



MSDS FOR SARA REPORTS

**Gasoline, Unleaded
CAS # 8006-61-9**

Health	1
Flammability	3
Reactivity	0
Special	

* C H E M I N F O *
* Canadian Centre for Occupational Health and Safety *
* Issue : 2000-4 (November, 2000) *

*** SECTION 1. CHEMICAL IDENTIFICATION ***

CHEMINFO RECORD NUMBER : 25
 CCOHS CHEMICAL NAME : Gasoline
 SYNONYMS :
 * Automotive Gasoline
 * Petrol
 * Motor Spirits
 * Benzin
 * Natural Gasoline
 * Gasolene
 * Gas
 CAS REGISTRY NUMBER : 8006-61-9
 OTHER CAS REGISTRY NUMBER(S) : 8006-61-9; 68425-31-0; 68514-15-8; 68606-11-1
 UN/NA NUMBER(S) : 1203
 RTECS NUMBER(S) : LX330000
 CHEMICAL FAMILY : Mixed hydrocarbons / petroleum hydrocarbon distillate
 MOLECULAR FORMULA : Complex. See Composition.
 STRUCTURAL FORMULA : Complex

STATUS :
 The CHEMINFO record for this chemical is complete. The full format ("TOTAL") provides a detailed evaluation of health, fire and reactivity hazards, as well as recommendations on topics such as handling and storage, personal protective equipment, accidental release and first aid.

*** SECTION 2. DESCRIPTION ***

APPEARANCE AND ODOUR :
 Colourless liquid with a characteristic odour. It may be dyed for recognition.
 ODOUR THRESHOLD :
 0.12-0.15 ppm (recognition); 0.06-0.08 ppm (threshold) (1)
 WARNING PROPERTIES :
 GOOD - TLV is more than 10 times the odour threshold.
 COMPOSITION/PURITY :

This CHEMINFO record refers to common, commercial unleaded gasoline used for automotive purposes, unless otherwise specified.

Gasoline is a complex mixture of petroleum hydrocarbons. The composition of the hydrocarbons depends on factors such as the origin of the crude oil used for refining and refining conditions. In general, the hydrocarbon groups consist of chains containing 4 to 12 carbons, and are mostly paraffins (alkanes), isoparaffins (isalkanes), cycloparaffins (cycloalkanes) and aromatics. n-Hexane (1.5-3.0%) and benzene (0.5-2.0%) are normally present.

In addition, trace or small amounts of additives and blending agents such as anti-knock compounds (MMT - methylcyclopentadienyl manganese tricarbonyl), anti-icing agents, anti-rust agents and metal deactivators can be found in gasoline.

The chemical and physical properties of gasoline are highly variable depending on the specific product. As well, the hazards of gasoline are affected by the proportion of individual components. For example, gasoline containing a significant proportion of n-hexane may have toxic effects attributable to n-hexane. For information on specific components in gasoline consult the manufacturer or the appropriate CHEMINFO record.

USES AND OCCURRENCES :

Fuel for motor vehicles; some use as diluent and solvent.

*** SECTION 3. HAZARDS IDENTIFICATION ***

** EMERGENCY OVERVIEW **

Colourless liquid with characteristic odour. May be dyed yellow. EXTREMELY FLAMMABLE LIQUID AND VAPOUR. Liquid can accumulate static charge by flow or agitation. Vapour is heavier than air and may spread long distances. Distant ignition and flash back are possible. Liquid can float on water and may spread to distant locations and/or spread fire. POSSIBLE CANCER HAZARD. May cause cancer, based on animal data. Central nervous system depressant. High vapour concentrations may cause headache, nausea, dizziness, drowsiness, unconsciousness and death. Aspiration hazard. Swallowing or vomiting of the liquid may result in aspiration into the lungs.

