 3/2004). Notes: 1999 Adoption. TWA: 300 ppm 8 hour/hours. Form: All forms ACGIH TLV (United States, 1/2004). STEL: 125 ppm 15 minute/minutes. Form: All forms TWA: 100 ppm 8 hour/hours. Form: All forms NIOSH REL (United States, 6/2001). STEL: 125 ppm 15 minute/minutes. Form: All forms TWA: 100 ppm 10 hour/hours. Form: All forms OSHA PEL (United States, 6/1993). TWA: 100 ppm 8 hour/hours. Form: All forms ACGIH TLV (United States, 1/2004). TWA: 100 ppm 8 hour/hours. Form: All forms NIOSH REL (United States, 6/2001). TWA: 300 ppm 10 hour/hours. Form: All forms OSHA PEL (United States, 6/1993). TWA: 300 ppm 8 hour/hours. Form: All forms ACGIH TLV (United States, 9/2004). TWA: 10 ppm 8 hour/hours. Form: All forms STEL: 15 ppm 15 minute/minutes. Form: All forms NIOSH REL (United States, 12/2001). CEIL: 10 ppm 10 minute/minutes. Form: All forms OSHA PEL Z2 (United States, 8/1997). CEIL: 20 ppm Form: All forms AMP: 50 ppm 10 minute/minutes. Form: All forms
Naphthalene	
n-Nonane	
n-Heptane	
n-Hexane	
Octane (All Isomers)	
Ethylbenzene	
Cyclohexane	
Hydrogen Sulfide	

Toluene	ACGIH TLV (United States, 5/2004). Skin Notes: 1996 Adoption Refers to Appendix A – Carcinogens. TWA: 50 ppm 8 hour/hours. Form: All forms NIOSH REL (United States, 6/2001). STEL: 150 ppm 15 minute/minutes. Form: All forms TWA: 100 ppm 10 hour/hours. Form: All forms OSHA PEL Z2 (United States, 6/2002). AMP: 500 ppm 10 minute/minutes. Form: All forms CEIL: 300 ppm Form: All forms TWA: 200 ppm 8 hour/hours. Form: All forms
Xylene (o,m,p isomers)	ACGIH TLV (United States, 5/2004). STEL: 150 ppm 15 minute/minutes. Form: All forms TWA: 100 ppm 8 hour/hours. Form: All forms OSHA PEL (United States, 6/1993). TWA: 100 ppm 8 hour/hours. Form: All forms
Benzene	NIOSH REL (United States, 6/2001). Notes: See Appendix A - NIOSH Potential Occupational Carcinogen STEL: 1 ppm 15 minute/minutes. Form: All forms TWA: 0.1 ppm 10 hour/hours. Form: All forms ACGIH TLV (United States, 5/2004). Skin STEL: 2.5 ppm 15 minute/minutes. Form: All forms TWA: 0.5 ppm 8 hour/hours. Form: All forms OSHA PEL (United States, 6/1993). STEL: 5 ppm 15 minute/minutes. Form: All forms TWA: 1 ppm 8 hour/hours. Form: All forms

Consult local authorities for acceptable exposure limits.

Section 9. Physical and Chemical Properties

Physical state	: Liquid. (May be dyed red.)
Color	: Clear. Straw. Black. Brown. Green.
Odor	: Kerosene (Strong.)
Boiling point	: 93.3 to 482.3°C (199.9 to 900.1°F)
Melting/freezing point	: May start to solidify at -51.15°C (-60.1°F) based on data for: n-Nonane. Weighted average: -99.54°C (-147.2°F)
Specific gravity	: 0.84 to 0.93 (Water = 1) (@ 60 °F)
Vapor pressure	: <0.7 kPa (<5.2 mm Hg) (at 20°C)
Vapor density	: 3 to 7 (Air = 1)
Volatility	: Negligible
Evaporation rate	:

Section 10. Stability and reactivity data

Stability and reactivity	: The product is stable.
Incompatibility with various substances	: Reactive with oxidizing agents, acids, alkalis.
Hazardous decomposition products	: These products are carbon oxides (CO, CO ₂), nitrogen and sulfur oxides (NO _x , SO _x), particulate matter, VOC's.
Hazardous polymerization	: Will not occur.

