



NEHAP MALAYSIA

QUICK REFERENCE DATABASE OF TOXIC CHEMICALS

Prepared by:

Environmental Health Expert Advisory Committee
(A Committee under National Environmental Health Action Plan – NEHAP Malaysia)

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QUICK REFERENCE DATABASE OF TOXIC CHEMICALS

1.0 Introduction

This guideline provides quick reference to decision maker in dealing with chemical disaster with acute exposure.

Additional information in term of the Acute Exposure Level Guidelines (AELGs) are added to the tables of each chemical obtained from the document prepared by an international group of experts on behalf of International Labour Organization (ILO) and World Health Organization (WHO). The table originally has information on the characteristics of the chemicals including the safety, acute exposures, acute hazard and symptoms. In addition, the preventive measures, first aid, spillage exposure, classification and labelling.

The most important are the exposure and the acute health effects in occupational as well as in the ambient environment in case of any disaster in workplace or chemical spill in communities where hazardous waste were disposed illegally. In the case of the disaster in Pasir Gudang, the list of chemicals which were monitored and found in the environment were compiled in this Quick Reference database.

The AELG values are important as a reference to exposure mitigation such as closing schools, relocation or medical treatment to the victims.

2.0 Overview of Acute Exposure Level Guidelines (AELG)

Acute Exposure Level Guidelines (AELGs) are used by emergency planners and responders worldwide as guidance in dealing with rare, usually accidental, releases of chemicals into the air. AELGs are expressed as specific concentrations of airborne chemicals at which health effects may occur.

AELG values represent threshold levels for the general public. As mentioned, that includes susceptible subpopulations, such as infants, children, the elderly, persons with asthma, and those with other illnesses. They are designed to protect the elderly and children, and other individuals who may be susceptible.

2.1 AELGs assigned 1, 2 or 3 according to severity of effects

AELGs are calculated for five relatively short exposure periods – 10 minutes, 30 minutes, 1 hour, 4 hours, and 8 hours – as differentiated from air standards based on longer or repeated exposures. AELG “levels” are dictated by the severity of the toxic effects caused by the exposure, with Level 1 being the least and Level 3 being the most severe.

All levels are expressed as parts per million or milligrams per cubic meter (ppm or mg/m³) of a substance above which it is predicted that the general population could experience, including susceptible individuals:

2.1.1 Below AEGL Level 1

Airborne concentrations below the AEGL-1 represent exposure levels that could produce mild and progressively increasing but transient and non-disabling odour, taste, and sensory irritation or certain asymptomatic, non-sensory effects. With increasing airborne concentrations above each AEGL, there is a progressive increase in the likelihood of occurrence and the severity of effects described for each corresponding AEGL.

2.1.2 Level 1

Notable discomfort, irritation, or certain asymptomatic non-sensory effects. However, the effects are not disabling and are transient and reversible upon cessation of exposure.

2.1.3 Level 2

Irreversible or other serious, long-lasting adverse health effects or an impaired ability to escape.

2.1.4 Level 3

Life-threatening health effects or death.

3.0 List of Chemicals

For the initial stage, the chemicals that will be documented are referring to chemicals that have been found during chemical pollution incidents in Sg. Kim-Kim and during the Ops. Mawar, both in Pasir Gudang.

Those chemicals are:

1. Acrolein
2. Acrylonitrile
3. Benzene
4. Ethylbenzene
5. Hydrogen Chloride
6. Limonene
7. Methyl Mercaptan
8. Methane
9. Toluene
10. Xylene

The Reference Database of those chemicals are listed in Appendix.

References

1. AEGL : <https://www.epa.gov/aeql/access-acute-exposure-guideline-levels-aeqls-values#chemicals>
2. ICSC: https://www.ilo.org/dyn/icsc/showcard.listCards3?p_lang=en
3. ATSDR : <https://www.atsdr.cdc.gov/PHS/Index.asp>

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APPENDIX

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ACROLEIN

PRODUCT NAME: ACROLEIN			
Synonyms: 2-Propenal Acrylic aldehyde 2-Propen-1-al		CAS #: 107-02-8 UN #: 1092 EC Number: 203-453-4	
	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Highly flammable. Vapour /air mixtures are explosive. Risk of fire and explosion on contact with bases, acids or strong oxidizing agents.	NO open flames, NO sparks and NO smoking. Closed system, ventilation, explosion-proof electrical equipment and lighting. Use non-sparking handtools.	Use alcohol-resistant foam. Use powder. Use carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water. Combat fire from a sheltered position.
STRICT HYGIENE! IN ALL CASES CONSULT A DOCTOR!			
	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Burning sensation. Cough. Laboured breathing. Shortness of breath. Sore throat. Nausea. Symptoms may be delayed. See Notes.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Half-upright position. Refer for medical attention.
Skin	Redness. Pain. Blisters. Skin burns.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse skin with plenty of water or shower. Refer for medical attention.
Eyes	Redness. Pain. Severe deep burns.	Wear face shield or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Burning sensation in the throat and chest. Convulsions. Nausea.	Do not eat, drink, or smoke during work. Wash hands before eating.	Rinse mouth. Do NOT induce vomiting. Refer for medical attention.
SPILLAGE DISPOSAL			
Evacuate danger area! Consult an expert! Personal protection: chemical protection suit including self-contained breathing apparatus. Remove all ignition sources. Do NOT let this chemical enter the environment. Collect leaking and spilled liquid in covered containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.			
STORAGE			
Fireproof. Separated from strong oxidants, strong bases, strong acids and food and feedstuffs. Cool. Ventilation along the floor. Store only if stabilized.			
PACKAGING			
Unbreakable packaging. Put breakable packaging into closed unbreakable container. Do not transport with food and feedstuffs. Marine pollutant.			
CLASSIFICATION & LABELLING			
According to UN GHS Criteria Transportation UN Classification UN Hazard Class: 6.1; UN Subsidiary Risks: 3; UN Pack Group: I			

PRODUCT NAME: ACROLEIN					
PHYSICAL & CHEMICAL INFORMATION					
Physical State; Appearance Yellow to colourless liquid with pungent odour.					
Physical dangers The vapour is heavier than air and may travel along the ground; distant ignition possible.					
Chemical dangers The substance can form explosive peroxides. The substance may polymerize. This generates fire or explosion hazard. Decomposes on heating. Upon heating, toxic fumes are formed. This produces toxic fumes. Reacts with strong acids, strong bases and strong oxidants. This generates fire and explosion hazard.					
Formula: CH ₂ =CHCHO Molecular mass: 56.06 Boiling point: 53°C Melting point: -88°C Relative density (water = 1): 0.8 Solubility in water, g/100ml at 20°C: 20 Vapour pressure, kPa at 20°C: 29 Relative vapour density (air = 1): 1.9 Relative density of the vapour/air-mixture at 20°C (air = 1): 1.2 Flash point: -26°C c.c. Auto-ignition temperature: 234°C Explosive limits, vol% in air: 2.8-31 Octanol/water partition coefficient as log Pow: 0.9					
EXPOSURE & HEALTH EFFECTS					
Routes of exposure The substance can be absorbed into the body by inhalation of its vapour, through the skin and by ingestion.					
Effects of short-term exposure Lachrymation. The substance is severely irritating to the eyes, skin and respiratory tract. Inhalation of high concentrations may cause lung oedema. See Notes. The effects may be delayed. Medical observation is indicated					
Inhalation risk A harmful contamination of the air can be reached very quickly on evaporation of this substance at 20°C.					
Effects of long-term or repeated exposure -					
OCCUPATIONAL EXPOSURE LIMITS					
TLV: 0.1 ppm as TWA; (ceiling value): (skin); A4 (not classifiable as a human carcinogen). MAK: carcinogen category: 3B. EU-OEL: 0.05 mg/m ³ , 0.02 ppm as TWA; 0.12 mg/m ³ , 0.05 ppm as STEL					
ENVIRONMENT					
The substance is very toxic to aquatic organisms.					
Acrolein Results - AEGL Program					
	10 min	30 min	60 min	4 hr	8 hr
	ppm				
AEGL 1	0.030	0.030	0.030	0.030	0.030
AEGL 2	0.44	0.18	0.10	0.10	0.10
AEGL 3	6.2	2.5	1.4	0.48	0.27
NOTES					
<ul style="list-style-type: none"> - The symptoms of lung oedema often do not become manifest until a few hours have passed and they are aggravated by physical effort. - Rest and medical observation are therefore essential. - Immediate administration of an appropriate inhalation therapy by a doctor, or by an authorized person, should be considered. - An added stabilizer or inhibitor can influence the toxicological properties of this substance, consult an expert. The odour warning when the exposure limit value is exceeded is insufficient. - The occupational exposure limit value should not be exceeded during any part of the working exposure. Check for peroxides prior to distillation; render harmless if positive. 					
ADDITIONAL INFORMATION					
EC Classification					
Symbol: F, T+, N; R: 11-24/25-26-34-50; S: 23-26-28-36/37/39-45-61; Note: D					
Reference	<ol style="list-style-type: none"> 1. https://www.ilo.org/dyn/icsc/showcard.display?p_lang=en&p_card_id=0090&p_version=2 2. https://www.epa.gov/aeql/access-acute-exposure-guideline-levels-aeqls-values 				

