



Eternal Materials

ETERSET 2508PT-5

ETERNAL MATERIALS (MALAYSIA) SDN.BHD.

Chemwatch Hazard Alert Code: 2

Version No: 35.37

Safety Data Sheet according to OSHA HazCom Standard (2012) requirements

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L.GHS.U.S.A.EN

SECTION 1 IDENTIFICATION

Product Identifier

Product name	ETERSET 2508PT-5
Synonyms	Not Available
Proper shipping name	Resin Solution, flammable
Other means of identification	Not Available

Recommended use of the chemical and restrictions on use

Relevant identified uses	The use of a quantity of material in an unventilated or confined space may result in increased exposure and an irritating atmosphere developing. Before starting consider control of exposure by mechanical ventilation.
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Name, address, and telephone number of the chemical manufacturer, importer, or other responsible party

Registered company name	ETERNAL MATERIALS (MALAYSIA) SDN.BHD.
Address	PTD 5044, Jalan Rumbia 2, Kawasan Perindustrian Tanjung Langsat Industrial Estate, Mukim Sungai Tiram, 81700 Pasir Gudang, Johor, Malaysia
Telephone	+607-5137916
Fax	+607-5137917
Website	http://www.eternal-group.com/Home/EngIndex
Email	Not Available

Emergency phone number

Association / Organisation	ETERNAL MATERIALS (MALAYSIA) SDN.BHD.
Emergency telephone numbers	+607-5137916
Other emergency telephone numbers	Not Available

SECTION 2 HAZARD(S) IDENTIFICATION

Classification of the substance or mixture



Note: The hazard category numbers found in GHS classification in section 2 of this SDSs are NOT to be used to fill in the NFPA 704 diamond. Blue = Health Red = Fire Yellow = Reactivity White = Special (Oxidizer or water reactive substances)

Classification	Flammable Liquid Category 3, Skin Corrosion/Irritation Category 2, Eye Irritation Category 2A, Specific target organ toxicity - repeated exposure Category 1
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Label elements

Hazard pictogram(s)	
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SIGNAL WORD	DANGER
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Hazard statement(s)

H226	Flammable liquid and vapour.
H315	Causes skin irritation.
H319	Causes serious eye irritation.

Continued...

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H372 Causes damage to organs through prolonged or repeated exposure



Hazard(s) not otherwise classified

Not Applicable

Precautionary statement(s) Prevention

P210	Keep away from heat/sparks/open flames/hot surfaces. - No smoking.
P233	Keep container tightly closed.
P260	Do not breathe dust/fume/gas/mist/vapours/spray.
P240	Ground/bond container and receiving equipment.
P242	Use only non-sparking tools.
P243	Take precautionary measures against static discharge.
P270	Do not eat, drink or smoke when using this product.
P280	Wear protective gloves/protective clothing/eye protection/face protection.

Precautionary statement(s) Response

P362	Take off contaminated clothing and wash before reuse.
P370+P378	In case of fire: Use alcohol resistant foam or normal protein foam for extinction.
P314	Get medical advice/attention if you feel unwell.
P337+P313	If eye irritation persists: Get medical advice/attention.
P302+P352	IF ON SKIN: Wash with plenty of soap and water.
P303+P361+P353	IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower.
P332+P313	If skin irritation occurs: Get medical advice/attention.

Precautionary statement(s) Storage

P403+P235	Store in a well-ventilated place. Keep cool.
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Precautionary statement(s) Disposal

P501	Dispose of contents/container in accordance with local regulations.
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SECTION 3 COMPOSITION / INFORMATION ON INGREDIENTS

Substances

See section below for composition of Mixtures

Mixtures

CAS No	%[weight]	Name
100-42-5	46	<u>styrene</u>
58182-50-6*	54	<u>unsaturated polyester resin</u>

SECTION 4 FIRST-AID MEASURES

Description of first aid measures

Eye Contact	<p>If this product comes in contact with the eyes: Wash out immediately with fresh running water.</p> <ul style="list-style-type: none"> Ensure complete irrigation of the eye by keeping eyelids apart and away from eye and moving the eyelids by occasionally lifting the upper and lower lids. Seek medical attention without delay; if pain persists or recurs seek medical attention. Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.
Skin Contact	<p>If skin contact occurs:</p> <ul style="list-style-type: none"> Immediately remove all contaminated clothing, including footwear. Flush skin and hair with running water (and soap if available). Seek medical attention in event of irritation.
Inhalation	<ul style="list-style-type: none"> If fumes, aerosols or combustion products are inhaled remove from contaminated area. Other measures are usually unnecessary.
Ingestion	<ul style="list-style-type: none"> Immediately give a glass of water. First aid is not generally required. If in doubt, contact a Poisons Information Centre or a doctor.

Most important symptoms and effects, both acute and delayed

See Section 11

Indication of any immediate medical attention and special treatment needed

Treat symptomatically.

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For acute or short term repeated exposures to styrene:

INHALATION:

- ▶ Severe exposures should have cardiac monitoring to detect arrhythmia.
- ▶ Catecholamines, especially epinephrine (adrenaline) should be used cautiously (if at all).
- ▶ Aminophylline and inhaled beta-two selective bronchodilators (e.g. salbutamol) are the drugs of choice for treatment of bronchospasm.



INGESTION:

- ▶ Ipecac syrup should be given for ingestions exceeding 3ml (styrene)/kg.
- ▶ For patients at risk of aspiration because of obtundation, intubation should precede lavage.
- ▶ Pneumonitis is a significant risk. Watch the patient closely in an upright (alert patient) or left lateral head-down position (obtunded patient) to reduce aspiration potential. [Ellenhorn and Barceloux: Medical Toxicology]

BIOLOGICAL EXPOSURE INDEX - BEI

These represent the determinants observed in specimens collected from a healthy worker who has been exposed at the Exposure Standard (ES or TLV):

Determinant	Index	Sampling Time	Comments
1. Mandelic acid in urine	800 mg/gm creatinine	End of shift	NS
	300 mg/gm creatinine	Prior to next shift	NS
2. Phenylglyoxylic acid in urine	240 mg/gm creatinine	End of shift	NS
	100 mg/gm creatinine	Prior to next shift	
3. Styrene in venous blood	0.55 mg/L	End of shift	SQ
	0.02 mg/L	Prior to next shift	SQ

NS: Non-specific determinant; also seen after exposure to other materials.

SQ: Semi-quantitative determinant - Interpretation may be ambiguous; should be used as a screening test or confirmatory test.

B: Background levels occur in specimens collected from subjects **NOT** exposed

SECTION 5 FIRE-FIGHTING MEASURES

Extinguishing media

- ▶ Foam.
- ▶ Dry chemical powder.
- ▶ BCF (where regulations permit).
- ▶ Carbon dioxide.
- ▶ Water spray or fog - Large fires only.

Special hazards arising from the substrate or mixture

Fire Incompatibility	▶ Avoid contamination with oxidising agents i.e. nitrates, oxidising acids, chlorine bleaches, pool chlorine etc. as ignition may result
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Special protective equipment and precautions for fire-fighters

Fire Fighting	<ul style="list-style-type: none"> ▶ Alert Fire Brigade and tell them location and nature of hazard. May be violently or explosively reactive. ▶ Wear breathing apparatus plus protective gloves. ▶ Prevent, by any means available, spillage from entering drains or water course. ▶ If safe, switch off electrical equipment until vapour fire hazard removed. Use water delivered as a fine spray to control fire and cool adjacent area. Avoid spraying water onto liquid pools. ▶ DO NOT approach containers suspected to be hot. ▶ Cool fire exposed containers with water spray from a protected location. ▶ If safe to do so, remove containers from path of fire.
Fire/Explosion Hazard	<ul style="list-style-type: none"> ▶ Liquid and vapour are flammable. ▶ Moderate fire hazard when exposed to heat or flame. Vapour forms an explosive mixture with air. ▶ Moderate explosion hazard when exposed to heat or flame. Vapour may travel a considerable distance to source of ignition. ▶ Heating may cause expansion or decomposition leading to violent rupture of containers. ▶ On combustion, may emit toxic fumes of carbon monoxide (CO). Combustion products include: carbon monoxide (CO) carbon dioxide (CO2) other pyrolysis products typical of burning organic material. ▶ Contains low boiling substance: Closed containers may rupture due to pressure buildup under fire conditions.

SECTION 6 ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures

See section 8

Environmental precautions

See section 12

Methods and material for containment and cleaning up

Minor Spills	<ul style="list-style-type: none"> ▶ Remove all ignition sources. ▶ Clean up all spills immediately. <p>Avoid breathing vapours and contact with skin and eyes.</p>
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- ▶ Control personal contact with the substance, by using protective equipment.
- ▶ Contain and absorb small quantities with vermiculite or other absorbent material.
- ▶ Wipe up.
- ▶ Collect residues in a flammable waste container.