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Section 11. Toxicological Information

Toxicity data

DIESEL EXHAUST FUMES have been reported to be a potential occupational carcinogen in humans by NIOSH Current Intelligence Bulletin 50.

HEPTANE can affect the body if it is inhaled, comes in contact with the eyes or skin, or is swallowed. Heptane vapor is a narcotic. Concentrations of 10,000 to 15,000 ppm produced narcosis in mice within 30 to 60 minutes, while 15,000 to 20,000 ppm caused convulsions and death. At 48,000 ppm, respiratory arrest was produced in mice in 3 to 4 minutes from the start of exposure. Human subjects exposed to 1,000 ppm for 6 minutes, or to 2,000 ppm for 4 minutes, reported slight vertigo. At 5,000 ppm for 4 minutes, there was marked vertigo, inability to walk a straight line, hilarity, and incoordination, but no complaints of eye and upper respiratory tract or mucous membrane irritation. A 15-minute exposure at 5,000 ppm produced in some subjects a state of stupor lasting for 30 minutes after exposure. These subjects also reported loss of appetite, slight nausea, and a taste resembling gasoline for several hours after exposure. Although chronic nervous system effects have not been attributed to heptane, polyneuritis has been reported following prolonged exposure to a petroleum fraction with boiling range between 70°C and 100°C, and this fraction would normally contain various isomers of heptane as major ingredients.

n-HEXANE can affect the body if it is inhaled, comes in contact with the eyes or skin, or is swallowed. Hexane vapor is a narcotic and a mild upper respiratory irritant. Polyneuropathy (peripheral nerve damage) has been reported to occur in workers exposed to hexane vapors, characterized by progressive weakness and numbness in the extremities, loss of deep tendon reflexes and reduction of motor nerve conduction velocity. Recovery ranges from no recovery to complete recovery depending upon the duration of exposure and severity of nerve damage. Concentrations of 30,000 ppm produced narcosis in mice within 30 to 60 minutes, convulsions and death occurred at 35,000 to 40,000 ppm, and at 64,000 ppm respiratory arrest was produced in 2.5 to 4.5 minutes from the start of exposure. Concentrations up to 8000 ppm produced no anesthesia. In human subjects, 2000 ppm for 10 minutes produced no effects, but 5000 ppm resulted in dizziness and a sensation of giddiness. Other investigators reported slight nausea, headache and irritation of the eyes and throat at 1400 to 1500 ppm. In industrial practice, mild narcotic symptoms such as dizziness have been observed when concentrations exceeded 1000 ppm, but not below 500 ppm.

NONANE causes a four hour LC50 in rats at concentrations of 3200 ppm, or at about the same level as VM&P Naphtha. This level is markedly lower than the lethal concentrations reported in earlier mice studies involving octane (13,500 ppm) and heptane (16,000 ppm), supporting the lower limit for nonane.

OCTANE can affect the body if it is inhaled, comes in contact with the skin or eyes or is swallowed. Octane vapor is a mild narcotic and mucous membrane irritant. Concentrations of 6600 to 13,700 ppm produced narcosis in mice in 30 to 90 minutes, the fatal concentration for animals is near 13,500 ppm. No chronic systemic effects have been reported in humans.

NAPHTHALENE can affect the body if it is inhaled, comes into contact with the eyes or the skin or if it is swallowed. Naphthalene vapor causes hemolysis and eye irritation, and may cause cataracts. Severe intoxication from ingestion of the solid results in characteristic manifestations of marked intravascular hemolysis and its consequences, including potentially fatal hyperkalemia. Initial symptoms include eye irritation, headache, confusion, excitement, malaise, profuse sweating, nausea, vomiting, abdominal pain, and irritation of the bladder. There may be progression to jaundice, hematuria, hemoglobinuria, renal tubular blockage, and acute renal shutdown. Hematologic features include red cell fragmentation, icterus, severe anemia with nucleated red cells, leukocytosis, and dramatic decreases in hemoglobin, hematocrit and red cell count; sometimes there is formation of Heinz bodies and methemoglobin. Individuals with a deficiency of glucose-6-phosphate dehydrogenase in erythrocytes may be more susceptible to hemolysis by naphthalene. Cataracts and ocular irritation have been produced experimentally in animals and have been described in humans. Of 21 workers exposed to high concentrations of fume or vapor for 5 years, 8 had peripheral lens opacities; in other studies, no abnormalities of the eyes have been detected in workers exposed to naphthalene for several years. The vapor causes eye irritation at 15 ppm. Eye contact with the solid may result in conjunctivitis, superficial injury to the cornea, choriorretinitis, scotoma, and diminished visual acuity. Naphthalene on the skin may cause hypersensitivity dermatitis, chronic dermatitis is rare.