ACRYLONITRILE

PRODUCT NAME: ACRYLONITRILE			
Synonyms: Cyanoethylene 2-Propenenitrile Vinyl cyanide		CAS #: 107-13-1 UN #: 1093 EC Number: 203-466-5	
	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Highly flammable. Gives off irritating or toxic fumes (or gases) in a fire. Vapour/air mixtures are explosive. Risk of fire and explosion on contact with strong bases or strong acids.	NO open flames, NO sparks and NO smoking. NO contact with strong bases or strong acids. Closed system, ventilation, explosion-proof electrical equipment and lighting. Use non-sparking handtools.	Use water spray, powder, alcohol-resistant foam, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water.
AVOID ALL CONTACT! IN ALL CASES CONSULT A DOCTOR!			
	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Dizziness. Headache. Nausea. Shortness of breath. Vomiting. Weakness. Convulsions. Chest tightness.	Use closed system or ventilation.	Fresh air, rest. Refer for medical attention. See Notes
Skin	MAY BE ABSORBED! Redness. Pain. Blisters. Further see Inhalation.	Protective gloves. Protective clothing.	First rinse with plenty of water for at least 15 minutes, then remove contaminated clothes and rinse again. Refer for medical attention.
Eyes	Redness. Pain.	Wear safety goggles or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Abdominal pain. Vomiting. Further see Inhalation.	Do not eat, drink, or smoke during work. Wash hands before eating.	Rinse mouth. Give a slurry of activated charcoal in water to drink. Induce vomiting (ONLY IN CONSCIOUS PERSONS!). Refer for medical attention.
SPILLAGE DISPOSAL			
Evacuate danger area! Consult an expert! Personal protection: chemical protection suit including self-contained breathing apparatus. Ventilation. Do NOT wash away into sewer. Do NOT let this chemical enter the environment. Collect leaking and spilled liquid in covered containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.			
STORAGE			
Fireproof. Separated from strong oxidants, strong bases and food and feedstuffs. Cool. Keep in the dark. Ventilation along the floor. Store only if stabilized.			
PACKAGING			
Unbreakable packaging. Put breakable packaging into closed unbreakable container. Do not transport with food and feedstuffs.			
CLASSIFICATION & LABELLING			
According to UN GHS Criteria Transportation UN Classification UN Hazard Class: 3; UN Subsidiary Risks: 6.1; UN Pack Group: I			

PRODUCT NAME: ACRYLONITRILE					
PHYSICAL & CHEMICAL INFORMATION					
Physical State; Appearance Colourless or pale yellow liquid with pungent odour.					
Physical dangers The vapour is heavier than air and may travel along the ground; distant ignition possible.					
Chemical dangers The substance polymerizes due to heating and under the influence of light and bases. This generates fire or explosion hazard. Decomposes on heating. This produces toxic fumes including hydrogen cyanide and nitrogen oxides. Reacts violently with strong acids and strong oxidants. Attacks plastics and rubber.					
Formula: C ₃ H ₃ N / CH ₂ =CH-CN Molecular mass: 53.1 Boiling point: 77°C Melting point: -84°C Relative density (water = 1): 0.8 Solubility in water, g/100ml at 20°C: 7 Vapour pressure, kPa at 20°C: 11.0 Relative vapour density (air = 1): 1.8 Relative density of the vapour/air-mixture at 20°C (air = 1): 1.05 Flash point: -1°C c.c. Auto-ignition temperature: 481°C Explosive limits, vol% in air: 3.0-17.0 Octanol/water partition coefficient as log Pow: 0.25					
EXPOSURE & HEALTH EFFECTS					
Routes of exposure The substance can be absorbed into the body by inhalation of its vapour, through the skin and by ingestion.					
Effects of short-term exposure The substance and the vapour are irritating to the eyes, skin and respiratory tract. The substance may cause effects on the central nervous system. Exposure far above the OEL could cause death. The effects may be delayed. See Notes. Medical observation is indicated					
Inhalation risk A harmful contamination of the air can be reached very quickly on evaporation of this substance at 20°C.					
Effects of long-term or repeated exposure Repeated or prolonged contact may cause skin sensitization. The substance may have effects on the central nervous system and liver. This substance is possibly carcinogenic to humans.					
OCCUPATIONAL EXPOSURE LIMITS					
TLV: 2 ppm as TWA; (skin); A3 (confirmed animal carcinogen with unknown relevance to humans). MAK: carcinogen category: 2; sensitization of skin (SH); skin absorption (H)					
ENVIRONMENT					
The substance is harmful to aquatic organisms.					
Acetonitrile Results - AEGL Program					
	10 min	30 min	60 min	4 hr	8 hr
	ppm				
AEGL 1	13	13	13	13	NR
AEGL 2	80	80	50	21	14
AEGL 3	240	240	150	64	42
NR = Not recommended due to insufficient data					
NOTES					
<ul style="list-style-type: none"> - Depending on the degree of exposure, periodic medical examination is suggested. - Exposure to the substance will result in cyanide formation. - See ICSC 0671. - Specific treatment is necessary in case of poisoning with this substance; the appropriate means with instructions must be available. - The odour warning when the exposure limit value is exceeded is insufficient. - Rinse contaminated clothing with plenty of water because of fire hazard. 					
ADDITIONAL INFORMATION					
EC Classification Symbol: F, T, N; R: 45-11-23/24/25-37/38-41-43-51/53; S: 9-16-53-45-61; Note: D, E					
Reference	<ol style="list-style-type: none"> 1. https://www.ilo.org/dyn/icsc/showcard.display?p_lang=en&p_card_id=0092&p_version=2 2. https://www.epa.gov/aeql/access-acute-exposure-guideline-levels-aeqls-values 				