Chemical Class: aromatic hydrocarbons
For release onto land: recommended sorbents listed in order of priority.

SORBENT TYPE	RANK	APPLICATION	COLLECTION	LIMITATIONS
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LAND SPILL - SMALL

Feathers - pillow	1	throw	pitchfork	DGC, RT
cross-linked polymer - particulate	2	shovel	shovel	R,W,SS
cross-linked polymer- pillow	2	throw	pitchfork	R, DGC, RT
sorbent clay - particulate	3	shovel	shovel	R, I, P,
treated clay/ treated natural organic - particulate	3	shovel	shovel	R, I
wood fibre - pillow	4	throw	pitchfork	R, P, DGC, RT

LAND SPILL - MEDIUM

cross-linked polymer -particulate	1	blower	skidloader	R, W, SS
treated clay/ treated natural organic - particulate	2	blower	skidloader	R, I
sorbent clay - particulate	3	blower	skidloader	R, I, P
polypropylene - particulate	3	blower	skidloader	W, SS, DGC
feathers - pillow	3	throw	skidloader	DGC, RT
expanded mineral - particulate	4	blower	skidloader	R, I, W, P, DGC

Major Spills

Legend

DGC: Not effective where ground cover is dense
R: Not reusable
I: Not incinerable
P: Effectiveness reduced when rainy
RT: Not effective where terrain is rugged
SS: Not for use within environmentally sensitive sites
W: Effectiveness reduced when windy
Reference: Sorbents for Liquid Hazardous Substance Cleanup and Control;
R.W Melvold et al: Pollution Technology Review No. 150: Noyes Data Corporation 1988

- ▶ Clear area of personnel and move upwind.
- ▶ Alert Fire Brigade and tell them location and nature of hazard.
- ▶ May be violently or explosively reactive.
- ▶ Wear breathing apparatus plus protective gloves.
- ▶ Prevent, by any means available, spillage from entering drains or water course.
- ▶ Consider evacuation (or protect in place).
- ▶ No smoking, naked lights or ignition sources.
- ▶ Increase ventilation.
- ▶ Stop leak if safe to do so.
- ▶ Water spray or fog may be used to disperse /absorb vapour.
- ▶ Contain spill with sand, earth or vermiculite.
- ▶ Use only spark-free shovels and explosion proof equipment.
- ▶ Collect recoverable product into labelled containers for recycling.
- ▶ Absorb remaining product with sand, earth or vermiculite.
- ▶ Collect solid residues and seal in labelled drums for disposal.
- ▶ Wash area and prevent runoff into drains.
- ▶ If contamination of drains or waterways occurs, advise emergency services.

Personal Protective Equipment advice is contained in Section 8 of the SDS.

SECTION 7 HANDLING AND STORAGE

Precautions for safe handling

Safe handling

- ▶ Containers, even those that have been emptied, may contain explosive vapours.
- ▶ Do NOT cut, drill, grind, weld or perform similar operations on or near containers.

Contains low boiling substance:

Storage in sealed containers may result in pressure buildup causing violent rupture of containers not rated appropriately. ▶ Check for bulging containers.

- ▶ Vent periodically
- ▶ Always release caps or seals slowly to ensure slow dissipation of vapours ▶
- ▶ Avoid all personal contact, including inhalation.
- ▶ Wear protective clothing when risk of overexposure occurs. ▶
- ▶ Use in a well-ventilated area.
- ▶ Prevent concentration in hollows and sumps.
- ▶ **DO NOT enter confined spaces until atmosphere has been checked.** ▶
- ▶ Avoid smoking, naked lights or ignition sources.
- ▶ Avoid generation of static electricity.
- ▶ **DO NOT use plastic buckets.** ▶
- ▶ Earth all lines and equipment.
- ▶ Use spark-free tools when handling.
- ▶ Avoid contact with incompatible materials.
- ▶ **When handling, DO NOT eat, drink or smoke.**

	<ul style="list-style-type: none"> ▶ Keep containers securely sealed when not in use. ▶ Avoid physical damage to containers. ▶ Always wash hands with soap and water after handling. ▶ Work clothes should be laundered separately. ▶ Use good occupational work practice. ▶ Observe manufacturer's storage and handling recommendations contained within this SDS. ▶ Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions. ▶ DO NOT allow clothing wet with material to stay in contact with skin 	
Other information	<ul style="list-style-type: none"> ▶ Store in original containers in approved flammable liquid storage area. ▶ Store away from incompatible materials in a cool, dry, well-ventilated area. ▶ DO NOT store in pits, depressions, basements or areas where vapours may be trapped. ▶ No smoking, naked lights, heat or ignition sources. ▶ Storage areas should be clearly identified, well illuminated, clear of obstruction and accessible only to trained and authorised personnel - adequate security must be provided so that unauthorised personnel do not have access. ▶ Store according to applicable regulations for flammable materials for storage tanks, containers, piping, buildings, rooms, cabinets, allowable quantity and minimum storage distances. ▶ Use non-sparking ventilation systems, approved explosion proof equipment and intrinsically safe electrical systems. ▶ Have appropriate extinguishing capability in storage area (e.g. portable fire extinguishers - dry chemical, foam or carbon dioxide) and flammable gas detectors. ▶ Keep adsorbents for leaks and spills readily available. ▶ Protect containers against physical damage and check regularly for leaks. ▶ Observe manufacturer's storage and handling recommendations contained within this SDS. <p>In addition, for tank storages (where appropriate):</p> <ul style="list-style-type: none"> ▶ Store in grounded, properly designed and approved vessels and away from incompatible materials. ▶ For bulk storages, consider use of floating roof or nitrogen blanketed vessels; where venting to atmosphere is possible, equip storage tank vents flame arrestors; inspect tank vents during winter conditions for vapour/ ice build-up. ▶ Storage tanks should be above ground and diked to hold entire contents. 	

Conditions for safe storage, including any incompatibilities

Suitable container	<ul style="list-style-type: none"> ▶ Packing as supplied by manufacturer. ▶ Plastic containers may only be used if approved for flammable liquid. ▶ Check that containers are clearly labelled and free from leaks. ▶ For low viscosity materials (i) : Drums and jerry cans must be of the non-removable head type. (ii) : Where a can is to be used as an inner package, the can must have a screwed enclosure. ▶ For materials with a viscosity of at least 2680 cSt. (23 deg. C) ▶ For manufactured product having a viscosity of at least 250 cSt. (23 deg. C) ▶ Manufactured product that requires stirring before use and having a viscosity of at least 20 cSt (25 deg. C): (i) Removable head packaging; (ii) Cans with friction closures and (iii) low pressure tubes and cartridges may be used. ▶ Where combination packages are used, and the inner packages are of glass, there must be sufficient inert cushioning material in contact with inner and outer packages ▶ In addition, where inner packagings are glass and contain liquids of packing group I there must be sufficient inert absorbent to absorb any spillage, unless the outer packaging is a close fitting moulded plastic box and the substances are not incompatible with the plastic.
Storage incompatibility	<p>For alkyl aromatics: The alkyl side chain of aromatic rings can undergo oxidation by several mechanisms. The most common and dominant one is the attack by oxidation at benzylic carbon as the intermediate formed is stabilised by resonance structure of the ring.</p> <ul style="list-style-type: none"> ▶ Following reaction with oxygen and under the influence of sunlight, a hydroperoxide at the alpha-position to the aromatic ring, is the primary oxidation product formed (provided a hydrogen atom is initially available at this position) - this product is often short-lived but may be stable dependent on the nature of the aromatic substitution; a secondary C-H bond is more easily attacked than a primary C-H bond whilst a tertiary C-H bond is even more susceptible to attack by oxygen ▶ Monoalkylbenzenes may subsequently form monocarboxylic acids; alkyl naphthalenes mainly produce the corresponding naphthalene carboxylic acids. ▶ Oxidation in the presence of transition metal salts not only accelerates but also selectively decomposes the hydroperoxides. Hock-rearrangement by the influence of strong acids converts the hydroperoxides to hemiacetals. Peresters formed from the hydroperoxides undergo Criegee rearrangement easily. ▶ Alkali metals accelerate the oxidation while CO₂ as co-oxidant enhances the selectivity. ▶ Microwave conditions give improved yields of the oxidation products. ▶ Photo-oxidation products may occur following reaction with hydroxyl radicals and NO_x - these may be components of photochemical smogs. Oxidation of Alkylaromatics: T.S.S Rao and Shubhra Awasthi: E-Journal of Chemistry Vol 4, No. 1, pp 1-13 January 2007 ▶ Vigorous reactions, sometimes amounting to explosions, can result from the contact between aromatic rings and strong oxidising agents. Aromatics can react exothermally with bases and with diazo compounds. <p>WARNING:</p> <p>May decompose violently or explosively on contact with other substances.</p> <ul style="list-style-type: none"> ▶ This substance, or one of its components, is one of the relatively few compounds which are described as "endothermic" i.e. heat is absorbed into the compound, rather than released from it, during its formation. ▶ The majority of endothermic compounds are thermodynamically unstable and may decompose explosively under various circumstances of initiation. ▶ Many but not all endothermic compounds have been involved in decompositions, reactions and explosions and, in general, compounds with significantly positive values of standard heats of formation, may be considered suspect on stability grounds. <p>BREITHERICK L.: Handbook of Reactive Chemical Hazards</p> <ul style="list-style-type: none"> ▶ Contamination with polymerisation catalysts - peroxides, persulfates, oxidising agents - also strong acids, strong alkalis, will cause polymerisation with exotherm - generation of heat. ▶ Polymerisation of large quantities may be violent - even explosive. ▶ Avoid any contamination of this material as it is very reactive and any contamination is potentially hazardous <p>▶ Styrene:</p> <ul style="list-style-type: none"> ▶ requires inhibition with adequate levels of substituted phenol (such as tert-butylcatechol to prevent polymerisation - material that has had inhibitor removed, e.g. is uninhibited, must be refrigerated and used within 24 hours, i.e. not stored; contact with alkali solutions or glycols will remove inhibitor and render material unstable on storage ▶ polymerisation may cause container to explode ▶ polymerisation may be caused by elevated temperatures (above 66 deg C.), butyl lithium, peroxides, UV light, or sunlight reacts violently with chlorosulfonic acid, strong oxidisers, sulfuric acid, xenon tetrafluoride ▶ is incompatible with acids, rust, catalysts for vinyl polymerisation, 2,5-dimethyl-2,5-di(tert-butylperoxy)hexane, peroxides, metals salts (e.g., aluminium chloride, copper chlorate, manganese nitrate, etc.) ▶ corrodes copper and its alloys ▶ attacks some plastics, rubber or coatings ▶ flow or agitation may generate electrostatic charges due to low conductivity ▶ uninhibited monomer vapour may block vents and confined spaces by forming solid polymer