HEXANE ISOMERS are three times as toxic to mice as is pentane. Narcosis was produced in mice within 30-60 minutes at concentrations of 30,000 ppm. In man, concentrations for 10 minutes at 2000 ppm produced no effects, but 5000 ppm caused dizziness and a sense of giddiness. Concentrations of 1400-1500 ppm produced slight nausea, headache, eye, and throat irritation.

HYDROGEN SULFIDE can affect the body if it is inhaled or if it comes into contact with the eyes, skin, nose or throat. It can also affect the body if it is swallowed. It is colorless and has the odor of rotten eggs. However, its odor cannot be used as an indication of its presence since one of the first effects of H₂S exposure is the loss of the sense of smell. Inhalation of high concentrations of hydrogen sulfide, 1000 to 2000 ppm, may cause coma after a single breath and may be rapidly fatal, convulsions can also occur. Hydrogen sulfide gas is a rapidly acting systemic poison which causes respiratory paralysis with consequent asphyxia at high concentrations (500 to 1000 ppm). A case of polyneuritis and encephalopathy from one day's exposure to a concentration insufficient to cause loss of consciousness has been reported. It irritates the eyes and respiratory tract at lower concentrations (50 to 500 ppm). Pulmonary edema and bronchial pneumonia may follow prolonged exposure at concentrations exceeding 250 ppm. Exposure to concentrations of hydrogen sulfide around 50 ppm for one hour may produce rhinitis, pharyngitis, bronchitis, pneumonitis, acute conjunctivitis with pain, lacrimation and photophobia. In severe form this may progress to keratoconjunctivitis and vesiculation of the corneal epithelium. In lower concentrations, hydrogen sulfide may cause headache, fatigue, irritability, insomnia, and gastrointestinal disturbances, as well as central nervous system disturbances, causing excitation and dizziness. Repeated exposure to hydrogen sulfide results in increased susceptibility, so that eye irritation, cough and systemic effects may result from concentrations previously tolerated without any effect.

BENZENE is considered to be a carcinogen to humans, and may cause adverse health effects following exposure via inhalation, ingestion or dermal or eye contact. Acute inhalation of benzene by rats, mice or rabbits caused narcosis, spontaneous heart contractions (ventricular fibrillation) and death due to respiratory paralysis. Subchronic inhalation of benzene by rats produced decreased white blood cell counts, decreased bone marrow cell activity, increased red blood cell activity and cataracts. In rats, chronic inhalation or oral administration of benzene produced cancers of the liver, mouth and Zymbal gland. Acute inhalation exposure of benzene in humans has caused nerve inflammation (polyneuritis), central nervous system depression and cardiac sensitization. Chronic exposure to benzene has produced anorexia and irreversible injury to the blood forming organs. Effects include aplastic anemia and leukemia. Animal studies have demonstrated testicular effects, alterations in reproductive cycles, chromosomal aberrations, and embryo/fetotoxicity. No birth defects have been shown to occur in pregnant laboratory animals exposed to doses not toxic to the mother.

ETHYLBENZENE can affect the body if it is inhaled, swallowed or comes in contact with the eyes or skin. It is primarily an irritant of skin, and to some

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degree, of eyes and upper respiratory tract. Systemic absorption causes depression of the central nervous system with narcosis at very high concentrations. On the eyes and nose, the vapor at 5000 ppm causes intolerable irritation, eye irritation and lacrimation are immediate and severe at 2000 ppm, irritation and tearing occur at 1000 ppm although tolerance develops rapidly, and the vapor is a transient irritant on human eyes at 200 ppm. Aspiration of small amounts causes extensive edema and hemorrhage of lung tissue.