BENZENE

PRODUCT NAME: BENZENE			
Synonyms: Cyclohexatriene Benzol		CAS #: 71-43-2 UN #: 1114 EC Number: 200-753-7	
	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Highly flammable. Vapour/ air mixtures are explosive. Risk of fire and explosion. See Chemical Dangers.	NO open flames, NO sparks and NO smoking. Closed system, ventilation, explosion-proof electrical equipment and lighting. Do NOT use compressed air for filling, discharging, or handling. Use non-sparking handtools. Prevent build-up of electrostatic charges (e.g., by grounding).	Use foam, water spray, carbon dioxide, powder. In case of fire: keep drums, etc., cool by spraying with water.
AVOID ALL CONTACT! IN ALL CASES CONSULT A DOCTOR!			
	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Dizziness. Drowsiness. Headache. Nausea. Shortness of breath. Convulsions. Unconsciousness.	Use ventilation, local exhaust or breathing protection	Fresh air, rest. Refer for medical attention.
Skin	MAY BE ABSORBED! Dry skin. Redness. Pain. Further see Inhalation.	Protective gloves. Protective clothing	Remove contaminated clothes. Rinse skin with plenty of water or shower. Refer for medical attention.
Eyes	Redness. Pain.	Wear face shield or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Abdominal pain. Sore throat. Vomiting. Further see Inhalation.	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Refer for medical attention.
SPILLAGE DISPOSAL			
Remove all ignition sources. Evacuate danger area! Consult an expert! Personal protection: complete protective clothing including self-contained breathing apparatus. Do NOT wash away into sewer. Do NOT let this chemical enter the environment. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.			
STORAGE			
Fireproof. Separated from food and feedstuffs, oxidants and halogens. Store in an area without drain or sewer access.			
PACKAGING			
Do not transport with food and feedstuffs.			
CLASSIFICATION & LABELLING			
According to UN GHS Criteria  DANGER		Highly flammable liquid and vapour May be fatal if swallowed and enters airways Causes skin irritation Causes serious eye irritation May cause genetic defects May cause cancer Causes damage to the bone marrow and the central nervous system through prolonged or repeated exposure Harmful to aquatic life with long lasting effects Transportation UN Classification UN Hazard Class: 3; UN Pack Group: II	

PRODUCT NAME: BENZENE					
PHYSICAL & CHEMICAL INFORMATION					
Physical State; Appearance Colourless liquid with characteristic odour.					
Physical dangers The vapour is heavier than air and may travel along the ground; distant ignition possible. As a result of flow, agitation, etc., electrostatic charges can be generated.					
Chemical dangers Reacts violently with oxidants, nitric acid, sulfuric acid and halogens. This generates fire and explosion hazard. Attacks plastics and rubber.					
Formula: C ₆ H ₆ Molecular mass: 78.1 Boiling point: 80°C Melting point: 6°C Relative density (water = 1): 0.88 Solubility in water, g/100ml at 25°C: 0.18 Vapour pressure, kPa at 20°C: 10			Relative vapour density (air = 1): 2.7 Relative density of the vapour/air-mixture at 20°C (air = 1): 1.2 Flash point: -11°C c.c. Auto-ignition temperature: 498°C Explosive limits, vol% in air: 1.2-8.0 Octanol/water partition coefficient as log Pow: 2.13		
EXPOSURE & HEALTH EFFECTS					
Routes of exposure The substance can be absorbed into the body by inhalation, through the skin and by ingestion.					
Effects of short-term exposure The substance defats the skin, which may cause dryness or cracking. The substance may have effects on the central nervous system and immune system. The substance may have effects on the bone marrow. This may result in anaemia. This substance is carcinogenic to humans. May cause heritable genetic damage to human germ cells. See Notes					
Inhalation risk A harmful contamination of the air can be reached very quickly on evaporation of this substance at 20°C.					
Effects of long-term or repeated exposure The substance defats the skin, which may cause dryness or cracking. The substance may have effects on the central nervous system and immune system. The substance may have effects on the bone marrow. This may result in anaemia. This substance is carcinogenic to humans. May cause heritable genetic damage to human germ cells. See Notes.					
OCCUPATIONAL EXPOSURE LIMITS					
TLV: 0.5 ppm as TWA; 2.5 ppm as STEL; (skin); A1 (confirmed human carcinogen); BEI issued. EU-OEL: 3.25 mg/m ³ , 1 ppm as TWA; (skin). MAK: carcinogen category: 1; germ cell mutagen group: 3A; skin absorption (H)					
ENVIRONMENT					
The substance is toxic to aquatic organisms. The substance may cause long-term effects in the aquatic environment.					
Benzene Results - AEGL Program					
	10 min	30 min	60 min	4 hr	8 hr
	ppm (12/12/06)				
AEGL 1	130	73	52	18	9.0
AEGL 2	2,000*	1,100	800	400	200
AEGL 3	**	5,600*	4,000*	2,000*	990
Lower Explosive Limit (LEL) = 14,000 ppm * = >10% LEL; ** = >50% LEL AEGL 3 - 10 mins = ** 9,700 ppm For values denoted as * safety considerations against the hazard(s) of explosion(s) must be taken into account. For values denoted as ** extreme safety considerations against the hazard(s) of explosion(s) must be taken into account.					
NOTES					
<ul style="list-style-type: none"> - Use of alcoholic beverages enhances the harmful effect. - Depending on the degree of exposure, periodic medical examination is suggested. - The odour warning when the exposure limit value is exceeded is insufficient. - Benzene causes acute myeloid leukaemia/acute non-lymphocytic leukaemia. Also, a positive association has been observed between exposure to benzene and acute lymphocytic leukaemia, chronic lymphocytic leukaemia, multiple myeloma, and non-Hodgkin lymphoma. 					
ADDITIONAL INFORMATION					
EC Classification Symbol: F, T; R: 45-46-11-36/38-48/23/24/25-65; S: 53-45; Note: E					
Reference	<ol style="list-style-type: none"> 1. https://www.ilo.org/dyn/icsc/showcard.display?p_lang=en&p_card_id=0015&p_version=2 2. https://www.epa.gov/aeql/access-acute-exposure-guideline-levels-aeqls-values 				

ETHYLBENZENE

PRODUCT NAME: ETHYLBENZENE			
Synonyms: Ethylbenzol Phenylethane EB		CAS #: 100-41-4 UN #: 1175 EC Number: 202-849-4	
	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Highly flammable. Vapour/air mixtures are explosive.	NO open flames, NO sparks and NO smoking. Closed system, ventilation, explosion-proof electrical equipment and lighting. Do NOT use compressed air for filling, discharging, or handling.	Use dry powder, foam, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water.
PREVENT GENERATION OF MISTS!			
	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Sore throat. Dizziness. Drowsiness. Headache.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin	Redness.	Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes	Redness. Pain.	Wear safety goggles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Burning sensation in the throat and chest. Further see Inhalation.	Do not eat, drink, or smoke during work.	Rinse mouth. DO NOT induce vomiting. Refer for medical attention
SPILLAGE DISPOSAL			
Personal protection: filter respirator for organic gases and vapours adapted to the airborne concentration of the substance. Ventilation. Do NOT let this chemical enter the environment. Do NOT wash away into sewer. Collect leaking and spilled liquid in covered containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.			
STORAGE			
Fireproof. Separated from strong oxidants. Provision to contain effluent from fire extinguishing. Store in an area without drain or sewer access.			
PACKAGING			
CLASSIFICATION & LABELLING			
According to UN GHS Criteria  DANGER		Highly flammable liquid and vapour Harmful if inhaled May be harmful if swallowed Causes mild skin irritation Causes eye irritation Suspected of causing cancer May cause respiratory irritation May cause drowsiness and dizziness May be harmful if swallowed and enters airways Toxic to aquatic life Transportation UN Classification UN Hazard Class: 3; UN Pack Group: II	