SECTION 8 EXPOSURE CONTROLS / PERSONAL PROTECTION



Control parameters

OCCUPATIONAL EXPOSURE LIMITS (OEL)

INGREDIENT DATA

Source	Ingredient	Material name	TWA	STEL	Peak	Notes
US NIOSH Recommended Exposure Limits (RELs)	styrene	Ethenyl benzene, Phenylethylene, Styrene monomer, Styrol, Vinyl benzene	50 ppm / 215 mg/m3	425 mg/m3 / 100 ppm	Not Available	Not Available
US ACGIH Threshold Limit Values (TLV)	styrene	Styrene, monomer	20 ppm	40 ppm	Not Available	TLV® Basis: CNS impair; URT irr; peripheral neuropathy; BEI
US OSHA Permissible Exposure Levels (PELs) - Table Z2	styrene	Styrene	100 ppm	Not Available	200 ppm	(Z37.15-1969)
US OSHA Permissible Exposure Levels (PELs) - Table Z1	styrene	Styrene	Not Available	Not Available	Not Available	See Table Z-2

EMERGENCY LIMITS

Ingredient	Material name	TEEL-1	TEEL-2	TEEL-3
styrene	Styrene	Not Available	Not Available	Not Available

Ingredient	Original IDLH	Revised IDLH
styrene	700 ppm	Not Available
unsaturated polyester resin	Not Available	Not Available

MATERIAL DATA

for styrene:

Odour Threshold: 0.017 to 1.9 with a geometric average threshold of 0.32 ppm.

NOTE: Detector tubes measuring styrene at greater than 10 ppm are available.

The recommended TLV-TWA and STEL is based on the influence of styrene exposure on the central and peripheral nervous systems. At the TWA, total daily styrene exposure to the standard 70 kg medium-frame man who inhales 10 m3 and who retains 70% of the inspired compound is 21 mg/kg with 0.5 mg/kg absorbed through the skin. The total absorbed dose can be increased six-fold with physical work and increased respiration rate.

Measurement of styrene and its metabolites in the urine can be an indication of recent exposure though this approach may be limited by factors such as the influence of alcohol consumption on styrene pharmacodynamics. Exposure at or below the TLV-TWA is thought to protect the worker against the significant risks of narcosis, neuropathies and irritation although other findings suggest that neuro-optical effects are significant amongst workers exposed at 4 ppm.

Odour Safety Factor(OSF)

OSF=63 (STYRENE)

Exposure controls

Engineering controls are used to remove a hazard or place a barrier between the worker and the hazard. Well-designed engineering controls can be highly effective in protecting workers and will typically be independent of worker interactions to provide this high level of protection.

The basic types of engineering controls are:

- Process controls which involve changing the way a job activity or process is done to reduce the risk.
- Enclosure and/or isolation of emission source which keeps a selected hazard "physically" away from the worker and ventilation that strategically "adds" and "removes" air in the work environment. Ventilation can remove or dilute an air contaminant if designed properly. The design of a ventilation system must match the particular process and chemical or contaminant in use.

Employers may need to use multiple types of controls to prevent employee overexposure.

For flammable liquids and flammable gases, local exhaust ventilation or a process enclosure ventilation system may be required. Ventilation equipment should be explosion-resistant.

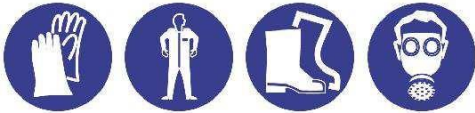
Air contaminants generated in the workplace possess varying "escape" velocities which, in turn, determine the "capture velocities" of fresh circulating air required to effectively remove the contaminant.

Type of Contaminant:	Air Speed:
solvent, vapours, degreasing etc., evaporating from tank (in still air).	0.25-0.5 m/s (50-100 f/min.)
aerosols, fumes from pouring operations, intermittent container filling, low speed conveyer transfers, welding, spray drift, plating acid fumes, pickling (released at low velocity into zone of active generation)	0.5-1 m/s (100-200 f/min.)
direct spray, spray painting in shallow booths, drum filling, conveyer loading, crusher dusts, gas discharge (active generation into zone of rapid air motion)	1-2.5 m/s (200-500 f/min.)

Within each range the appropriate value depends on:

Lower end of the range	Upper end of the range
1: Room air currents minimal or favourable to capture	1: Disturbing room air currents
2: Contaminants of low toxicity or of nuisance value only.	2: Contaminants of high toxicity
3: Intermittent, low production.	3: High production, heavy use
4: Large hood or large air mass in motion	4: Small hood-local control only

Simple theory shows that air velocity falls rapidly with distance away from the opening of a simple extraction pipe. Velocity generally decreases with the square of distance from the extraction point (in simple cases). Therefore the air speed at the extraction point should be adjusted, accordingly, after reference to distance from the contaminating source. The air velocity at the extraction fan, for example, should be a minimum of 1-2 m/s (200-400 f/min.) for extraction of solvents generated in a tank 2 meters distant from the extraction point. Other mechanical considerations, producing performance deficits within