** POTENTIAL HEALTH EFFECTS **

EFFECTS OF SHORT-TERM (ACUTE) EXPOSURE :

INHALATION :

Gasoline vapours can cause central nervous system (CNS) depression.(1) No significant effects except eye and throat irritation were seen in volunteers exposed for 30 minutes to concentrations as high as 1054 ppm, or for 8 hours to concentrations around 150-270 ppm.(6,7) Mild dizziness was experienced by volunteers exposed for 1 hour to 2600 ppm. Pronounced dizziness was experienced by volunteers after about 5 minutes exposure to about 1100 ppm.(6) Other CNS effects such as headache, lack of appetite, drowsiness and incoordination can occur. In one case, exposure for a few minutes to very high concentrations (above 5000 ppm) of aviation gasoline caused unconsciousness, pulmonary edema (a life-threatening accumulation of fluid in the lungs) and death.(15)

SKIN CONTACT :

When gasoline is NOT trapped against the skin and can freely evaporate, it is probably only mildly irritating or not irritating. However, case reports indicate that when gasoline is trapped against the skin (clothing is soaked in gasoline, skin is in contact with a puddle) for a long period (probably more than 30 minutes), serious burns and skin loss may occur. Absorption through the skin occurs, but is normally not significant.(1,8)

EYE CONTACT :

Irritation reported by volunteers exposed to vapour concentrations as low as 164 ppm for 30 minutes.(7) The liquid may cause temporary pain if splashed in the eye(s), but probably does not cause permanent damage. No significant irritation was observed in studies with rabbits.

INGESTION :

Gasoline is moderately toxic if ingested. It may cause burning in the mouth, throat and chest as well as stomach irritation, nausea, vomiting and

cyanosis (bluish discoloration of the fingertips, toes, lips and other extremities). Central nervous symptom depression, such as unconsciousness and coma, can occur. Inhalation of gasoline into the lungs (aspiration) can occur while gasoline is in the mouth, being swallowed or during vomiting. Aspiration often occurs when gasoline is siphoned by mouth. The aspiration of even a small amount (less than an ounce) of gasoline into the lungs is very hazardous and may cause death. Aspiration of gasoline can cause chemical pneumonitis (inflammation of the lungs) and/or pulmonary edema (a life-threatening accumulation of fluid in the lungs).(1,11,12,13)

EFFECTS OF LONG-TERM (CHRONIC) EXPOSURE :

EFFECTS ON THE SKIN: Repeated or prolonged contact can dry the skin (removes fat from skin) and cause cracking, irritation and dermatitis. Allergic reactions (hypersensitivity) have been reported but these are rare occurrences.(1,10)

EFFECTS ON THE BLOOD: There are reports of effects on the blood in gasoline tanker crewmen and painters who were exposed to gasoline.(5) These workers were probably exposed to other chemicals and therefore it is not possible to establish a causal relationship. However, benzene is known to cause harmful effects on the blood and may be present in gasoline in small amounts.

EFFECTS ON THE PERIPHERAL NERVOUS SYSTEM: Gasoline is composed of different paraffins (alkanes) such as n-hexane. Prolonged and/or repeated exposure to n-hexane can cause irreversible damage to the peripheral nervous system. Whether or not exposure to gasoline can cause this effect depends on the presence of n-hexane and its concentration and on the degree and duration of exposure.

EFFECTS ON THE NEUROLOGICAL SYSTEM: Abuse of gasoline by inhalation of the vapours by so-called "sniffers" has resulted in many neurological effects. Dizziness, tremor, visual and auditory hallucinations, and loss of memory were symptoms reported in case studies of abusers who sniffed vapours sometimes daily for years.(16,17,18) These situations are not relevant to occupational exposures.

Effects on memory, intellectual capacity, psychomotor and learning ability were seen in attendants exposed to gasoline vapours at gas stations. The most significant effects were seen in attendants exposed for more than 5 years. Very little effect was seen in attendants with less than 1 year of exposure.(26) The exposure concentrations were not cited in the study. Therefore, it is difficult to evaluate the results.

CARCINOGENICITY :

The available human information is inadequate for evaluation because there is no detailed data concerning actual exposure to gasoline. Unleaded gasoline caused kidney cancers in male rats and liver cancers in female mice. The International Agency for Research on Cancer (IARC) concludes that gasoline is possibly a human carcinogen (2B). Gasoline may contain known carcinogens (e.g. benzene, ethylene dibromide).