A draft report on a study conducted by the National Toxicology program states that lifetime inhalation exposure of rats and mice to concentrations of ethylbenzene (750 ppm) resulted in increases in certain types of cancer, including kidney tumors in rats and lung and liver tumors in mice. These effects were not observed in animals exposed to lower concentrations of ethylbenzene (75 ppm or 250 ppm). The draft report does not address the relevance of these results to humans.

MIDDLE DISTILLATE FUELS have been demonstrated to cause chromosome damage in the in vivo rat bone marrow cytogenetics assay, and mutagenic in the L5178Y mouse lymphoma assay. Repeated dermal application of high levels of middle distillate fuels in experimental animals has produced extremely severe irritation on the skin. Varying degrees of liver and kidney damage were noted in these studies, including congestion, enlargement, mottling, and multifocal necrosis.

PETROLEUM DISTILLATES (naphtha, C6H14, C8H16, C8H18 aliphatics) can affect the body if they are inhaled, come in contact with the eyes or skin, or are swallowed. The vapors of petroleum distillates are mild narcotics and mucous membrane irritants. There have been few toxicologic studies, either on animals or man. While 4,000 to 7,000 ppm are tolerated for 1 hour by human subjects, symptoms of narcosis, such as dizziness and drowsiness, occur at these concentrations. Continuing exposure may produce signs of inebriation, followed by headache or nausea. Exposure at 10,000 to 20,000 ppm is regarded as immediately hazardous to life. The higher boiling fractions may produce irritation of the eyes, nose, and throat in addition to symptoms of mild narcosis. No chronic systemic effects have been reported from widespread industrial use. If benzene is present in the distillate; however, the hazard of both acute and chronic poisoning is increased.

Lifetime skin painting studies conducted by the American Petroleum Institute, Exxon, and others have shown that similar products boiling between 175-370°C (350-700°F) usually produce skin tumors and/or skin cancer in laboratory mice. The degree of carcinogenic response was weak to moderate with a relatively long latent period. The implications of these results for humans have not been determined.

Limited studies on oils that are very active carcinogens have shown that washing the animals' skin with soap and water between applications greatly reduces tumor formation. These studies demonstrate the effectiveness of cleansing the skin after contact.

<u>Ingredient name</u>	<u>Test</u>	<u>Result</u>	<u>Route</u>	<u>Species</u>
Naphthalene	LD50	490 mg/kg	Oral	Rat
	LD50	316 mg/kg	Oral	Mouse
	LD50	1200 mg/kg	Oral	Guinea pig
	LD50	>2500 mg/kg	Dermal	Rat
	LDLo	100 mg/kg	Oral	child
	LDLo	400 mg/kg	Oral	Dog
Ethylbenzene	LD50	3500 mg/kg	Oral	Rat
Cyclohexane	LD50	12705 mg/kg	Oral	Rat
	LD50	813 mg/kg	Oral	Mouse
	LDLo	5500 mg/kg	Oral	Rabbit
Toluene	LD50	636 mg/kg	Oral	Rat
	LDLo	50 mg/kg	Oral	human
	LD50	4300 mg/kg	Oral	Rat
Xylene (o,m,p isomers)	LD50	2119 mg/kg	Oral	Mouse
	LD50	4300 mg/kg	Oral	Mammal
	LD50	>1700 mg/kg	Dermal	Rabbit
	LDLo	50 mg/kg	Oral	human
	LD50	930 mg/kg	Oral	Rat
Benzene	LD50	4700 mg/kg	Oral	Mouse
	LD50	5700 mg/kg	Oral	Mammal
	LD50	48 mg/kg	Dermal	Mouse
	LDLo	50 mg/kg	Oral	man