	the extraction apparatus, make it essential that theoretical air velocities are multiplied by factors of 10 or more when extraction systems are installed or used.
Personal protection	
Eye and face protection	<ul style="list-style-type: none"> ▶ Safety glasses with side shields. Chemical goggles. ▶ Contact lenses may pose a special hazard; soft contact lenses may absorb and concentrate irritants. A written policy document, describing the wearing of lenses or restrictions on use, should be created for each workplace or task. This should include a review of lens absorption and adsorption for the class of chemicals in use and an account of injury experience. Medical and first-aid personnel should be trained in their removal and suitable equipment should be readily available. In the event of chemical exposure, begin eye irrigation immediately and remove contact lens as soon as practicable. Lens should be removed at the first signs of eye redness or irritation - lens should be removed in a clean environment only after workers have washed hands thoroughly. [CDC NIOSH Current Intelligence Bulletin 59], [AS/NZS 1336 or national equivalent]
Skin protection	See Hand protection below
Hands/feet protection	<ul style="list-style-type: none"> ▶ Wear chemical protective gloves, e.g. PVC. ▶ Wear safety footwear or safety gumboots, e.g. Rubber <p>The selection of suitable gloves does not only depend on the material, but also on further marks of quality which vary from manufacturer to manufacturer. Where the chemical is a preparation of several substances, the resistance of the glove material can not be calculated in advance and has therefore to be checked prior to the application.</p> <p>The exact break through time for substances has to be obtained from the manufacturer of the protective gloves and has to be observed when making a final choice.</p> <p>Personal hygiene is a key element of effective hand care. Gloves must only be worn on clean hands. After using gloves, hands should be washed and dried thoroughly. Application of a non-perfumed moisturiser is recommended.</p> <p>Suitability and durability of glove type is dependent on usage. Important factors in the selection of gloves include:</p> <ul style="list-style-type: none"> - frequency and duration of contact, - chemical resistance of glove material, - glove thickness and - dexterity <p>Select gloves tested to a relevant standard (e.g. Europe EN 374, US F739, AS/NZS 2161.1 or national equivalent).</p> <ul style="list-style-type: none"> - When prolonged or frequently repeated contact may occur, a glove with a protection class of 5 or higher (breakthrough time greater than 240 minutes according to EN 374, AS/NZS 2161.10.1 or national equivalent) is recommended. - When only brief contact is expected, a glove with a protection class of 3 or higher (breakthrough time greater than 60 minutes according to EN 374, AS/NZS 2161.10.1 or national equivalent) is recommended. - Some glove polymer types are less affected by movement and this should be taken into account when considering gloves for long-term use. - Contaminated gloves should be replaced. <p>As defined in ASTM F-739-96 in any application, gloves are rated as:</p> <ul style="list-style-type: none"> - Excellent when breakthrough time > 480 min - Good when breakthrough time > 20 min - Fair when breakthrough time < 20 min - Poor when glove material degrades <p>For general applications, gloves with a thickness typically greater than 0.35 mm, are recommended.</p> <p>It should be emphasised that glove thickness is not necessarily a good predictor of glove resistance to a specific chemical, as the permeation efficiency of the glove will be dependent on the exact composition of the glove material. Therefore, glove selection should also be based on consideration of the task requirements and knowledge of breakthrough times.</p> <p>Glove thickness may also vary depending on the glove manufacturer, the glove type and the glove model. Therefore, the manufacturers' technical data should always be taken into account to ensure selection of the most appropriate glove for the task.</p> <p>Note: Depending on the activity being conducted, gloves of varying thickness may be required for specific tasks. For example:</p> <ul style="list-style-type: none"> - Thinner gloves (down to 0.1 mm or less) may be required where a high degree of manual dexterity is needed. However, these gloves are only likely to give short duration protection and would normally be just for single use applications, then disposed of. - Thicker gloves (up to 3 mm or more) may be required where there is a mechanical (as well as a chemical) risk i.e. where there is abrasion or puncture potential <p>Gloves must only be worn on clean hands. After using gloves, hands should be washed and dried thoroughly. Application of a non-perfumed moisturiser is recommended.</p>
Body protection	See Other protection below
Other protection	<ul style="list-style-type: none"> ▶ Overalls. ▶ PVC Apron. ▶ PVC protective suit may be required if exposure severe. Eyewash unit. ▶ Ensure there is ready access to a safety shower. ▶ Some plastic personal protective equipment (PPE) (e.g. gloves, aprons, overshoes) are not recommended as they may produce static electricity. For large scale or continuous use wear tight-weave non-static clothing (no metallic fasteners, cuffs or pockets). ▶ Non sparking safety or conductive footwear should be considered. Conductive footwear describes a boot or shoe with a sole made from a conductive compound chemically bound to the bottom components, for permanent control to electrically ground the foot an shall dissipate static electricity from the body to reduce the possibility of ignition of volatile compounds. Electrical resistance must range between 0 to 500,000 ohms. Conductive shoes should be stored in lockers close to the room in which they are worn. Personnel who have been issued conductive footwear should not wear them from their place of work to their homes and return.

Recommended material(s)**GLOVE SELECTION INDEX**

Glove selection is based on a modified presentation of the:
"Forsberg Clothing Performance Index".

The effect(s) of the following substance(s) are taken into account in the
computer-generated selection:
ETERSET 2504PT-N

Material	CPI
PE/EVAL/PE	A
TEFLO	A

Respiratory protection

Type A Filter of sufficient capacity. (AS/NZS 1716 & 1715, EN 143:2000 & 149:2001, ANSI Z88 or national equivalent)

Where the concentration of gas/particulates in the breathing zone, approaches or exceeds the "Exposure Standard" (or ES), respiratory protection is required. Degree of protection varies with both face-piece and Class of filter; the nature of protection varies with Type of filter.

Required Minimum Protection Factor	Half-Face Respirator	Full-Face Respirator	Powered Air Respirator
up to 5 x ES	A-AUS / Class 1 -		A-PAPR-AUS / Class 1
up to 25 x ES	Air-line*	A-2	A-PAPR-2

Continued...

NATURALRUBBE	C
NITRIL	C
NITRILE+PV	C
PV	C
SARANEX-2	C

* CPI - Chemwatch Performance Index

A: Best Selection

B: Satisfactory; may degrade after 4 hours continuous immersion

C: Poor to Dangerous Choice for other than short term immersion

NOTE: As a series of factors will influence the actual performance of the glove,

a final selection must be based on detailed observation. -

* Where the glove is to be used on a short term, casual or infrequent basis, factors such as

"feel" or convenience (e.g. disposability), may dictate a choice of gloves which might otherwise

be unsuitable following long-term or frequent use. A qualified practitioner should be consulted.

up to 50 x ES	-	A-3	-
50+ x ES	-	Air-line**	-

^ - Full-face

A(All classes) = Organic vapours, B AUS or B1 = Acid gasses, B2 = Acid gas or hydrogen cyanide(HCN), B3 = Acid gas or hydrogen cyanide(HCN), E = Sulfur dioxide(SO2), G = Agricultural chemicals, K = Ammonia(NH3), Hg = Mercury, NO = Oxides of nitrogen, MB = Methyl bromide, AX = Low boiling point organic compounds(below 65 degC)

- Cartridge respirators should never be used for emergency ingress or in areas of unknown vapour concentrations or oxygen content.
- The wearer must be warned to leave the contaminated area immediately on detecting any odours through the respirator. The odour may indicate that the mask is not functioning properly, that the vapour concentration is too high, or that the mask is not properly fitted. Because of these limitations, only restricted use of cartridge respirators is considered appropriate.
- Cartridge performance is affected by humidity. Cartridges should be changed after 2 hr of continuous use unless it is determined that the humidity is less than 75%, in which case, cartridges can be used for 4 hr. Used cartridges should be discarded daily, regardless of the length of time used



SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties

Appearance	Not Available		
Physical state	Liquid	Relative density (Water = 1)	Not Available
Odour	Not Available	Partition coefficient n-octanol / water	Not Available
Odour threshold	Not Available	Auto-ignition temperature (°C)	490
pH (as supplied)	Not Available	Decomposition temperature	Not Available
Melting point / freezing point (°C)	-31	Viscosity (cSt)	Not Available
Initial boiling point and boiling range (°C)	145	Molecular weight (g/mol)	Not Available
Flash point (°C)	31	Taste	Not Available
Evaporation rate	0.49 BuAC = 1	Explosive properties	Not Available
Flammability	Flammable.	Oxidising properties	Not Available
Upper Explosive Limit (%)	6.1	Surface Tension (dyn/cm or mN/m)	Not Available
Lower Explosive Limit (%)	1.1	Volatile Component (%vol)	42
Vapour pressure (kPa)	1.27	Gas group	Not Available
Solubility in water	Immiscible	pH as a solution (1%)	Not Available
Vapour density (Air = 1)	3.6	VOC g/L	Not Available

SECTION 10 STABILITY AND REACTIVITY

Reactivity	See section 7
Chemical stability	<ul style="list-style-type: none"> Unstable in the presence of incompatible materials. Product is considered stable. Hazardous polymerisation will not occur.
Possibility of hazardous reactions	See section 7
Conditions to avoid	See section 7
Incompatible materials	See section 7
Hazardous decomposition products	See section 5