PRODUCT NAME: ETHYLBENZENE					
PHYSICAL & CHEMICAL INFORMATION					
Physical State; Appearance Colourless liquid with aromatic odour.					
Physical dangers The vapour mixes well with air, explosive mixtures are easily formed.					
Chemical dangers Reacts with strong oxidants. Attacks plastics and rubber.					
Formula: C ₈ H ₁₀ /C ₆ H ₅ C ₂ H ₅ Molecular mass: 106.2 Boiling point: 136°C Melting point: -95°C Relative density (water = 1): 0.9 Solubility in water, g/100ml at 20°C: 0.015 Vapour pressure, kPa at 20°C: 0.9 Relative vapour density (air = 1): 3.7 Relative density of the vapour/air-mixture at 20°C (air = 1): 1.02 Flash point: 18°C c.c. Auto-ignition temperature: 432°C Explosive limits, vol% in air: 1.0-6.7 Octanol/water partition coefficient as log Pow: 3.1 Viscosity: 0.6 mm ² /s at 25°C					
EXPOSURE & HEALTH EFFECTS					
Routes of exposure The substance can be absorbed into the body by inhalation of its vapour and by ingestion.					
Effects of short-term exposure The substance is irritating to the eyes, skin and respiratory tract. If this liquid is swallowed, aspiration into the lungs may result in chemical pneumonitis. The substance may cause effects on the central nervous system. Exposure above the OEL could cause lowering of consciousness.					
Inhalation risk A harmful contamination of the air will be reached rather slowly on evaporation of this substance at 20°C.					
Effects of long-term or repeated exposure This substance is possibly carcinogenic to humans. The substance may have effects on the kidneys and liver. This may result in impaired functions.					
OCCUPATIONAL EXPOSURE LIMITS					
TLV: 20 ppm as TWA; A3 (confirmed animal carcinogen with unknown relevance to humans); BEI issued. MAK: 88 mg/m ³ , 20 ppm; peak limitation category: II(2); skin absorption (H); carcinogen category: 4; pregnancy risk group: C. EU-OEL: 442 mg/m ³ , 100 ppm as TWA; 884 mg/m ³ , 200 ppm as STEL; (skin)					
ENVIRONMENT					
The substance is toxic to aquatic organisms. It is strongly advised not to let the chemical enter into the environment.					
Ethylbenzene Results - AEGL Program					
	10 min	30 min	60 min	4 hr	8 hr
	ppm (9/21/09)				
AEGL 1	33	33	33	33	33
AEGL 2	2900	1600	1100	660	580
AEGL 3	4700	2600	1800	1000	910
NOTES					
- The odour warning when the exposure limit value is exceeded is insufficient.					
ADDITIONAL INFORMATION					
EC Classification					
Symbol: F, Xn; R: 11-20; S: (2)-16-24/25-29					
Reference	1. https://www.ilo.org/dyn/icsc/showcard.display?p_lang=en&p_card_id=0268&p_version=2 2. https://www.epa.gov/aeql/access-acute-exposure-guideline-levels-aeqls-values				

HYDROGEN CHLORIDE

PRODUCT NAME: HYDROGEN CHLORIDE			
Synonyms: Anhydrous hydrogen chloride Hydrochloric acid, anhydrous		CAS #: 7647-01-0 UN #: 1050 EC Number: 231-595-7	
FIRE & EXPLOSION	ACUTE HAZARDS Not combustible.	PREVENTION -	FIRE FIGHTING In case of fire in the surroundings, use appropriate extinguishing media. In case of fire: keep cylinder cool by spraying with water. Combat fire from a sheltered position.
AVOID ALL CONTACT! IN ALL CASES CONSULT A DOCTOR!			
	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Sore throat. Burning sensation. Shortness of breath. Laboured breathing.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Half-upright position. Artificial respiration may be needed. Refer immediately for medical attention.
Skin	Redness. Pain. Serious skin burns. On contact with liquid: frostbite.	Cold-insulating gloves. Protective clothing.	Wear protective gloves when administering first aid. First rinse with plenty of water for at least 15 minutes, then remove contaminated clothes and rinse again. Refer immediately for medical attention.
Eyes	Redness. Pain. Blurred vision. Severe burns. On contact with liquid: frostbite.	Wear face shield or eye protection in combination with breathing protection.	Rinse with plenty of water for several minutes (remove contact lenses if easily possible). Refer immediately for medical attention.
Ingestion	-	-	-
SPILLAGE DISPOSAL			
Evacuate danger area! Consult an expert! Personal protection: gas-tight chemical protection suit including self-contained breathing apparatus. Ventilation. Remove gas with fine water spray.			
STORAGE			
Cool. Fireproof if in building. Separated from food and feedstuffs and incompatible materials. See Chemical Dangers. Keep in a well-ventilated room			
PACKAGING			
-			
CLASSIFICATION & LABELLING			
According to UN GHS Criteria <div style="display: flex; justify-content: center; align-items: center;"> </div> <p style="text-align: center; margin-top: 5px;">DANGER</p>		Contains gas under pressure; may explode if heated Toxic if inhaled Causes severe skin burns and eye damage May cause respiratory irritation See Notes Transportation UN Classification UN Hazard Class: 2.3; UN Subsidiary Risks: 8	

PRODUCT NAME: HYDROGEN CHLORIDE					
PHYSICAL & CHEMICAL INFORMATION					
Physical State; Appearance Colourless compressed liquefied gas with pungent odour.					
Physical dangers The gas is heavier than air and may accumulate in lowered spaces causing a deficiency of oxygen.					
Chemical dangers The solution in water is a strong acid. It reacts violently with bases and is corrosive. Reacts violently with oxidants. This produces toxic gas (chlorine - see ICSC 0126). Attacks many metals in the presence of water. This produces flammable/explosive gas (hydrogen - see ICSC 0001).					
Formula: HCl Molecular mass: 36.5 Boiling point: -85.1°C Melting point: -114.2°C Density (gas): 1.00045 g/l Solubility in water, g/100ml at 30°C: 67 (moderate) Relative vapour density (air = 1): 1.3 Octanol/water partition coefficient as log Pow: 0.25					
EXPOSURE & HEALTH EFFECTS					
Routes of exposure Serious local effects by all routes of exposure. The substance can be absorbed into the body by inhalation.					
Effects of short-term exposure Rapid evaporation of the liquid may cause frostbite. The substance is corrosive to the eyes, skin and respiratory tract. Inhalation of this gas may cause asthma-like reactions (RADS). Exposure could cause asphyxiation due to swelling in the throat. Inhalation of high concentrations may cause lung oedema, but only after initial corrosive effects on the eyes and the upper respiratory tract have become manifest. Inhalation of high concentrations may cause pneumonitis. See Notes.					
Inhalation risk A harmful concentration of this gas in the air will be reached very quickly on loss of containment.					
Effects of long-term or repeated exposure Repeated or prolonged inhalation may cause effects on the teeth. This may result in tooth erosion. The substance may have effects on the upper respiratory tract and lungs. This may result in chronic inflammation of the respiratory tract and reduced lung function. Mists of this strong inorganic acid are carcinogenic to humans. See Notes					
OCCUPATIONAL EXPOSURE LIMITS					
TLV: 2 ppm as STEL; A4 (not classifiable as a human carcinogen). MAK: 3.0 mg/m ³ , 2 ppm; peak limitation category: I(2); pregnancy risk group: C. EU-OEL: 8 mg/m ³ , 5 ppm as TWA; 15 mg/m ³ , 10 ppm as STEL					
ENVIRONMENT					
The substance is harmful to aquatic organisms.					
Hydrogen Chloride Results - AEGL Program					
	10 min	30 min	60 min	4 hr	8 hr
	ppm				
AEGL 1	1.8	1.8	1.8	1.8	1.8
AEGL 2	100	43	22	11	11
AEGL 3	620	210	100	26	26
NOTES					
<ul style="list-style-type: none"> - The occupational exposure limit value should not be exceeded during any part of the working exposure. - The symptoms of lung oedema often do not become manifest until a few hours have passed and they are aggravated by physical effort. Rest and medical observation are therefore essential. - IARC considers mists of strong inorganic acid to be carcinogenic (group 1). However there is no information available on the carcinogenicity of other physical forms of this substance. Therefore no classification for carcinogenicity under GHS has been applied. - Turn leaking cylinder with the leak up to prevent escape of gas in liquid state. - Other UN number(s) 2186 (refrigerated liquid) hazard class: 2.3; subsidiary hazard: 8; 1789 (hydrochloric acid) hazard class: 8, pack group II or III. - Aqueous solutions may contain up to 38% hydrogen chloride. 					
ADDITIONAL INFORMATION					
EC Classification Symbol: T, C; R: 23-35; S: (1/2)-9-26-36/37/39-45					
Reference	<ol style="list-style-type: none"> 1. https://www.ilo.org/dyn/icsc/showcard.display?p_lang=en&p_card_id=0163&p_version=2 2. https://www.epa.gov/aeql/access-acute-exposure-guideline-levels-aeqls-values 				