TERATOGENICITY AND EMBRYOTOXICITY :

No human information available. No effect seen in one rat study.

REPRODUCTIVE TOXICITY :

No information suitable for evaluation. There is a Russian study of women exposed to gasoline above the maximum permissible level which described effects on menstrual cycle, and childbearing and lactation functions were observed. Also, a number of newborns were malformed. The actual exposure concentration and the length of exposure were not cited and so this study is not suitable for evaluation.(25)

MUTAGENICITY :

The bulk of the data indicate gasoline is not mutagenic or genotoxic.

There was a positive effect seen in one in-vivo and one in-vitro test.

TOXICOLOGICALLY SYNERGISTIC MATERIALS :

Methyl ethyl ketone or methyl isobutyl ketone enhance the action of n-hexane. n-Hexane is one type of paraffin (alkane) found in gasoline.

POTENTIAL FOR ACCUMULATION :

Inadequate information for evaluation.

*** SECTION 4. FIRST AID MEASURES ***

INHALATION :

This product is flammable. Take proper precautions (e.g. remove any source

of ignition). Take proper precautions to ensure your own safety before attempting rescue; (e.g., wear appropriate protective equipment, use the "buddy" system). Remove source of contamination or move victim to fresh air. If breathing has stopped, trained personnel should begin artificial respiration (AR), or, if the heart has stopped, cardiopulmonary resuscitation (CPR) immediately. Immediately transport victim to an emergency care facility.

SKIN CONTACT :

Avoid direct contact. Wear chemical protective clothing if necessary. Quickly and gently blot or brush away excess chemical quickly. Wash gently and thoroughly with water and non-abrasive soap for 5 minutes or until the chemical is removed. Under running water, remove contaminated clothing, shoes, and leather goods (e.g., watchbands, belts). If irritation persists, repeat flushing. Obtain medical advice immediately. Completely decontaminated clothing, shoes and leather goods before re-use or discard.

EYE CONTACT :

Avoid direct contact. Wear chemical protective clothing if necessary. Quickly and gently blot away chemical. Immediately flush the contaminated eye(s) with lukewarm, gently flowing water for 5 minutes or until the chemical is removed, while holding the eyelid(s) open. Obtain medical advice immediately.

INGESTION :

Never give anything by mouth if victim is rapidly losing consciousness, or is unconscious or convulsing. Have victim rinse mouth thoroughly with water. DO NOT INDUCE VOMITING. Have victim drink 240 to 300 mL (8 to 10 oz.) of water. If vomiting occurs naturally, have victim lean forward to reduce risk of aspiration. Repeat administration of water. If breathing has stopped, trained personnel should begin artificial respiration (AR) or, if the heart has stopped, cardiopulmonary resuscitation (CPR) immediate. Quickly transport victim to an emergency care facility.

FIRST AID COMMENTS :

Provide general supportive measures (comfort, warmth, rest). Consult a physician and/or the nearest Poison Control Centre for all exposures except minor instances of inhalation or skin contact. All first aid procedures should be periodically reviewed by a doctor familiar with the material and its conditions of use in the workplace.

*** SECTION 5. FIRE FIGHTING MEASURES ***

FLASH POINT :

Approx. -43 deg C (-45 deg F) (19); -30 deg C (-22 deg F) (22)

LOWER FLAMMABLE (EXPLOSIVE) LIMIT (LFL/LEL) :

1.4% (19); 0.6% (21)

UPPER FLAMMABLE (EXPLOSIVE) LIMIT (UFL/UEL) :

7.6% (19); 8.0% (21)

AUTOIGNITION (IGNITION) TEMPERATURE :

257 deg C (495 deg F) (20); 280 deg C (536 deg F) (22); 400 deg C (750 deg F) (23)

EXPLOSION DATA - SENSITIVITY TO MECHANICAL IMPACT :

Probably not sensitive. Stable material.

EXPLOSION DATA - SENSITIVITY TO STATIC CHARGE :

Vapour can be readily ignited by static charge. Liquid can accumulate static charge by flow or agitation.