SECTION 11 TOXICOLOGICAL INFORMATION

Information on toxicological effects

Inhaled	<p>The material is not thought to produce adverse health effects or irritation of the respiratory tract (as classified by EC Directives using animal models). Nevertheless, good hygiene practice requires that exposure be kept to a minimum and that suitable control measures be used in an occupational setting. The acute toxicity of inhaled alkylbenzenes is best described by central nervous system depression. As a rule, these compounds may also act as general anaesthetics.</p> <p>Systemic poisoning produced by general anaesthesia is characterised by lightheadedness, nervousness, apprehension, euphoria, confusion, dizziness, drowsiness, tinnitus, blurred or double vision, vomiting and sensations of heat, cold or numbness, twitching, tremors, convulsions, unconsciousness respiratory depression and arrest. Cardiac arrest may result from cardiovascular collapse. Bradycardia, and hypotension may also be produced. Inhaled alkylbenzene vapours cause death in animals at air levels that are relatively similar (typically LC50s are in the range 5000 -8000 ppm for 4 to 8 hour exposures). It is likely that acute inhalation exposure to alkylbenzenes resembles that to general anaesthetics.</p> <p>Alkylbenzenes are not generally toxic other than at high levels of exposure. This may be because their metabolites have a low order of toxicity and are easily excreted. There is little or no evidence to suggest that metabolic pathways can become saturated leading to spillover to alternate pathways. Nor is there evidence that toxic reactive intermediates, which may produce subsequent toxic or mutagenic effects, are formed</p>
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	<p>Central nervous system (CNS) depression is seen at styrene exposures exceeding 50 ppm, whilst headache, fatigue, nausea and dizziness are reported consistently at exposures of 100 ppm.</p> <p>Eye and throat irritation occurred in human volunteers exposed to 376 ppm styrene for 1 hour and was accompanied by increased nasal secretion at exposures of 800 ppm for 4 hours. At the end of an 8-hour workshift, workers exposed to 212 ppm styrene had higher urinary levels of alanine-aminopeptidase and N-acetyl-glucosaminidase than unexposed workers, indicating potential renal effects of styrene.</p> <p>Evidence exists that 5% to 10% reductions in sensory nerve conduction occur at 100 ppm and that slowed reaction times occur after exposure to 50 ppm. Exposure at 370 ppm produces unpleasant subjective symptoms and signs of neurological impairment. High vapour concentrations may have a toxic and anaesthetic effect which may lead to unconsciousness or death. Exposure at 1000 ppm can rapidly lead to unconsciousness whilst exposure to 10000 ppm may cause death in less than one hour. Simple reaction times were increased and coordination decreased amongst volunteers inhaling 350 ppm (via mouth tube) for 30 minutes. Controlled inhalation studies with 300 ppm (via mouth tube) for one hour found reduced ocular tracking abilities but no changes in balance or coordination.</p> <p>In humans exposed to styrene vapor, pulmonary retention is approximately 66% of the administered concentration.</p> <p>Following inhalation exposure, styrene is preferentially distributed to adipose tissue. Fat levels in rats were 10-times greater than levels in observed organs after exposure to 50-2000 ppm for 5 hours.</p> <p>Urinary excretion is the major route of elimination of styrene. In humans, the main urinary metabolites are mandelic acid and phenylglyoxylic acid; rats also excrete hippuric acid and glucuronide. Human volunteers exposed by inhalation to 50 to 200 parts per million (ppm) showed biphasic urinary elimination of mandelic acid with a half-life for the first phase of 4 hours and for the second phase of 25 hours. Urinary metabolite concentrations have been correlated with exposure concentrations in humans.</p>
Ingestion	<p>The material has NOT been classified by EC Directives or other classification systems as "harmful by ingestion". This is because of the lack of corroborating animal or human evidence. The material may still be damaging to the health of the individual, following ingestion, especially where pre-existing organ (e.g liver, kidney) damage is evident. Present definitions of harmful or toxic substances are generally based on doses producing mortality rather than those producing morbidity (disease, ill-health). Gastrointestinal tract discomfort may produce nausea and vomiting. In an occupational setting however, ingestion of insignificant quantities is not thought to be cause for concern.</p> <p>Styrene is absorbed into the body following oral or inhalation exposure. Complete absorption occurred in fasted rats given a total of 3.147 mg styrene by gavage in an aqueous solution. A peak blood level of 6 micrograms/ml was reached within minutes. Following oral administration of 20 mg/kg of radiolabeled styrene to rats, the highest organ levels were found in the kidney, liver, and pancreas.</p> <p>Styrene is presumed to be metabolised to styrene oxide which is then converted to styrene glycol. Styrene glycol is metabolised to either mandelic acid or to benzoic acid and then hippuric acid. Mandelic acid is also metabolized to phenylglyoxylic acid. Minor metabolic pathways include the conjugation of styrene oxide with glutathione and the formation of vinyl phenol.</p> <p>Following an oral dose of 50 mg/kg radiolabeled styrene to rats, 95% of the label was recovered in the urine, 1% in expired air, and 4% in the feces over 72-hours</p>
Skin Contact	<p>The material may accentuate any pre-existing dermatitis condition</p> <p>Skin contact is not thought to have harmful health effects (as classified under EC Directives); the material may still produce health damage following entry through wounds, lesions or abrasions.</p> <p>Open cuts, abraded or irritated skin should not be exposed to this material</p> <p>Entry into the blood-stream through, for example, cuts, abrasions, puncture wounds or lesions, may produce systemic injury with harmful effects. Examine the skin prior to the use of the material and ensure that any external damage is suitably protected.</p> <p>Dermal absorption of styrene has been shown to be significantly less than absorption by the respiratory tract</p> <p>The material produces moderate skin irritation; evidence exists, or practical experience predicts, that the material either produces</p> <ul style="list-style-type: none"> ↳ moderate inflammation of the skin in a substantial number of individuals following direct contact, and/or ↳ produces significant, but moderate, inflammation when applied to the healthy intact skin of animals (for up to four hours), such inflammation being present twenty-four hours or more after the end of the exposure period. <p>Skin irritation may also be present after prolonged or repeated exposure; this may result in a form of contact dermatitis (nonallergic). The dermatitis is often characterised by skin redness (erythema) and swelling (oedema) which may progress to blistering (vesiculation), scaling and thickening of the epidermis. At the microscopic level there may be intercellular oedema of the spongy layer of the skin (spongiosis) and intracellular oedema of the epidermis.</p>
Eye	<p>The vapour when concentrated has pronounced eye irritation effects and this gives some warning of high vapour concentrations. If eye irritation occurs seek to reduce exposure with available control measures, or evacuate area.</p> <p>Evidence exists, or practical experience predicts, that the material may cause severe eye irritation in a substantial number of individuals and/or may produce significant ocular lesions which are present twenty-four hours or more after instillation into the eye(s) of experimental animals. Eye contact may cause significant inflammation with pain. Corneal injury may occur; permanent impairment of vision may result unless treatment is prompt and adequate. Repeated or prolonged exposure to irritants may cause inflammation characterised by a temporary redness (similar to windburn) of the conjunctiva (conjunctivitis); temporary impairment of vision and/or other transient eye damage/ulceration may occur.</p>
Chronic	<p>Long-term exposure to the product is not thought to produce chronic effects adverse to health (as classified by EC Directives using animal models); nevertheless exposure by all routes should be minimised as a matter of course.</p> <p>Exposure to styrene may aggravate central nervous system disorders, chronic respiratory disease, skin disease, kidney disease and liver disease. Workers engaged in the manufacture of styrene polymers with exposure to generally <1 ppm for 1-36 years had low erythrocyte counts and altered liver enzyme profiles. Blood and liver effects do not appear to be of concern for human exposures to styrene.</p> <p>Occupational studies in humans show styrene to be a neurotoxicant.</p> <p>Occupational styrene exposure causes central and peripheral nervous system effects. It causes a reversible decrease in colour discrimination and in some studies effects on hearing have been reported.</p> <p>Neuro-optic pathways have been shown to be particularly vulnerable to organic solvent exposure and studies support the proposition that styrene exposure can induce dose-dependent colour vision loss. In the fibre-glass reinforced plastics industry, visual colour impairment was detected where exposure was above 4 ppm. Campagna D. et al, Neurotoxicology, 17(2), pp 367-374, 1996</p> <p>Studies of effects of styrene on the haematopoietic and immune systems, liver and kidney, in exposed workers, do not reveal consistent changes. Central nervous system effects of styrene in rats, guinea pigs and rabbits, have been reported. Styrene exposure causes liver and lung toxicity in mice and nasal toxicity in rats and mice.</p> <p>Chromosomal abnormalities (micronuclei, chromosome gaps or breaks, nuclear bridges and unscheduled DNA synthesis in peripheral lymphocytes) have been recorded in workers exposed to styrene. Such aberrations however are not always apparent in epidemiological studies and the status of styrene as a DNA effector is equivocal.</p> <p>Death due to cancers among workers exposed to styrene is statistically unremarkable.</p> <p>The dominant first metabolite of styrene is styrene-7,8-epoxide which binds covalently to DNA and shows activity in various in-vitro and in-vivo assays for genetic effects where it induces dose-related responses of chromosomal damage at low concentrations. Styrene-7,8-oxide is detected in the blood of workers exposed to styrene. Adducts in haemoglobin and DNA, DNA single-strand breaks/alkali-labile sites as well as significant increases in the frequency of chromosomal damage have been found in workers exposed to styrene in the reinforced plastics industry.</p> <p>In humans there is little evidence for an association between workplace exposure to styrene and spontaneous abortions, malformations or decreased male fecundity.</p> <p>Spontaneous abortions amongst female worker, exposed to styrene, has been reported in some studies. This finding has not been substantiated in other studies. Increased congenital malformations, embryonic foetal deaths or reduced birth weights have also been reported but simultaneous exposure to other substances makes the link to styrene conjectural. In rats, there is some evidence for reduced sperm count and peripubertal animals may be more sensitive than adult animals. Styrene crosses the placenta in rats and mice. It increases prenatal death at doses levels causing decreased maternal weight gain. Decreased pup weight, postnatal developmental delays as well as neurobehavioral and neurochemical abnormalities have been reported in rats exposed to styrene during pre- or postnatal development. The potential for developmental toxicity appears to be much higher for styrene-7,8-oxide, a metabolite.</p> <p>Rats given weekly doses of styrene by gavage at 500 mg/kg for 102 weeks showed liver, kidney, and stomach lesions; no effects were seen in mice. Reduced weight gain and increased liver and kidney weights occurred in rats receiving 285 or 475 mg/kg/day for 185 days but no effects at 95 mg/kg/day. Male and</p>