Chronic effects on humans : **CARCINOGENIC EFFECTS:** Classified 2 (Suspected for humans.) by European Union [Distillates, petroleum residues vacuum]. Classified 2B (Possible for humans.) by IARC [Naphthalene]. Classified A4 (Not classifiable for humans or animals.) by ACGIH [Naphthalene]. Classified A3 (Proven for animals.) by ACGIH, 2B (Possible for humans.) by IARC [Ethylbenzene]. Classified A4 (Not classifiable for humans or animals.) by ACGIH, 3 (Not classifiable for humans.) by IARC [Toluene]. Classified A4 (Not classifiable for humans or animals.) by ACGIH, 3 (Not classifiable for humans.) by IARC [Xylene (o,m,p isomers)]. Classified A1 (Confirmed for humans.) by ACGIH, 1 (Proven for humans.) by IARC, 1 (Known to be human carcinogens.) by NTP, + (Proven.) by OSHA, + (Proven.) by NIOSH [Benzene].

Contains material which causes damage to the following organs: blood, kidneys, liver, peripheral nervous system, upper respiratory tract, skin, central nervous system (CNS),

Continued on next page

eye, lens or cornea.

Other toxic effects on humans : Very hazardous in case of eye contact (corrosive).
Hazardous in case of skin contact (irritant), of ingestion, of inhalation (lung irritant).

Special remarks on toxicity to animals : No additional remark.

Special remarks on chronic effects on humans : No additional remark.

Special remarks on other toxic effects on humans : No additional remark.

Specific effects

• **Carcinogenic effects** : Contains material which may cause cancer. Risk of cancer depends on duration and level of exposure.

Target organs : Contains material which causes damage to the following organs: blood, kidneys, liver, peripheral nervous system, upper respiratory tract, skin, central nervous system (CNS), eye, lens or cornea.

Section 12. Ecological Information**Ecotoxicity data**

<u>Ingredient name</u>	<u>Species</u>	<u>Period</u>	<u>Result</u>
Naphthalene	Daphnia magna (EC50)	48 hour/hours	1.6 mg/l
	Daphnia magna (EC50)	48 hour/hours	2.194 mg/l
	Daphnia magna (EC50)	48 hour/hours	2.55 mg/l
	Daphnia pulex (LC50)	96 hour/hours	1 mg/l
n-Hexane	Oncorhynchus mykiss (LC50)	96 hour/hours	1.6 mg/l
	Oncorhynchus mykiss (LC50)	96 hour/hours	1.8 mg/l
	Pimephales promelas (LC50)	96 hour/hours	2.5 mg/l
	Daphnia magna (EC50)	48 hour/hours	2.93 mg/l
Ethylbenzene	Daphnia magna (EC50)	48 hour/hours	2.97 mg/l
	Selenastrum capricornutum (EC50)	48 hour/hours	7.2 mg/l
	Oncorhynchus mykiss (LC50)	96 hour/hours	4.2 mg/l
	Pimephales promelas (LC50)	96 hour/hours	9.09 mg/l
Cyclohexane	Poecilia reticulata (LC50)	96 hour/hours	9.6 mg/l
	Pimephales promelas (LC50)	96 hour/hours	4.53 mg/l
	Pimephales promelas (LC50)	96 hour/hours	32.71 mg/l
	Lepomis macrochirus (LC50)	96 hour/hours	34.72 mg/l
Hydrogen Sulfide	Pimephales promelas (LC50)	96 hour/hours	42.33 mg/l
	Poecilia reticulata (LC50)	96 hour/hours	57.68 mg/l
	Pimephales promelas (LC50)	96 hour/hours	93 mg/l
	Pimephales promelas (LC50)	96 hour/hours	0.007 mg/l
Toluene	Oncorhynchus mykiss (LC50)	96 hour/hours	0.007 mg/l
	Pimephales promelas (LC50)	96 hour/hours	0.0071 mg/l
	Lepomis macrochirus (LC50)	96 hour/hours	0.009 mg/l
	Pimephales promelas (LC50)	96 hour/hours	0.0107 mg/l
Xylene (o,m,p isomers)	Oncorhynchus mykiss (LC50)	96 hour/hours	0.012 mg/l
	Daphnia magna (EC50)	48 hour/hours	6 mg/l
	Daphnia magna (EC50)	48 hour/hours	6.56 mg/l
	Oncorhynchus mykiss (EC50)	48 hour/hours	6.78 mg/l
	Oncorhynchus mykiss (LC50)	96 hour/hours	5.8 mg/l
	Oncorhynchus mykiss (LC50)	96 hour/hours	6.78 mg/l
	Pimephales promelas (LC50)	96 hour/hours	12.6 mg/l
	Oncorhynchus mykiss (LC50)	96 hour/hours	3.3 mg/l
	Oncorhynchus mykiss (LC50)	96 hour/hours	8.2 mg/l