COMBUSTION AND THERMAL DECOMPOSITION PRODUCTS :

Carbon monoxide, hydrocarbons, aromatics, oxides of nitrogen, lead and other trace elements, phenols, polynuclear aromatic hydrocarbons.

FIRE HAZARD COMMENTS :

Extremely flammable. Material will readily ignite at room temperature. Can release vapours that form explosive mixtures with air. Liquid can accumulate static charge by flow or agitation. Vapour can be ignited by static discharge. Vapour is heavier than air and may travel a considerable distance to a source of ignition and flash back to a leak or open container. Liquid can float on water and may travel to distant locations and/or spread fire. During a fire, irritating/toxic gases may be generated. Can accumulate in confined spaces, resulting in a toxicity and flammability hazard. Containers may explode in heat of fire.

EXTINGUISHING MEDIA :

Carbon dioxide, dry chemical, foam, water spray or fog. Water may be ineffective, since it may not cool gasoline below its flash point.

FIRE FIGHTING INSTRUCTIONS :

Evacuate area and fight fire from a safe distance or a protected location.

Approach fire from upwind to avoid hazardous vapours and toxic decomposition products. Stop leak before attempting to put out the fire. If the leak cannot be stopped, and if there is no risk to the surrounding area, let the fire burn itself out. If the flames are extinguished without stopping the leak, vapours could form explosive mixtures with air and reignite.

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Isolate materials not yet involved in the fire and protect personnel. Containers may explode in the heat of fire. Move containers from fire area if this can be done without risk. Otherwise, keep cooling streams of water on fire-exposed tanks or containers.

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Water may be ineffective for fighting fires involving gasoline because of its low flash point, unless used under favourable conditions by experienced firefighters trained in fighting all types of flammable liquid fires. However, water can be used on low flash point liquids when applied as a spray to absorb heat and protect exposed material of structures. If a leak or spill has not ignited, use water spray to disperse the vapours and to protect personnel attempting to stop a leak. Solid streams of water may be ineffective and spread material.

.
For a massive fire in a large area, use unmanned hose holder or monitor nozzles. If this is not possible, withdraw from fire area and allow fire to burn. Stay away from ends of tanks. Withdraw immediately in case of rising sound from venting safety device or any discolouration of tank due to fire.

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Do not enter without wearing specialized protective equipment suitable for the situation. Firefighter's normal protective clothing (Bunker Gear) will not provide adequate protection. Chemical resistant clothing (e.g. chemical splash suit) and positive pressure self-contained breathing apparatus (MSHA/NIOSH approved or equivalent) may be necessary.

** NATIONAL FIRE PROTECTION ASSOCIATION (NFPA) HAZARD INDEX **

NFPA - HEALTH : 1 - Slightly hazardous to health.
NFPA - FLAMMABILITY : 3 - Can be ignited under almost all normal temperature conditions.
NFPA - REACTIVITY : 0 - Normally stable.

NFPA - COMMENTS :

The hazard identification ratings and definitions presented here are based on the 1985 edition of NFPA Code 704. NFPA is currently updating these hazard ratings based on the 1990 edition of NFPA Code 704.

*** SECTION 6. ACCIDENTAL RELEASE MEASURES ***

PRECAUTIONS :

Restrict access to area. Extinguish or remove all ignition sources. Ensure clean-up is conducted by trained personnel only. Wear adequate personnel protective equipment. Ventilate area. Notify government occupational health and safety and environmental authorities.

CLEAN-UP :

Do not touch spilled material. Prevent material from entering sewers, waterways or confined spaces. Stop or reduce leak if it can be done safely.

.
Small spills: Contain spill with earth, sand, or absorbent material which does not react with spilled material. Do not use combustible materials such as sawdust. Shovel into clean, dry, labelled containers and cover. Flush area with water. Contaminated absorbent may pose the same hazards as the spilled product.

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Large spills: Contact fire and emergency services and supplier for advice.

*** SECTION 7. HANDLING AND STORAGE ***

HANDLING :

This material is an EXTREMELY FLAMMABLE LIQUID and a SUSPECTED CANCER HAZARD. Before handling it is very important that engineering contrd's are operated and that protective equipment requirements are being followed. People working with this chemical should be properly trained regarding its

hazards and its safe use.