LIMONENE

PRODUCT NAME: LIMONENE			
Synonyms: Carvene (R)-4-Isopropenyl-1-methylcyclohexene (+)-Limonene		CAS #: 5989-27-5 UN #: see Notes EC Number: 227-813-5	
	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Flammable. Above 48°C explosive vapour/air mixtures may be formed.	NO open flames, NO sparks and NO smoking. Above 48°C use a closed system, ventilation and explosion- proof electrical equipment.	Use water spray, powder, alcohol- resistant foam, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water.
STRICT HYGIENE!			
	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	-	Use ventilation.	Fresh air, rest
Skin	Redness. Pain.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes	Redness.	Wear safety spectacles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	-	Do not eat, drink, or smoke during work.	Rinse mouth.
SPILLAGE DISPOSAL			
Personal protection: particulate filter respirator adapted to the airborne concentration of the substance. Do NOT let this chemical enter the environment. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.			
STORAGE			
Fireproof. Separated from strong oxidants. Store in an area without drain or sewer access.			
PACKAGING			
-			
CLASSIFICATION & LABELLING			
According to UN GHS Criteria Transportation UN Classification			

PRODUCT NAME: LIMONENE	
PHYSICAL & CHEMICAL INFORMATION	
Physical State; Appearance Colourless liquid with characteristic odour.	
Physical dangers -	
Chemical dangers Reacts violently with a mixture of iodine pentafluoride and tetrafluoroethylene. This generates fire and explosion hazard. Reacts with oxidants.	
Formula: C ₁₀ H ₁₆ Molecular mass: 136.23 Boiling point: 178°C Melting point: -74°C Relative density (water = 1): 0.84 Solubility in water at 25°C: very poor Vapour pressure, kPa at 20°C: 0.19 Relative vapour density (air = 1): 4.7 Flash point: 48°C c.c. Auto-ignition temperature: 237°C Octanol/water partition coefficient as log Pow: 4.2	
EXPOSURE & HEALTH EFFECTS	
Routes of exposure -	
Effects of short-term exposure The substance is irritating to the skin. The substance is mildly irritating to the eyes.	
Inhalation risk No indication can be given about the rate at which a harmful concentration of this substance in the air is reached on evaporation at 20°C.	
Effects of long-term or repeated exposure Repeated or prolonged contact may cause skin sensitization. See Notes.	
OCCUPATIONAL EXPOSURE LIMITS	
MAK: 28 mg/m ³ , 5 ppm; peak limitation category: II(4); skin absorption (H); sensitization of skin (SH); pregnancy risk group: B	
ENVIRONMENT	
The substance is very toxic to aquatic organisms. Bioaccumulation of this chemical may occur in fish.	
Limonene Results - AEGL Program	
Not available	
NOTES	
<ul style="list-style-type: none"> - Sensitization may occur with the oxidized substance. - This can occur when the pure or diluted substance has been kept for several days. - UN 2052 (Transport Emergency Card 30S2052) and UN 2319 (Transport Emergency Card 30GF1-III) with Hazard class 3, Pack group III are used in transport of this substance. 	
ADDITIONAL INFORMATION	
EC Classification Symbol: Xi, N; R: 10-38-43-50/53; S: (2)-24-37-60-61	
Reference	1. https://www.ilo.org/dyn/icsc/showcard.display?p_lang=en&p_card_id=0918&p_version=2

METHYL MERCAPTAN

PRODUCT NAME: METHYL MERCAPTAN			
Synonyms: Methanethiol Mercaptomethane Methyl sulphydrate Thiomethanol		CAS #: 74-93-1 UN #: 1064 EC Number: 200-822-1	
	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Extremely flammable. Gas/air mixtures are explosive.	NO open flames, NO sparks and NO smoking. Closed system, ventilation, explosion-proof electrical equipment and lighting.	Shut off supply; if not possible and no risk to surroundings, let the fire burn itself out. In other cases extinguish with powder, carbon dioxide. In case of fire: keep cylinder cool by spraying with water.
AVOID ALL CONTACT! IN ALL CASES CONSULT A DOCTOR!			
	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Sore throat. Dizziness. Headache. Nausea. Vomiting. Unconsciousness.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Artificial respiration may be needed. Refer for medical attention.
Skin	On contact with liquid: frostbite.	Cold-insulating gloves.	Remove contaminated clothes. Refer for medical attention. ON FROSTBITE: rinse with plenty of water, DO NOT remove clothes.
Eyes	Redness. Pain.	Wear safety goggles or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	-	-	-
SPILLAGE DISPOSAL			
Evacuate danger area! Consult an expert! Personal protection: self-contained breathing apparatus. Ventilation. Do NOT let this chemical enter the environment.			
STORAGE			
Fireproof. Separated from strong oxidants and acids. Cool. Store in an area without drain or sewer access.			
PACKAGING			
Marine pollutant.			
CLASSIFICATION & LABELLING			
According to UN GHS Criteria Transportation UN Classification UN Hazard Class: 2.3; UN Subsidiary Risks: 2.1			

PRODUCT NAME: METHYL MERCAPTAN					
PHYSICAL & CHEMICAL INFORMATION					
Physical State; Appearance Colourless gas with characteristic odour.					
Physical dangers The gas is heavier than air and may travel along the ground; distant ignition possible.					
Chemical dangers Decomposes on burning. This produces toxic fumes including sulfur oxides and hydrogen sulfide. Reacts violently with strong oxidants. Reacts with water, steam and acids. This produces flammable and toxic gas.					
Formula: CH ₃ SH Molecular mass: 48.1 Boiling point: 6°C Melting point: -123°C Relative density (water = 1): 0.9 Solubility in water, g/100ml at 20°C: 2.3 Vapour pressure, kPa at 26.1°C: 202 Relative vapour density (air = 1): 1.66 Flash point: Flammable gas Explosive limits, vol% in air: 3.9-21.8					
EXPOSURE & HEALTH EFFECTS					
Routes of exposure The substance can be absorbed into the body by inhalation.					
Effects of short-term exposure The substance is irritating to the eyes and respiratory tract. The substance may cause effects on the central nervous system. This may result in respiratory depression. Exposure at high levels could cause unconsciousness. Exposure at high levels could cause death. The effects may be delayed. Medical observation is indicated.					
Inhalation risk A harmful concentration of this gas in the air will be reached very quickly on loss of containment.					
Effects of long-term or repeated exposure -					
OCCUPATIONAL EXPOSURE LIMITS					
TLV: 0.5 ppm as TWA. MAK: 1.0 mg/m ³ , 0.5 ppm; peak limitation category: II(2); pregnancy risk group: D					
ENVIRONMENT					
The substance is very toxic to aquatic organisms. It is strongly advised not to let the chemical enter into the environment.					
Methyl Mercaptan Results - AEGL Program					
	10 min	30 min	60 min	4 hr	8 hr
	ppm				
AEGL 1	NR	NR	NR	NR	NR
AEGL 2	40	29	23	14	7.3
AEGL 3	120	86	68	43	22
	NR = Not recommended due to insufficient data Level of Distinct Odor Awareness (LOA)= 0.019 ppm				
NOTES					
- Turn leaking cylinder with the leak up to prevent escape of gas in liquid state.					
ADDITIONAL INFORMATION					
EC Classification Symbol: F+, T, N; R: 12-23-50/53; S: (2)-16-25-60-61					
Reference	1. https://www.ilo.org/dyn/icsc/showcard.display?p_lang=en&p_card_id=0299&p_version=2 2. https://www.epa.gov/aeql/access-acute-exposure-guideline-levels-aeqls-values				