Continued on next page

Benzene	Lepomis macrochirus (LC50)	96 hour/hours	8.6 mg/l
	Lepomis macrochirus (LC50)	96 hour/hours	12 mg/l
	Lepomis macrochirus (LC50)	96 hour/hours	13.3 mg/l
	Pimephales promelas (LC50)	96 hour/hours	13.4 mg/l
	Daphnia magna (EC50)	48 hour/hours	9.23 mg/l
	Daphnia magna (EC50)	48 hour/hours	10 mg/l
	Daphnia magna (EC50)	48 hour/hours	11.73 mg/l
	Oncorhynchus mykiss (LC50)	96 hour/hours	5.3 mg/l
	Oncorhynchus mykiss (LC50)	96 hour/hours	5.9 mg/l
	Oncorhynchus mykiss (LC50)	96 hour/hours	9.2 mg/l

Products of degradation : These products are carbon oxides (CO, CO₂) and water.

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

Section 13. Disposal Considerations

Waste disposal : The generation of waste should be avoided or minimized wherever possible. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements.

Consult your local or regional authorities.

Section 14. Transport Information

Regulatory information	UN number	Proper shipping name	Class	Packing group	Label	Additional information
DOT Classification	UN1268	PETROLEUM DISTILLATES, N.O.S.	3	III		Not available.
TDG Classification	UN1258	PETROLEUM DISTILLATES, N.O.S.	3	III		Not available.

Section 15. Regulatory Information

United States

U.S. Federal regulations : TSCA 4(a) final test rules: Hexane (Other isomers); n-Hexane
TSCA 8(a) PAIR: Naphthalene; n-Nonane; n-Heptane
TSCA 8(b) inventory: Distillates, petroleum residues vacuum; Hexane (Other isomers); Naphthalene; n-Nonane; n-Heptane; n-Hexane; Octane (All isomers); Ethylbenzene; Cyclohexane; Hydrogen Sulfide; Toluene; Xylene (o,m,p isomers); Benzene
SARA 302/304/311/312 extremely hazardous substances: No products were found.
SARA 302/304 emergency planning and notification: No products were found.
SARA 302/304/311/312 hazardous chemicals: Hexanes (Other isomers); Naphthalene; n-Nonane; n-Heptane; n-Hexane
SARA 311/312 MSDS distribution - chemical inventory - hazard identification: Hexane (Other isomers): Fire hazard, Immediate (acute) health hazard; Naphthalene: Fire hazard, Immediate (acute) health hazard, Delayed (chronic) health hazard; n-Nonane: Fire hazard, Immediate (acute) health hazard; n-Heptane: Fire hazard; n-Hexane: Fire hazard, Immediate (acute) health hazard, Delayed (chronic) health hazard
Clean Water Act (CWA) 307: Naphthalene; Ethylbenzene; Toluene; Benzene
Clean Water Act (CWA) 311: Naphthalene; Ethylbenzene; Cyclohexane; Toluene; Xylene (o,m,p isomers); Benzene
Clean Air Act (CAA) 112 accidental release prevention: Hydrogen Sulfide

Continued on next page

Clean Air Act (CAA) 112 regulated flammable substances: No products were found.