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Eliminate all ignition sources (e.g. sparks, open flames, hot surfaces). Keep away from heat. Post "NO-SMOKING" signs. It is very important to keep areas where this material is used clear of other materials which can burn. Use non-sparking ventilation systems, approved explosion-proof equipment and intrinsically safe electrical systems in areas of use. Keep aisles and exits free of obstruction. Immediately report leaks, spills or ventilation failures. Ground all drums, transfer vessels, hoses and piping. Ground clips must contact bare metal. When dispensing in other than a closed system, ensure dispensing container is bonded to receiving transfer equipment and container. Liquid can accumulate charge. In large scale operations, increase conductivity with additive designed for that purpose, reduce flowrate in transfer operations, increase time the liquid remains in transfer piping and/or handle at lower temperature. To prevent sparking, generously wet hard surfaces before they are chipped, ground, etc, in potentially hazardous areas. Never perform any welding, cutting, soldering, drilling or other hot work on an empty vessel, container or piping until all liquid and vapours have been cleared. Have suitable emergency equipment for fires, spills and leaks readily available. For large scale operations, consider the installation of leak and fire detection equipment along with a suitable, automatic fire suppression system.

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Use in smallest possible amounts in a well ventilated area separate from the storage area. Avoid generating vapours or mists. Prevent the release of vapours and mists into the workplace air. Do not use with incompatible materials such as strong oxidizing agents (e.g. peroxides, nitric acid and perchlorates). These can increase the risk of fire and explosion. Avoid generating vapours or mists. Do not dispense in storage area unless dispensing area is segregated by fire-resistant construction. Only use portable containers and dispensing equipment (faucet, pump, drip can) approved for flammable liquids. Do not siphon by mouth. Never return contaminated material to its original container. Label containers. Keep containers closed when not in use. Avoid damaging containers. Empty containers may contain hazardous residues.

.
Follow handling precautions on Material Safety Data Sheet. Practice good housekeeping. Maintain handling equipment. Comply with applicable regulations.

STORAGE :

Storage area should be clearly identified, well-illuminated, clear of obstruction and accessible only to trained and authorized personnel. Store in a cool, dry, well-ventilated area out of direct sunlight. Store away from incompatible materials such as strong oxidizing agents (e.g. peroxides). Follow any special instructions for storage on supplier/manufacturer Material Safety Data Sheet (e.g. maximum storage quantities and temperature requirements).

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Inspect all incoming containers before storing to ensure they are undamaged and properly labelled. Whenever possible store in original container. Otherwise, store in sturdy containers made of compatible materials. Keep containers tightly closed and protect from damage. Avoid stacking containers on each other. Keep empty containers in separate area. Empty containers can be hazardous due to residual material. Keep closed. Provide raised sills or ramps at doorways or create a trench which drains to a safe location. Consider leak detection and alarm equipment for storage area. Keep absorbents for leaks and spills readily available.

.
Store away from all heat and ignition sources. Use non-sparking ventilation systems, approved explosion-proof equipment and intrinsically safe electrical systems. Store according to applicable regulations for flammable materials for storage tanks, containers, buildings, rooms, cabinets, allowable quantities and minimum separation distances. Keep quantity stored as small as possible. Store away from process and production areas, away from elevators, building and room exits or main aisles leading to exits. Keep storage area clear of other materials which can burn. Have appropriate extinguishing capability in storage area (e.g. sprinkler system, portable fire extinguishers).

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Use approved explosion-proof refrigerator when storing small quantities.

Bond and ground metal containers in storage area. Avoid bulk storage indoors. Equip storage tank vents with a flame arrestor. Storage tanks should be above ground over an area sealed on the bottom and diked to hold entire contents. Store separate from work areas, eating areas and protective equipment storage. Inspect containers and contents regularly for leakage or expired shelf life. Eliminate all defective containers. Have replacement containers and labels on hand. Floors should be sealed to prevent absorption of this chemical.

*** SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION ***

NOTE : Exposure to this material can be controlled in many ways. The measures appropriate for a particular worksite depend on how this material is used and on the extent of exposure. This general information can be used to help develop specific control measures. Ensure that control systems are properly designed and maintained. Comply with occupational, environmental, fire, and other applicable regulations.

SAMPLING AND ANALYSIS :

Use appropriate instrumentation and sampling strategy (location, timing, duration, frequency and number of samples). Interpretation of the sampling results is related to these variables and the analytical method. Sampling should be performed by trained personnel.

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OSHA IN-HOUSE METHOD - OSHA CD-ROM (OSHA 95-1). US Department of Labour, December, 1994. Partially validated. Collection on activated charcoal sorbent tube. Desorption with carbon disulphide (CS₂) or carbon disulfide/dimethyl formamide (99:1). Analysis by gas chromatography using flame ionization detector (FID). For further details, contact OSHA Salt Lake Technical Centre at 801-487-0267.

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Published NIOSH methods for sampling/analysis of airborne gasoline specifically, are not currently available.

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The method described below has been reported for hydrocarbons, BP36-126 deg C and is also suitable for gasoline with appropriate calibration.

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NIOSH METHOD 1500 - NIOSH Manual of Analytical Methods. 4th ed. Vol. 2. Fully evaluated method for most of the components. Collection on coconut shell activated charcoal sorbent tube. Desorption with carbon disulphide (CS₂). Analysis by gas chromatography using flame ionization detector (FID).

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DIRECT READING INSTRUMENTS: Methods of detection in commercially available devices which may be suitable for sampling/analysis of specific components: flame ionization detector, infrared photometer, photoionization analyzer, gas chromatography analyzer.

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COLORIMETRIC DETECTORS TUBES: Commercially available.

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NOTE: Gasoline is a mixture of hydrocarbons. Consider sampling and analysis for the individual components.

ENGINEERING CONTROLS :

Engineering methods to control hazardous exposures are preferred. Methods include mechanical ventilation (dilution and local exhaust), process or personnel enclosure, control of process conditions, and process modification (e.g., substitution of a less hazardous material). Administrative controls and personal protective equipment may also be required.

.
Because of the high potential fire hazard associated with this substance, stringent control measures such as enclosure or isolation may be necessary. Use an explosion-proof, non-sparking, grounded ventilation system separate from other exhaust ventilation systems. Exhaust directly to the outside, taking necessary precautions for environmental protection. Air cleaning devices may be required. Provide sufficient local exhaust and general (dilution) ventilation. Supply sufficient replacement air to make up for air removed by exhaust systems.

PERSONAL PROTECTIVE EQUIPMENT :

If engineering controls and work practices are not effective in controlling exposure to this material, then wear suitable personal protective equipment including approved respiratory protection. Have appropriate equipment available for use in emergencies such as spills or fire.

If respiratory protection is required, institute a complete respiratory protection program including selection, fit testing, training, maintenance and inspection. Refer to the CSA Standard Z94.4-93, "Selection, Use and Care of Respirators," available from the Canadian Standards Association, Rexdale, Ontario, M9W 1R3.

RESPIRATORY PROTECTION GUIDELINES :

NIOSH RECOMMENDATIONS FOR GASOLINE CONCENTRATIONS IN AIR (29): AT CONCENTRATIONS ABOVE THE NIOSH REL, OR WHERE THERE IS NO REL, AT ANY DETECTABLE CONCENTRATION: Positive pressure, full-facepiece SCBA; or positive pressure, full-facepiece SAR with an auxiliary positive pressure SCBA.

ESCAPE: Gas mask with organic vapour canister; or escape-type SCBA.

NOTE: The NIOSH Recommended Exposure Limit (REL) for gasoline has not been established.

NOTE: NIOSH has classified this material as a potential occupational carcinogen, according to specific NIOSH criteria, with no recommended exposure limit (REL). This classification is reflected in these recommendations for respiratory protection, which specify that only the most reliable and protective respirators be worn at any detectable concentration. The requirements in Canadian jurisdictions may vary.

The respirator use limitations specified by the approving agency and the manufacturer must be observed.