female rats were given 0, 1000, or 2000 mg/kg and male and female mice were given 0, 150, or 300 mg/kg by gavage for 78 weeks. Reduced body weight occurred in both treated male rat groups, high-dose female rats, and both treated female mouse groups. In another study, male and female mice were treated weekly with 1350 mg/kg. At 20 weeks, mortality was 50% and 20% for males and females, respectively accompanied by liver necrosis, splenic hypoplasia, and lung congestion. Male and female mice were exposed to 0, 62.5, 125, 250, or 500 ppm styrene for 6 hours/day, 5 days/week for 13 weeks. In both sexes the liver to body weight ratio was increased at the two highest doses; histopathology of the respiratory tract revealed metaplasia and degeneration of the olfactory epithelium of the nasal cavity at the lowest dose, necrosis at higher concentrations, and bronchiolar regeneration at all concentrations. Male and female rats exposed to 0, 125, 500, 1000, or 1500 ppm on the same schedule had increased liver to body weight ratios at the three highest levels in males and the two highest levels in females; degeneration of the olfactory epithelium occurred in both sexes at around 1000 ppm. Pathological changes were observed in the respiratory mucosa of rats following exposure to 1000 ppm 4 hours/day, 5 days/week for 3 weeks. Chromosomal abnormalities (micronuclei, chromosome gaps or breaks, nuclear bridges and unscheduled DNA synthesis in peripheral lymphocytes) have been recorded in workers exposed to styrene. Such aberrations however are not always apparent in epidemiological studies and the status of styrene as a DNA effector is equivocal. Death due to cancers among workers exposed to styrene is statistically unremarkable. The dominant first metabolite of styrene is styrene-7,8-epoxide which binds covalently to DNA and shows activity in various in-vitro and in-vivo assays for genetic effects where it induces dose-related responses of chromosomal damage at low concentrations. Styrene-7,8-oxide is detected in the blood of workers exposed to styrene. Adducts in haemoglobin and DNA, DNA single-strand breaks/ alkali-labile sites as well as significant increases in the frequency of chromosomal damage have been found in workers exposed to styrene in the reinforced plastics industry. On the basis, primarily, of animal experiments, concern has been expressed that the material may produce carcinogenic or mutagenic effects; in respect of the available information, however, there presently exists inadequate data for making a satisfactory assessment.



ETERSET 2508PT-5MS	TOXICITY	IRRITATION
	Not Available	Not Available

styrene	TOXICITY	IRRITATION
	dermal (rat) LD50: >2000 mg/kg ^[1]	Eye (rabbit): 100 mg/24h - moderate
	Inhalation (rat) LC50: 11.8 mg/l/4H ^[2]	Eye (rabbit): 100 mg/24h - moderate
	Oral (rat) LD50: =1000 mg/kg ^[2]	Skin (rabbit): 500 mg - mild
		Skin (rabbit): 500 mg - mild

unsaturated polyester resin	TOXICITY	IRRITATION
	Not Available	Not Available

Legend: 1. Value obtained from Europe ECHA Registered Substances - Acute toxicity 2. * Value obtained from manufacturer's SDS. Unless otherwise specified data extracted from RTECS - Register of Toxic Effect of chemical Substances

STYRENE	The material may cause skin irritation after prolonged or repeated exposure and may produce a contact dermatitis (nonallergic). This form of dermatitis is often characterised by skin redness (erythema) and swelling of the epidermis. Histologically there may be intercellular oedema of the spongy layer (spongiosis) and intracellular oedema of the epidermis.
	WARNING: This substance has been classified by the IARC as Group 2B: Possibly Carcinogenic to Humans.
unsaturated polyester resin	No significant acute toxicological data identified in literature search.

Acute Toxicity	✘	Carcinogenicity	✘
Skin Irritation/Corrosion	✔	Reproductivity	✘
Serious Eye Damage/Irritation	✔	STOT - Single Exposure	✘
Respiratory or Skin sensitisation	✘	STOT - Repeated Exposure	✔
Mutagenicity	✘	Aspiration Hazard	✘

Legend: ✘ - Data either not available or does not fill the criteria for classification
✔ - Data available to make classification

SECTION 12 ECOLOGICAL INFORMATION

Toxicity

ETERSET 2504PT-N	ENDPOINT	TEST DURATION (HR)	SPECIES	VALUE	SOURCE
	Not Available	Not Available	Not Available	Not Available	Not Available

styrene	ENDPOINT	TEST DURATION (HR)	SPECIES	VALUE	SOURCE
	LC50	96	Fish	3.963mg/L	3
	EC50	48	Crustacea	4.7mg/L	2
	EC50	96	Algae or other aquatic plants	0.72mg/L	4
	EC10	96	Algae or other aquatic plants	=0.13mg/L	1
	NOEC	168	Crustacea	0.00006mg/L	2

unsaturated polyester resin	ENDPOINT	TEST DURATION (HR)	SPECIES	VALUE	SOURCE
	Not Available	Not Available	Not Available	Not Available	Not Available

Legend: Extracted from 1. IUCLID Toxicity Data 2. Europe ECHA Registered Substances - Ecotoxicological Information - Aquatic Toxicity 3. EPIWIN Suite V3. 12 (QSAR) - Aquatic Toxicity Data (Estimated) 4. US EPA, Ecotox database - Aquatic Toxicity Data 5. ECETOC Aquatic Hazard Assessment Data 6. NIT E (Japan) - Bioconcentration Data 7. METI (Japan) - Bioconcentration Data 8. Vendor Data

Within an aromatic series, acute toxicity increases with increasing alkyl substitution on the aromatic nucleus. For example, there is an increase in toxicity as alkylation of the naphthalene structure increases. The order of most toxic to least in a study using grass shrimp (*Palaemonetes pugio*) and brown shrimp (*Penaeus aztecus*) was dimethylnaphthalenes > methylnaphthalenes > naphthalenes.

Studies conclude that the toxicity of an oil appears to be a function of its di-aromatic and tri-aromatic hydrocarbons, which includes three-ring hydrocarbons such as phenanthrene.

The heavier (4-, 5-, and 6-ring) PAHs are more persistent than the lighter (2- and 3-ring) PAHs and tend to have greater carcinogenic and other chronic impact potential. PAHs in general are more frequently associated with chronic risks. These risks include cancer and often are the result of exposures to complex mixtures of chronic-risk aromatics (such as PAHs, alkyl PAHs, benzenes, and alkyl benzenes), rather than exposures to low levels of a single compound.

Anthracene is a phototoxic PAH. UV light greatly increases the toxicity of anthracene to bluegill sunfish. Benchmarks developed in the absence of UV light may be under-protective, and biological resources in strong sunlight are at more risk than those that are not.

for styrene:

log Kow : 2.95-3.05

Koc : 270-550 Half-

life (hr) air : 3.5-9

Half-life (hr) H₂O surface water :

3 Henry's atm m³/mol: 2.81E-03

BOD 5 : 0.55-2.45,65%

COD : 2.80-

2.88 ThOD :

3.07 BCF : 13.5

Nitrification inhibition : 75% inhibited at 175mg/l

Transport: Styrene is expected to volatilise from surface waters as predicted by its Henry's Law constant. The chemical is also removed from waters by adsorption onto soils and sediments. Under certain conditions, styrene may leach through soil (particularly sandy soils) and enter ground water

Transformation/ Persistence:

Air: In the atmosphere, styrene reacts with both hydroxyl radicals and ozone with estimated half-lives of 3.5 and 9 hours, respectively. The chemical is also degraded in the presence of NO_x and natural sunlight. Styrene contributes to the formation of photochemical smog due to indirect photochemical reactions. Smog chamber experiments with simulated sunlight and auto exhaust as a source of styrene, showed a 55% disappearance of styrene in 2 hours.

Soil: Biodegradation is the major route of removal of styrene from soils. Microbes isolated from landfill soil degraded 95% of the styrene present in 16 weeks

Water: Styrene rapidly volatilises from surface water with estimated half-lives from a river or pond of 0.6 days and 13 days, respectively. Microbes isolated from unadapted sewage sludge degraded 42% of the styrene present in 5 days while the microbial degradation with adapted sewage sludge was 80% in 5 days **Biota:** Based on the fish bioconcentration factor of 13.5 (goldfish) and the water solubility of styrene, the chemical is not likely to accumulate in biological organisms.