Clean Air Act (CAA) 112 regulated toxic substances: Hydrogen Sulfide

SARA 313

	<u>Product name</u>	<u>CAS number</u>	<u>Concentration</u>
Form R - Reporting requirements	: Naphthalene	91-20-3	0 - 3
	n-Hexane	110-54-3	0 - 2
	Ethylbenzene	100-41-4	0 - 1
	Benzene	71-43-2	0 - 0.5
Supplier notification	: Naphthalene	91-20-3	0 - 3
	n-Hexane	110-54-3	0 - 2
	Ethylbenzene	100-41-4	0 - 1
	Benzene	71-43-2	0 - 0.5

SARA 313 notifications must not be detached from the MSDS and any copying and redistribution of the MSDS shall include copying and redistribution of the notice attached to copies of the MSDS subsequently redistributed.

State regulations

: Connecticut carcinogen reporting list: Benzene
 Connecticut hazardous material survey: Naphthalene; n-Hexane; Ethylbenzene; Toluene; Xylene (o,m,p isomers); Benzene
 Illinois toxic substances disclosure to employee act: Naphthalene; n-Hexane; Ethylbenzene; Toluene; Xylene (o,m,p isomers); Benzene
 Illinois chemical safety act: Distillates, petroleum residues vacuum
 Rhode Island RTK hazardous substances: Distillates, petroleum residues vacuum; Naphthalene; n-Hexane; Ethylbenzene; Toluene; Xylene (o,m,p isomers); Benzene
 Pennsylvania RTK: Distillates, petroleum residues vacuum; Hexane (Other isomers); (generic environmental hazard); Naphthalene: (environmental hazard, generic environmental hazard); n-Nonane: (generic environmental hazard); n-Heptane: (generic environmental hazard); n-Hexane: (generic environmental hazard); Octane (All isomers): (generic environmental hazard); Ethylbenzene: (environmental hazard, generic environmental hazard); Cyclohexane: (environmental hazard, generic environmental hazard); Hydrogen Sulfide: (environmental hazard, generic environmental hazard); Toluene: (environmental hazard, generic environmental hazard); Xylene (o,m,p isomers): (environmental hazard, generic environmental hazard); Benzene: (special hazard, environmental hazard, generic environmental hazard)
 Florida: Distillates, petroleum residues vacuum; Naphthalene; n-Hexane; Ethylbenzene; Toluene; Xylene (o,m,p isomers); Benzene
 Minnesota: Distillates, petroleum residues vacuum
 Michigan critical material: Toluene; Xylene (o,m,p isomers); Benzene
 Massachusetts RTK: Hexane (Other isomers); Naphthalene; n-Nonane; n-Heptane; n-Hexane; Octane (All isomers); Ethylbenzene; Cyclohexane; Hydrogen Sulfide; Toluene; Xylene (o,m,p isomers); Benzene
 New Jersey: Distillates, petroleum residues vacuum; Naphthalene; n-Nonane; n-Heptane; n-Hexane; Octane (All isomers); Ethylbenzene; Cyclohexane; Hydrogen Sulfide; Toluene; Xylene (o,m,p isomers); Benzene
 Louisiana RTK reporting list: Distillates, petroleum residues vacuum

WARNING: This product contains chemical/chemicals known to the state of California to cause cancer, birth defects or other reproductive harm.: Naphthalene; Toluene; Benzene

WARNING: This product contains chemical/chemicals known to the state of California to cause reproductive harm (male): Benzene

California prop. 65 (no significant risk level): Benzene

California prop. 65 (Maximum Acceptable Dosage Level): Toluene; Benzene

WARNING: This product contains chemical/chemicals known to the state of California to cause birth defects or other reproductive harm.: Toluene; Benzene

WARNING: This product contains chemical/chemicals known to the state of California to cause cancer.: Naphthalene; Benzene

Canada

Continued on next page

WHMIS (Canada) : Class B-3: Combustible liquid with a flash point between 37.8°C (100°F) and 93.3°C (200°F).
 Class D-1B: Material causing immediate and serious toxic effects (Toxic).
 Class D-2A: Material causing other toxic effects (Very toxic).
 Class D-2B: Material causing other toxic effects (Toxic).
 Class E: Corrosive liquid.
 CEPA DSL: Distillates, petroleum residues vacuum; Hexane (Other Isomers); Naphthalene; n-Nonane; n-Heptane; n-Hexane; Octane (All Isomers); Ethylbenzene; Cyclohexane; Hydrogen Sulfide; Toluene; Xylene (o,m,p isomers); Benzene