METHANE

PRODUCT NAME: METHANE			
Synonyms: Methyl hydride		CAS #: 74-82-8 UN #: 1971 EC Number: 200-812-7	
	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Extremely flammable. Gas/air mixtures are explosive.	NO open flames, NO sparks and NO smoking. Closed system, ventilation, explosion-proof electrical equipment and lighting. Use non-sparking hand tools.	Shut off supply; if not possible and no risk to surroundings, let the fire burn itself out. In other cases extinguish with water spray, powder, carbon dioxide. In case of fire: keep cylinder cool by spraying with water. Combat fire from a sheltered position.
STRICT HYGIENE!			
	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Suffocation. See Notes.	Use ventilation. Use breathing protection.	Fresh air, rest. Artificial respiration may be needed. Refer for medical attention.
Skin	On contact with liquid: frostbite.	Cold-insulating gloves.	ON FROSTBITE: rinse with plenty of water, DO NOT remove clothes. Refer for medical attention.
Eyes	On contact with liquid: frostbite.	Wear safety goggles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	-	-	-
SPILLAGE DISPOSAL			
Evacuate danger area! Personal protection: self-contained breathing apparatus. Consult an expert! Ventilation. Remove all ignition sources. NEVER direct water jet on liquid.			
STORAGE			
Fireproof. Cool. Ventilation along the floor and ceiling.			
PACKAGING			
-			
CLASSIFICATION & LABELLING			
According to UN GHS Criteria Transportation UN Classification UN Hazard Class: 2.1			

PRODUCT NAME: METHANE	
PHYSICAL & CHEMICAL INFORMATION	
Physical State; Appearance Colourless odourless compressed or liquefied gas.	
Physical dangers The gas is lighter than air.	
Chemical dangers -	
Formula: CH ₄ Molecular mass: 16.0 Boiling point: -161°C Melting point: -183°C Solubility in water, ml/100ml at 20°C: 3.3 Relative vapour density (air = 1): 0.6 Flash point: Flammable gas Auto-ignition temperature: 537°C Explosive limits, vol% in air: 5-15 Octanol/water partition coefficient as log Pow: 1.09	
EXPOSURE & HEALTH EFFECTS	
Routes of exposure The substance can be absorbed into the body by inhalation.	
Effects of short-term exposure Rapid evaporation of the liquid may cause frostbite.	
Inhalation risk On loss of containment this substance can cause suffocation by lowering the oxygen content of the air in confined areas.	
Effects of long-term or repeated exposure -	
OCCUPATIONAL EXPOSURE LIMITS -	
ENVIRONMENT The substance is very toxic to aquatic organisms. Bioaccumulation of this chemical may occur in fish.	
Methane Results - AEGL Program Not available	
NOTES	
<ul style="list-style-type: none"> - Density of the liquid at boiling point: 0.42 kg/l. - High concentrations in the air cause a deficiency of oxygen with the risk of unconsciousness or death. Check oxygen content before entering area. - Turn leaking cylinder with the leak up to prevent escape of gas in liquid state. - After use for welding, turn valve off; regularly check tubing, etc., and test for leaks with soap and water. - The measures mentioned in section PREVENTION are applicable to production, filling of cylinders, and storage of the gas. Other UN number: 1972 (refrigerated liquid), Hazard class: 2.1. 	
ADDITIONAL INFORMATION	
EC Classification Symbol: F+; R: 12; S: (2)-9-16-33	
Reference	1. https://www.ilo.org/dyn/icsc/showcard.display?p_lang=en&p_card_id=0291&p_version=2

TOLUENE

PRODUCT NAME: TOLUENE			
Synonyms: Methylbenzene Toluol Phenylmethane		CAS #: 108-88-3 UN #: 1294 EC Number: 203-625-9	
	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Highly flammable. Vapour/air mixtures are explosive.	NO open flames, NO sparks and NO smoking. Closed system, ventilation, explosion-proof electrical equipment and lighting. Prevent build-up of electrostatic charges (e.g., by grounding). Do NOT use compressed air for filling, discharging, or handling. Use non-sparking hand tools.	Use powder, AFFF, foam, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water.
STRICT HYGIENE! AVOID EXPOSURE OF (PREGNANT) WOMEN!			
	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Sore throat. Dizziness. Drowsiness. Headache. Nausea. Unconsciousness.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin	Dry skin. Redness.	Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap. Refer for medical attention.
Eyes	Redness. Pain.	Wear safety goggles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Burning sensation. Abdominal pain. Further see Inhalation.	Do not eat, drink, or smoke during work.	Rinse mouth. DO NOT induce vomiting. Refer for medical attention.
SPILLAGE DISPOSAL			
Evacuate danger area! Consult an expert! Personal protection: chemical protection suit and self-contained breathing apparatus. Ventilation. Remove all ignition sources. Do NOT wash away into sewer. Do NOT let this chemical enter the environment. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.			
STORAGE			
Fireproof. Separated from strong oxidants.			
PACKAGING			
-			
CLASSIFICATION & LABELLING			
According to UN GHS Criteria Transportation UN Classification UN Hazard Class: 3; UN Pack Group: II			