Ecotoxicity: Styrene is moderately toxic to aquatic organisms with toxicity values in the range of >1 mg/L to 100 mg/L. Styrene is expected to have low toxicity towards terrestrial animals
Fish LC50 (96 h): *Lepomis macrochirus* (blue gill) 25 mg/l; *Pimephales promelas* (fathead minnow) 46.4 mg/l (soft water); *Carassius auratus* (goldfish) 64.74 mg/l; *Lebistes reticulatus* (guppy) 74.83 mg/l

Daphnia magna LC50 (48 h): 23 mg/l; (24 h): 27 mg/l

Substances containing unsaturated carbons are ubiquitous in indoor environments. They result from many sources (see below). Most are reactive with environmental ozone and many produce stable products which are thought to adversely affect human health. The potential for surfaces in an enclosed space to facilitate reactions should be considered.

Source of unsaturated substances Unsaturated substances (Reactive Emissions) Major Stable Products produced following reaction with ozone.

Occupants (exhaled breath, ski oils, personal care products) Isoprene, nitric oxide, squalene, unsaturated sterols, oleic acid and other unsaturated fatty acids, unsaturated oxidation products Methacrolein, methyl vinyl ketone, nitrogen dioxide, acetone, 6MHQ, geranyl acetone, 4OPA, formaldehyde, nonanal, decanal, 9-oxo-nonanoic acid, azelaic acid, nonanoic acid.

Soft woods, wood flooring, including cypress, cedar and silver fir boards, houseplants Isoprene, limonene, alpha-pinene, other terpenes and sesquiterpenes Formaldehyde, 4-AMC, pinoaldehyde, pinic acid, pinonic acid, formic acid, methacrolein, methyl vinyl ketone, SOAs including ultrafine particles

Carpets and carpet backing 4-Phenylcyclohexene, 4-vinylcyclohexene, styrene, 2-ethylhexyl acrylate, unsaturated fatty acids and esters Formaldehyde, acetaldehyde, benzaldehyde, hexanal, nonanal, 2-nonenal

Linoleum and paints/polishes containing linseed oil Linoleic acid, linolenic acid Propanal, hexanal, nonanal, 2-heptenal, 2-nonenal, 2-decanal, 1-pentene-3-one, propionic acid, n-butyric acid

Latex paint Residual monomers Formaldehyde

Certain cleaning products, polishes, waxes, air fresheners Limonene, alpha-pinene, linalool, linalyl acetate, and other terpenoids, longifolene and other sesquiterpenes Formaldehyde, acetaldehyde, glycoaldehyde, formic acid, acetic acid, hydrogen and organic peroxides, acetone, benzaldehyde, 4-hydroxy-4-methyl-5-hexen-1-ol, 5-ethenyl-dihydro-5-methyl-2(3H)-furanone, 4-AMC, SOAs including ultrafine particles

Natural rubber adhesive Isoprene, terpenes Formaldehyde, methacrolein, methyl vinyl ketone

Photocopier toner, printed paper, styrene polymers Styrene Formaldehyde, benzaldehyde

Environmental tobacco smoke Styrene, acrolein, nicotine Formaldehyde, benzaldehyde, hexanal, glyoxal, N-methylformamide, nicotinaldehyde, cotinine

Soiled clothing, fabrics, bedding Squalene, unsaturated sterols, oleic acid and other saturated fatty acids Acetone, geranyl acetone, 6MHO, 4OPA, formaldehyde, nonanal, decanal, 9-oxo-nonanoic acid, azelaic acid, nonanoic acid

Soiled particle filters Unsaturated fatty acids from plant waxes, leaf litter, and other vegetative debris; soot; diesel particles Formaldehyde, nonanal, and other aldehydes; azelaic acid; nonanoic acid; 9-oxo-nonanoic acid and other oxo-acids; compounds with mixed functional groups (=O, -OH, and -COOH)

Ventilation ducts and duct liners Unsaturated fatty acids and esters, unsaturated oils, neoprene C5 to C10 aldehydes

"Urban grime" Polycyclic aromatic hydrocarbons Oxidized polycyclic aromatic hydrocarbons

Perfumes, colognes, essential oils (e.g. lavender, eucalyptus, tea tree) Limonene, alpha-pinene, linalool, linalyl acetate, terpinene-4-ol, gamma-terpinene Formaldehyde, 4-AMC, acetone, 4-hydroxy-4-methyl-5-hexen-1-ol, 5-ethenyl-dihydro-5-methyl-2(3H) furanone, SOAs including ultrafine particles

Overall home emissions Limonene, alpha-pinene, styrene Formaldehyde, 4-AMC, pinonaldehyde, acetone, pinic acid, pinonic acid, formic acid, benzaldehyde, SOAs including ultrafine

particles Abbreviations: 4-AMC, 4-acetyl-1-methylcyclohexene; 6MHQ, 6-methyl-5-heptene-2-one, 4OPA, 4-oxopentanal, SOA,

Secondary Organic Aerosols Reference: Charles J Weschler; Environmental Health Perspectives, Vol 114, October 2006

Persistence and degradability

Ingredient	Persistence: Water/Soil	Persistence: Air
styrene	HIGH (Half-life = 210 days)	LOW (Half-life = 0.3 days)

Bioaccumulative potential

Ingredient	Bioaccumulation

styrene	LOW (BCF = 77)
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**Mobility in soil**

Ingredient	Mobility
styrene	LOW (KOC = 517.8)

SECTION 13 DISPOSAL CONSIDERATIONS**Waste treatment methods**

Product / Packaging disposal	<p>Legislation addressing waste disposal requirements may differ by country, state and/ or territory. Each user must refer to laws operating in their area. In some areas, certain wastes must be tracked.</p> <p>A Hierarchy of Controls seems to be common - the user should investigate:</p> <ul style="list-style-type: none"> ▶ Reduction ▶ Reuse ▶ Recycling ▶ Disposal (if all else fails) <p>This material may be recycled if unused, or if it has not been contaminated so as to make it unsuitable for its intended use. If it has been contaminated, it may be possible to reclaim the product by filtration, distillation or some other means. Shelf life considerations should also be applied in making decisions of this type. Note that properties of a material may change in use, and recycling or reuse may not always be appropriate.</p> <ul style="list-style-type: none"> ▶ DO NOT allow wash water from cleaning or process equipment to enter drains. ▶ It may be necessary to collect all wash water for treatment before disposal. ▶ In all cases disposal to sewer may be subject to local laws and regulations and these should be considered first. ▶ Where in doubt contact the responsible authority. ▶ Recycle wherever possible. ▶ Consult manufacturer for recycling options or consult local or regional waste management authority for disposal if no suitable treatment or dispose facility can be identified. ▶ Dispose of by: burial in a land-fill specifically licensed to accept chemical and / or pharmaceutical wastes or Incineration in a licensed apparatus (after admixture with suitable combustible material). ▶ Decontaminate empty containers. Observe all label safeguards until containers are cleaned and destroyed.
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SECTION 14 TRANSPORT INFORMATION**Labels Required**

	
Marine Pollutant	NO Not Applicable

Land transport (DOT)

UN number	1866
UN proper shipping name	Resin Solution, flammable
Transport hazard class(es)	Class : 3 Subrisk : Not Applicable
Packing group	III
Environmental hazard	Not Applicable
Special precautions for user	Hazard Label : 3 Special provisions : B1, B52, IB3, T2, TP1

Air transport (ICAO-IATA / DGR)

UN number	1866
UN proper shipping name	Resin solution flammable
Transport hazard class(es)	ICAO/IATA Class : 3 ICAO / IATA Subrisk : Not Applicable ERG Code : 3L
Packing group	III
Environmental hazard	Not Applicable
Special precautions for user	Special provisions : A3 Cargo Only Packing Instructions : 366 Cargo Only Maximum Qty / Pack : 220 L Passenger and Cargo Packing Instructions : 355

Passenger and Cargo Maximum Qty / Pack	60 L
Passenger and Cargo Limited Quantity Packing Instructions	Y344
Passenger and Cargo Limited Maximum Qty / Pack	10 L



Sea transport (IMDG-Code / GGVSee)

UN number	1866	
UN proper shipping name	RESIN SOLUTION flammable	
Transport hazard class(es)	IMDG Class	3
	IMDG Subrisk	Not Applicable
Packing group	III	
Environmental hazard	Not Applicable	
Special precautions for user	EMS Number	F-E, S-E
	Special provisions	223 955
	Limited Quantities	5 L