Section 16. Other Information

Label requirements : MAY BE FATAL IF INHALED.
 CANCER HAZARD.
 CONTAINS MATERIAL WHICH CAN CAUSE CANCER.
 HARMFUL IF SWALLOWED.
 CAUSES SKIN IRRITATION.
 CONTAINS MATERIAL WHICH CAUSES DAMAGE TO THE FOLLOWING ORGANS:
 BLOOD, KIDNEYS, LIVER, PERIPHERAL NERVOUS SYSTEM, RESPIRATORY TRACT, SKIN, CENTRAL NERVOUS SYSTEM, EYE, LENS OR CORNEA

Hazardous Material
 Information System (U.S.A.) :

	2
	3
Physical Hazard	0
Personal protection	

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



Date of printing : 3/13/2008.
 Date of issue : 3/13/2008.
 Version : 1.01

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Definitions of Material Safety Data Sheet Terminology

GOVERNMENT AGENCIES AND PRIVATE ASSOCIATIONS

ACGIH - American Conference of Governmental Industrial Hygienists, (private association)
DOT - United States Department of Transportation
EPA - United States Environmental Protection Agency
IARC - International Agency for Research on Cancer, (private association)
NFPA - National Fire Protection Association, (private association)
MSHA - Mine Safety and Health Administration, U.S. Department of Labor
NIOSH - National Institute of Occupational Safety and Health, U.S. Department of Health and Human Services
NTP - National Toxicology Program, (private association)
OSHA - Occupational Safety and Health Administration, U.S. Department of Labor
WHMIS - Workplace Hazardous Material Information System
CSA - Canadian Standards Association

HAZARD AND EXPOSURE INFORMATION

Acute Hazard - An adverse health effect which occurs rapidly as a result of short term exposure.
CAS # - American Chemical Society's Chemical Abstract service registry number which identifies the product and/or ingredients.
Ceiling - The concentration that should not be exceeded during any part of the working exposure
Chronic Hazard - An adverse health effect which generally occurs as a result of long term exposure or short term exposure with delayed health effects and is of long duration
Fire Hazard - A material that poses a physical hazard by being flammable, combustible, pyrophoric or an oxidizer as defined by 29 CFR 1910.1200
Hazard Class - DOT hazard classification
Hazardous Ingredients - Names of ingredients which have been identified as health hazards
IDLH - Immediately Dangerous to Life and Health, the airborne concentration below which a person can escape without respiratory protection and exposure up to 30 minutes, and not suffer debilitating or irreversible health effects. Established by NIOSH.
mg/m³ - Milligrams of contaminant per cubic meter of air, a mass to volume ratio
N/A - Not available or no relevant information found
NA - Not applicable
PEL - OSHA permissible exposure limit; an action level of one half this value may be applicable
ppm - Part per million (one volume of vapor or gas in one million volumes of air)
Pressure Hazard - A material that poses a physical hazard due to the potential of a sudden release of pressure such as explosive or a compressed gas as defined by 29 CFR 1910.1200
Reactive Hazard - A material that poses a physical hazard due to the potential to become unstable reactive, water reactive or that is an organic peroxide as defined by 29 CFR 1910.1200.
STEL - The ACGIH Short-Term Exposure Limit, a 15-minute Time-Weighted Average exposure which should not be exceeded at any time during a workday, even if the 8-hour TWA is less than the TLV.
TLV - ACGIH Threshold Limit Value, represented herein as an 8-hour TWA concentration.
8-hour TWA - The time weighted average concentration for a normal 8-hour workday and a 40-hour workweek, to which nearly all workers may be repeatedly exposed, day after day, without adverse effect.
LD₅₀ - Single dose of a substance that, when administered by a defined route in an animal assay, is expected to cause the death of 50% of the defined animal population.
LC₅₀ - The concentration of a substance in air that, when administered by means of inhalation over a specified length of time in an animal assay, is expected to cause the death of 50% of a defined animal population.