PRODUCT NAME: TOLUENE					
PHYSICAL & CHEMICAL INFORMATION					
Physical State; Appearance colourless liquid with characteristic odour.					
Physical dangers The vapour mixes well with air, explosive mixtures are easily formed. As a result of flow, agitation, etc., electrostatic charges can be generated.					
Chemical dangers Reacts violently with strong oxidants. This generates fire and explosion hazard.					
Formula: C ₆ H ₅ CH ₃ / C ₇ H ₈ Molecular mass: 92.1 Boiling point: 111°C Melting point: -95°C Relative density (water = 1): 0.87 Solubility in water: none Vapour pressure, kPa at 25°C: 3.8 Relative vapour density (air = 1): 3.1 Relative density of the vapour/air-mixture at 20°C (air = 1): 1.01 Flash point: 4°C c.c. Auto-ignition temperature: 480°C Explosive limits, vol% in air: 1.1-7.1 Octanol/water partition coefficient as log Pow: 2.69					
EXPOSURE & HEALTH EFFECTS					
Routes of exposure The substance can be absorbed into the body by inhalation, through the skin and by ingestion.					
Effects of short-term exposure The substance is irritating to the eyes and respiratory tract. The substance may cause effects on the central nervous system. If this liquid is swallowed, aspiration into the lungs may result in chemical pneumonitis. Exposure at high levels could cause cardiac dysrhythmia and unconsciousness.					
Inhalation risk A harmful contamination of the air can be reached rather quickly on evaporation of this substance at 20°C.					
Effects of long-term or repeated exposure The substance defats the skin, which may cause dryness or cracking. The substance may have effects on the central nervous system. Exposure to the substance may increase noise-induced hearing loss. Animal tests show that this substance possibly causes toxicity to human reproduction or development.					
OCCUPATIONAL EXPOSURE LIMITS					
TLV: 20 ppm as TWA; A4 (not classifiable as a human carcinogen); BEI issued. MAK: 190 mg/m ³ , 50 ppm; peak limitation category: II(4); skin absorption (H); pregnancy risk group: C. EU-OEL: 192 mg/m ³ , 50 ppm as TWA; 384 mg/m ³ , 100 ppm as STEL; (skin).					
ENVIRONMENT					
The substance is very toxic to aquatic organisms.					
Toluene Results - AEGL Program					
	10 min	30 min	60 min	4 hr	8 hr
	ppm				
AEGL 1	67	67	67	67	67
AEGL 2	1,400*	760	560	310	250
AEGL 3	** 10,000	5,200*	3,700*	1,800*	1,400*
Lower Explosive Limit (LEL) = 14,000 ppm * = > 10% LEL; ** = > 50% LEL AEGL 3 - 10 min = **10,000 ppm For values denoted as * safety considerations against the hazard(s) of explosion(s) must be taken into account. For values denoted as ** extreme safety considerations against the hazard(s) of explosion(s) must be taken into account.					
NOTES					
- Depending on the degree of exposure, periodic medical examination is suggested. - Use of alcoholic beverages enhances the harmful effect.					
ADDITIONAL INFORMATION					
EC Classification Symbol: F, Xn; R: 11-38-48/20-63-65-67; S: (2)-36/37-46-62					
Reference	1. https://www.ilo.org/dyn/icsc/showcard.display?p_lang=en&p_card_id=0078&p_version=2 2. https://www.epa.gov/aeql/access-acute-exposure-guideline-levels-aeqls-values				

XYLENE (o-Xylene)

PRODUCT NAME: o-XYLENE			
Synonyms: ortho-Xylene 1,2-Dimethylbenzene o-Xylol		CAS #: 95-47-6 UN #: 1307 EC Number: 202-422-2	
	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Flammable. Above 32°C explosive vapour/air mixtures may be formed.	NO open flames, NO sparks and NO smoking. Above 32°C use a closed system, ventilation and explosion-proof electrical equipment. Prevent build-up of electrostatic charges (e.g., by grounding).	Use water spray, powder, foam, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water.
STRICT HYGIENE! AVOID EXPOSURE OF (PREGNANT) WOMEN!			
	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Dizziness. Drowsiness. Headache. Nausea.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin	Dry skin. Redness.	Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes	Redness. Pain.	Wear safety spectacles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Burning sensation. Abdominal pain. Further see Inhalation.	Do not eat, drink, or smoke during work.	Rinse mouth. DO NOT induce vomiting. Refer for medical attention.
SPILLAGE DISPOSAL			
Personal protection: filter respirator for organic gases and vapours adapted to the airborne concentration of the substance. Ventilation. Remove all ignition sources. Do NOT let this chemical enter the environment. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.			
STORAGE			
Fireproof. Separated from strong oxidants and strong acids.			
PACKAGING			
-			
CLASSIFICATION & LABELLING			
According to UN GHS Criteria Transportation UN Classification UN Hazard Class: 3; UN Pack Group: III			

PRODUCT NAME: o-XYLENE					
PHYSICAL & CHEMICAL INFORMATION					
Physical State; Appearance Colourless liquid with characteristic odour.					
Physical dangers As a result of flow, agitation, etc., electrostatic charges can be generated.					
Chemical dangers Reacts with strong acids and strong oxidants.					
Formula: C ₆ H ₄ (CH ₃) ₂ / C ₈ H ₁₀ Molecular mass: 106.2 Boiling point: 144°C Melting point: -25°C Relative density (water = 1): 0.88 Solubility in water: none Vapour pressure, kPa at 20°C: 0.7 Relative vapour density (air = 1): 3.7 Relative density of the vapour/air-mixture at 20°C (air = 1): 1.02 Flash point: 32°C c.c. Auto-ignition temperature: 463°C Explosive limits, vol% in air: 0.9-6.7 Octanol/water partition coefficient as log Pow: 3.12					
EXPOSURE & HEALTH EFFECTS					
Routes of exposure The substance can be absorbed into the body by inhalation, through the skin and by ingestion.					
Effects of short-term exposure The substance is irritating to the eyes and skin. The substance may cause effects on the central nervous system. If this liquid is swallowed, aspiration into the lungs may result in chemical pneumonitis.					
Inhalation risk A harmful contamination of the air will be reached rather slowly on evaporation of this substance at 20°C.					
Effects of long-term or repeated exposure The substance defats the skin, which may cause dryness or cracking. The substance may have effects on the central nervous system. Exposure to the substance may increase noise-induced hearing loss. Animal tests show that this substance possibly causes toxicity to human reproduction or development.					
OCCUPATIONAL EXPOSURE LIMITS					
TLV: 100 ppm as TWA; 150 ppm as STEL; A4 (not classifiable as a human carcinogen); BEI issued. MAK: 440 mg/m ³ , 100 ppm; peak limitation category: II(2); skin absorption (H); pregnancy risk group: D. EU-OEL: 221 mg/m ³ , 50 ppm as TWA; 442 mg/m ³ , 100 ppm as STEL; (skin)					
ENVIRONMENT					
The substance is toxic to aquatic organisms.					
Xylene Results - AEGL Program					
Xylenes 1330-20-7					
	10 min	30 min	60 min	4 hr	8 hr
	ppm				
AEGL 1	130	130	130	130	130
AEGL 2	2,500*	1,300*	920*	500	400
AEGL 3	** see below	3,600*	2,500*	1,300*	1,000*
Lower Explosion Limit (LEL) = 9,000 ppm * ≥ 10% LEL; ** ≥ 50% LEL AEGL 3 - 10 min = ** 7,200 ppm For values denoted as * safety considerations against the hazard(s) of explosion(s) must be taken into account. For value denoted as ** extreme safety considerations against the hazard(s) of explosion(s) must be taken into account					
NOTES					
<ul style="list-style-type: none"> - Depending on the degree of exposure, periodic medical examination is suggested. The recommendations on this Card also apply to technical xylene. - See m-Xylene and p-Xylene 					
ADDITIONAL INFORMATION					
EC Classification					
Symbol: Xn; R: 10-20/21-38; S: (2)-25; Note: C					
Reference	<ol style="list-style-type: none"> 1. https://www.ilo.org/dyn/icsc/showcard.display?p_lang=en&p_card_id=0084&p_version=2 2. https://www.epa.gov/aeql/access-acute-exposure-guideline-levels-aeqls-values 				

XYLENE (m-Xylene)