Transport in bulk according to Annex II of MARPOL and the IBC code

Not Applicable

SECTION 15 REGULATORY INFORMATION

Safety, health and environmental regulations / legislation specific for the substance or mixture

STYRENE(100-42-5) IS FOUND ON THE FOLLOWING REGULATORY LISTS

FisherTransport Information	US - Vermont Permissible Exposure Limits Table Z-1-A Final Rule Limits for Air Contaminants US - Vermont Permissible Exposure Limits Table Z-1-A Transitional Limits for Air Contaminants
GESAMP/EHS Composite List - GESAMP Hazard Profiles	
IMO IBC Code Chapter 17: Summary of minimum requirements	
IMO MARPOL (Annex II) - List of Noxious Liquid Substances Carried in Bulk	US - Washington Permissible exposure limits of air contaminants
International Agency for Research on Cancer (IARC) - Agents Classified by the IARC Monographs	US - Washington Toxic air pollutants and their ASIL, SQER and de minimis emission values US - Wyoming Toxic and Hazardous Substances Table Z1 Limits for Air Contaminants
International Air Transport Association (IATA) Dangerous Goods Regulations	US - Wyoming Toxic and Hazardous Substances Table Z-2 Acceptable ceiling concentration, Acceptable maximum peak above the acceptable ceiling concentration for an 8-hr shift
International Air Transport Association (IATA) Dangerous Goods Regulations - Prohibited List Passenger and Cargo Aircraft	US ACGIH Threshold Limit Values (Spanish)
International Maritime Dangerous Goods Requirements (IMDG Code)	US ACGIH Threshold Limit Values (TLV)
Sigma-AldrichTransport Information	US ACGIH Threshold Limit Values (TLV) - Carcinogens
United Nations Recommendations on the Transport of Dangerous Goods Model Regulations (Chinese)	US ATSDR Minimal Risk Levels for Hazardous Substances (MRLs) US Clean Air Act - Hazardous Air Pollutants
United Nations Recommendations on the Transport of Dangerous Goods Model Regulations (English)	US Coast Guard, Department of Homeland Security Part 153: Ships Carrying Bulk Liquid, Liquefied gas or compressed gas hazardous materials. Table 1 to Part 153 --Summary of Minimum Requirements
United Nations Recommendations on the Transport of Dangerous Goods Model Regulations (Spanish)	US CWA (Clean Water Act) - List of Hazardous Substances
US - Alaska Limits for Air Contaminants	US Department of Transportation (DOT) List of Hazardous Substances and Reportable Quantities - Hazardous Substances Other Than Radionuclides
US - California OEHHA/ARB - Acute Reference Exposure Levels and Target Organs (RELs) US - California OEHHA/ARB - Chronic Reference Exposure Levels and Target Organs (CRELs)	US Department of Transportation (DOT), Hazardous Material Table
US - California Permissible Exposure Limits for Chemical Contaminants	US DOE Temporary Emergency Exposure Limits (TEELs)
US - California Proposition 65 - Carcinogens	US EPCRA Section 313 Chemical List
US - California Proposition 65 - No Significant Risk Levels (NSRLs) for Carcinogens US - Hawaii Air Contaminant Limits	US National Toxicology Program (NTP) 14th Report Part B. Reasonably Anticipated to be a Human Carcinogen
US - Idaho - Acceptable Maximum Peak Concentrations US - Idaho - Limits for Air Contaminants	US NFPA 497 Classification of Class I Combustible Materials
US - Idaho Toxic Air Pollutants Non- Carcinogenic Increments - Occupational Exposure Limits US - Massachusetts - Right To Know Listed Chemicals	US NIOSH Recommended Exposure Limits (RELs)
US - Michigan Exposure Limits for Air Contaminants	US NIOSH Recommended Exposure Limits (RELs) (Spanish)
US - Minnesota Permissible Exposure Limits (PELs)	US Office of Environmental Health Hazard Assessment Proposition 65 No Significant Risk Levels (NSRLs) for Carcinogens and Maximum Allowable Dose Levels (MADLs) for Chemicals Causing Reproductive Toxicity
US - New Jersey Right to Know - Special Health Hazard Substance List (SHHSL): Carcinogens	US OSHA Permissible Exposure Levels (PELs) - Table Z1
US - Oregon Permissible Exposure Limits (Z-1)	US OSHA Permissible Exposure Levels (PELs) - Table Z2
US - Oregon Permissible Exposure Limits (Z-2)	US OSHA Permissible Exposure Limits - Annotated Table Z-1 (Spanish)
US - Pennsylvania - Hazardous Substance List	US OSHA Permissible Exposure Limits - Annotated Table Z-2 (Spanish)
US - Rhode Island Hazardous Substance List	US Postal Service (USPS) Hazardous Materials Table: Postal Service Mailability Guide
US - Tennessee Occupational Exposure Limits - Limits For Air Contaminants	US Postal Service (USPS) Numerical Listing of Proper Shipping Names by Identification (ID) Number
	US Technical Guide 230 - Air Military Exposure Guidelines
	US Toxic Substances Control Act (TSCA) - Chemical Substance Inventory US
	TSCA Chemical Substance Inventory - Interim List of Active Substances

UNSATURATED POLYESTER RESIN(64386-67-0*) IS FOUND ON THE FOLLOWING REGULATORY LISTS

US List of Active Substances Exempt from the TSCA Inventory Notifications (Active-Inactive) Rule	US Toxic Substances Control Act (TSCA) - Chemical Substance Inventory
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Federal Regulations

Superfund Amendments and Reauthorization Act of 1986 (SARA)

SECTION 311/312 HAZARD CATEGORIES

Flammable (Gases, Aerosols, Liquids, or Solids)	Yes
Gas under pressure	No
Explosive	No
Self-heating	No
Pyrophoric (Liquid or Solid)	No
Pyrophoric Gas	No
Corrosive to metal	No
Oxidizer (Liquid, Solid or Gas)	No
Organic Peroxide	No
Self-reactive	No
In contact with water emits flammable gas	No
Combustible Dust	No
Carcinogenicity	No
Acute toxicity (any route of exposure)	No
Reproductive toxicity	No
Skin Corrosion or Irritation	Yes
Respiratory or Skin Sensitization	No
Serious eye damage or eye irritation	Yes
Specific target organ toxicity (single or repeated exposure)	Yes
Aspiration Hazard	No
Germ cell mutagenicity	No
Simple Asphyxiant	No

**US. EPA CERCLA HAZARDOUS SUBSTANCES AND REPORTABLE QUANTITIES (40 CFR 302.4)**

Name	Reportable Quantity in Pounds (lb)	Reportable Quantity in kg
Styrene	1000	454

State Regulations**US. CALIFORNIA PROPOSITION 65**

WARNING: This product contains a chemical known to the State of California to cause cancer and birth defects or other reproductive harm

US - CALIFORNIA PROPOSITION 65 - CARCINOGENS: LISTED SUBSTANCE

Styrene Listed

National Inventory Status

National Inventory	Status
Australia - AICS	Yes
Canada - DSL	Yes
Canada - NDLS	No (styrene; unsaturated polyester resin)
China - IECSC	Yes
Europe - EINEC / ELINCS / NLP	No (unsaturated polyester resin)
Japan - ENCS	No (unsaturated polyester resin)
Korea - KECI	Yes
New Zealand - NZIoC	Yes
Philippines - PICCS	No (unsaturated polyester resin)
USA - TSCA	Yes
Legend:	Yes = All ingredients are on the inventory No = Not determined or one or more ingredients are not on the inventory and are not exempt from listing(see specific ingredients in brackets)

SECTION 16 OTHER INFORMATION

Revision Date	01/23/2019
Initial Date	04/23/2018

Other information

Classification of the preparation and its individual components has drawn on official and authoritative sources as well as independent review by the Chemwatch Classification committee using available literature references.

The SDS is a Hazard Communication tool and should be used to assist in the Risk Assessment. Many factors determine whether the reported Hazards are Risks in the workplace or other settings. Risks may be determined by reference to Exposures Scenarios. Scale of use, frequency of use and current or available engineering controls must be considered.

Definitions and abbreviations

PC—TWA: Permissible Concentration-Time Weighted Average

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PC—STEL: Permissible Concentration-Short Term Exposure
Limit IARC: International Agency for Research on Cancer
ACGIH: American Conference of Governmental Industrial
Hygienists STEL: Short Term Exposure Limit
TEEL: Temporary Emergency Exposure Limit,
IDLH: Immediately Dangerous to Life or Health
Concentrations OSF: Odour Safety Factor
NOAEL :No Observed Adverse Effect
Level LOAEL: Lowest Observed Adverse
Effect Level TLV: Threshold Limit Value
LOD: Limit Of Detection
OTV: Odour Threshold Value
BCF: BioConcentration Factors
BEI: Biological Exposure Index

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