ABBREVIATIONS: SAR = supplied-air respirator; SCBA = self-contained breathing apparatus. IDLH = Immediately Dangerous to Life or Health.

EYE/FACE PROTECTION :

Splash-proof chemical safety goggles or face shield (eight inch minimum), as required.

SKIN PROTECTION :

Chemical protective gloves, coveralls and boots etc., as required. Have a safety shower/eye-wash fountain readily available in the immediate work area.

RESISTANCE OF MATERIALS FOR PROTECTIVE CLOTHING :

Guidelines for gasoline 40-55% aromatic (24):

RECOMMENDED (resistance to breakthrough longer than 8 hours): Nitrile rubber, Teflon (TM), Viton (TM), Barricade (TM), Responder (TM), CPF 3 (TM).

RECOMMENDED (resistance to breakthrough longer than 4 hours): 4H (TM) (polyethylene/ethylene vinyl alcohol).

NOT RECOMMENDED for use (resistance to breakthrough less than 1 hour): Butyl rubber, natural rubber, neoprene, polyvinyl chloride.

Guidelines for gasoline, unleaded (24):

RECOMMENDED (resistance to breakthrough longer than 8 hours): Viton (TM), Barricade (TM), nitrile rubber.

RECOMMENDED (resistance to breakthrough longer than 4 hours): Polyvinyl alcohol, Responder (TM), 4H (TM) (polyethylene/ethylene vinyl alcohol).

NOT RECOMMENDED for use (resistance to breakthrough less than 1 hour): Butyl rubber, natural rubber, neoprene, polyvinyl chloride

Recommendations are NOT valid for very thin natural rubber, Neoprene, nitrile and PVC gloves (0.3 mm or less).

Recommendations are valid for permeation rates reaching 0.1 ug/cm²/min or 1 mg/m²/min and over. Resistance of specific materials can vary from product to product. Breakthrough times are obtained under conditions of continuous contact, generally at room temperature. Evaluate resistance under conditions of use and maintain clothing carefully.

EXPOSURE CONTROLS/PERSONAL PROTECTION COMMENTS :

Remove contaminated clothing promptly. Contaminated clothing poses a fire hazard. Keep contaminated clothing in closed containers and away from ignition sources. Discard or launder before re-wearing. Inform laundry personnel of contaminant's hazards. Do not smoke, drink or eat in work

areas. Wash hands thoroughly after handling this material. Maintain good housekeeping.

** EXPOSURE GUIDELINES **

* THRESHOLD LIMIT VALUES (TLVs) / AMERICAN CONFERENCE OF
GOVERNMENTAL INDUSTRIAL HYGIENISTS (ACGIH) / 2000 *

TIME-WEIGHTED AVERAGE (TLV-TWA) : 300 ppm (890 mg/m3) - Carcinogenicity
Designation A3
SHORT-TERM EXPOSURE LIMIT (TLV-STEL) :
500 ppm (1480 mg/m3) - Carcinogenicity Designation A3
TLV BASIS - CRITICAL EFFECT(S) : Irritation
CNS (central nervous system)

TLV COMMENTS :

CARCINOGENICITY DESIGNATION A3 - Animal Carcinogen: Substance is carcinogenic in laboratory animals under conditions that are not considered relevant to worker exposure. Available human studies and evidence suggest that the substance is not likely to cause cancer in humans except under unusual or unlikely routes or levels of exposure. Worker exposure to an A3 carcinogen should be controlled to levels as low as reasonably achievable below the TLV.

NOTE: In many jurisdictions, exposure limits are similar to the ACGIH TLVs. Since the manner in which exposure limits are established, interpreted, and implemented can vary, obtain detailed information from the appropriate government agency in each jurisdiction.

* PERMISSIBLE EXPOSURE LIMITS (PELs) / FINAL RULE LIMITS /
U.S. OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA) *

TIME WEIGHTED AVERAGE (PEL-TWA) : 300 ppm (900 mg/m3)
SHORT TERM EXPOSURE LIMIT (PEL-STEL) :
500 ppm (1500 mg/m3)

NOTE: The OSHA PEL Final Rule Limits are currently non-enforceable due to a court decision. The OSHA