PRODUCT NAME: m-XYLENE			
Synonyms: meta-Xylene 1,3-Dimethylbenzene m-Xylol		CAS #: 108-38-3 UN #: 1307 EC Number: 203-576-3	
	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Flammable. Above 27°C explosive vapour/air mixtures may be formed.	NO open flames, NO sparks and NO smoking. Above 27°C use a closed system, ventilation and explosion-proof electrical equipment. Prevent build-up of electrostatic charges (e.g., by grounding).	Use water spray, powder, foam, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water.
STRICT HYGIENE!			
	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Dizziness. Drowsiness. Headache. Nausea.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin	Dry skin. Redness.	Protective gloves.	Remove contaminated clothes, Rinse and then wash skin with water and soap.
Eyes	Redness. Pain.	Wear safety spectacles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Burning sensation. Abdominal pain. Further see Inhalation.	Do not eat, drink, or smoke during work.	Rinse mouth. DO NOT induce vomiting. Refer for medical attention.
SPILLAGE DISPOSAL			
Personal protection: filter respirator for organic gases and vapours adapted to the airborne concentration of the substance. Ventilation. Remove all ignition sources. Do NOT let this chemical enter the environment. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.			
STORAGE			
Fireproof. Separated from strong oxidants and strong acids.			
PACKAGING			
-			
CLASSIFICATION & LABELLING			
According to UN GHS Criteria Transportation UN Classification UN Hazard Class: 3; UN Pack Group: III			

PRODUCT NAME: m-XYLENE					
PHYSICAL & CHEMICAL INFORMATION					
Physical State; Appearance Colourless liquid with characteristic odour.					
Physical dangers As a result of flow, agitation, etc., electrostatic charges can be generated.					
Chemical dangers Reacts with strong acids and strong oxidants.					
Formula: C ₆ H ₄ (CH ₃) ₂ / C ₈ H ₁₀ Molecular mass: 106.2 Boiling point: 139°C Melting point: -48°C Relative density (water = 1): 0.86 Solubility in water: none Vapour pressure, kPa at 20°C: 0.8 Relative vapour density (air = 1): 3.7 Relative density of the vapour/air-mixture at 20°C (air = 1): 1.02 Flash point: 27°C c.c. Auto-ignition temperature: 527°C Explosive limits, vol% in air: 1.1-7.0 Octanol/water partition coefficient as log Pow: 3.20					
EXPOSURE & HEALTH EFFECTS					
Routes of exposure The substance can be absorbed into the body by inhalation, through the skin and by ingestion.					
Effects of short-term exposure The substance is irritating to the eyes and skin. The substance may cause effects on the central nervous system. If this liquid is swallowed, aspiration into the lungs may result in chemical pneumonitis.					
Inhalation risk A harmful contamination of the air will be reached rather slowly on evaporation of this substance at 20°C.					
Effects of long-term or repeated exposure The substance defats the skin, which may cause dryness or cracking. The substance may have effects on the central nervous system. Exposure to the substance may increase noise-induced hearing loss. Animal tests show that this substance possibly causes toxicity to human reproduction or development.					
OCCUPATIONAL EXPOSURE LIMITS					
TLV: 100 ppm as TWA; A4 (not classifiable as a human carcinogen); BEI issued. EU-OEL: 150 ppm as STEL; 221 mg/m ³ , 50 ppm as TWA; 442 mg/m ³ , 100 ppm as STEL; (skin). MAK: 440 mg/m ³ , 100 ppm; peak limitation category: II(2); skin absorption (H); pregnancy risk group: D					
ENVIRONMENT					
The substance is toxic to aquatic organisms.					
Xylene Results - AEGL Program					
Xylenes 1330-20-7					
	10 min	30 min	60 min	4 hr	8 hr
	ppm				
AEGL 1	130	130	130	130	130
AEGL 2	2,500*	1,300*	920*	500	400
AEGL 3	** see below	3,600*	2,500*	1,300*	1,000*
Lower Explosion Limit (LEL) = 9,000 ppm * ≥ 10% LEL; ** ≥ 50% LEL AEGL 3 - 10 min = ** 7,200 ppm For values denoted as * safety considerations against the hazard(s) of explosion(s) must be taken into account. For value denoted as ** extreme safety considerations against the hazard(s) of explosion(s) must be taken into account					
NOTES					
- Depending on the degree of exposure, periodic medical examination is suggested. The recommendations on this Card also apply to technical xylene. - See o-Xylene and p-Xylene					
ADDITIONAL INFORMATION					
EC Classification					
Symbol: Xn; R: 10-20/21-38; S: (2)-25; Note: C					
Reference	1. https://www.ilo.org/dyn/icsc/showcard.display?p_lang=en&p_card_id=0085&p_version=2 2. https://www.epa.gov/aeql/access-acute-exposure-guideline-levels-aeqls-values				

XYLENE (p-Xylene)

PRODUCT NAME: p-XYLENE			
Synonyms: para-Xylene 1,4-Dimethylbenzene p-Xylol paraxylene		CAS #: 106-42-3 UN #: 1307 EC Number: 203-396-5	
	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Flammable. Above 27°C explosive vapour/air mixtures may be formed.	NO open flames, NO sparks and NO smoking. Above 27°C use a closed system, ventilation and explosion-proof electrical equipment. Prevent build-up of electrostatic charges (e.g., by grounding).	Use water spray, powder, foam, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water.
STRICT HYGIENE!			
	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Dizziness. Drowsiness. Headache. Nausea.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin	Dry skin. Redness.	Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes	Redness. Pain.	Wear safety spectacles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Burning sensation. Abdominal pain. Further see Inhalation.	Do not eat, drink, or smoke during work.	Rinse mouth. DO NOT induce vomiting. Refer for medical attention.
SPILLAGE DISPOSAL			
Personal protection: filter respirator for organic gases and vapours adapted to the airborne concentration of the substance. Ventilation. Remove all ignition sources. Do NOT let this chemical enter the environment. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.			
STORAGE			
Fireproof. Separated from strong oxidants and strong acids.			
PACKAGING			
-			
CLASSIFICATION & LABELLING			
According to UN GHS Criteria Transportation UN Classification UN Hazard Class: 3; UN Pack Group: III			

PRODUCT NAME: p-XYLENE					
PHYSICAL & CHEMICAL INFORMATION					
Physical State; Appearance Colourless liquid with characteristic odour.					
Physical dangers As a result of flow, agitation, etc., electrostatic charges can be generated.					
Chemical dangers Reacts with strong acids and strong oxidants.					
Formula: C ₆ H ₄ (CH ₃) ₂ / C ₈ H ₁₀ Molecular mass: 106.2 Boiling point: 138°C Melting point: 13°C Relative density (water = 1): 0.86 Solubility in water: none Vapour pressure, kPa at 20°C: 0.9 Relative vapour density (air = 1): 3.7 Relative density of the vapour/air-mixture at 20°C (air = 1): 1.02 Flash point: 27°C c.c. Auto-ignition temperature: 528°C Explosive limits, vol% in air: 1.1-7.0 Octanol/water partition coefficient as log Pow: 3.15					
EXPOSURE & HEALTH EFFECTS					
Routes of exposure The substance can be absorbed into the body by inhalation, through the skin and by ingestion.					
Effects of short-term exposure The substance is irritating to the eyes and skin. The substance may cause effects on the central nervous system. If this liquid is swallowed, aspiration into the lungs may result in chemical pneumonitis.					
Inhalation risk A harmful contamination of the air will be reached rather slowly on evaporation of this substance at 20°C.					
Effects of long-term or repeated exposure The substance defats the skin, which may cause dryness or cracking. The substance may have effects on the central nervous system. Exposure to the substance may increase noise-induced hearing loss. Animal tests show that this substance possibly causes toxicity to human reproduction or development.					
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NOTES					
- Depending on the degree of exposure, periodic medical examination is suggested. The recommendations on this Card also apply to technical xylene. - See o-Xylene and m-Xylene					
ADDITIONAL INFORMATION					
EC Classification					
Symbol: Xn; R: 10-20/21-38; S: (2)-25; Note: C					
Reference	1. https://www.ilo.org/dyn/icsc/showcard.display?p_lang=en&p_card_id=0086&p_version=2 2. https://www.epa.gov/aeql/access-acute-exposure-guideline-levels-aeqls-values				

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