

Appendix Tables

Appendix 1: Hazard categories based on OSH-CPL Regulations 1997 [23].

Group 1	Risk Phrases Code
Very toxic	R26-28, 39, 45(1), 46(1), 47(1), 49(1)
Toxic	R23-25, 39, 48, 45(2), 46(2), 47(2), 49(2)
Harmful	R20-22, 40, 40(3), 40(M2), 48
Respiratory sensitiser	R42
Respiratory irritant	R37
Group 2	Risk Phrases Code
Corrosive to skin/eye	R34, 35
Skin and eye irritants	R41, 38, 36

Appendix 2: Hazard rating based on health effect description [23].

Hazard Rating	Health Effects	Hazard Category
5	Local: Injury to the skin, eyes, or mucous membranes of sufficient severity to threaten life by single exposure	Very Toxic chemicals:-
	Systemic: Severe irreversible effects (e.g. central nervous system effects, kidney necrosis, liver lesions, anemia or paralysis) after a single exposure	-LD50<25 mg/kg (oral)
		-LD50<50 mg/kg (skin)
		-LC50<0.5 mg/litre
Known human carcinogens, mutagens or teratogens	Category 1 carcinogen, mutagen and teratogen	
4	Local: Injury to the skin, eyes, or mucous membranes of sufficient severity to cause permanent impairment, disfigurement or irreversible change from single or repeated exposure	Very Corrosive (R35: Causes severe burn)
	Systemic: Very serious physical or health impairment by repeated or prolonged exposure	Toxic chemicals:-
		-LD50: 25-200mg/kg(oral)
		-LD50: 50-400mg/kg(skin)
Probable human carcinogens, mutagens or teratogens based on animal studies	Category 2 carcinogen, mutagen and teratogen	
3	Local: Serious damage to skin, eyes or mucous membranes from single or repeated exposure	Corrosive(R34:Cause burn)
	Systemic: Severe effects after repeated or prolonged exposure	Respiratory sensitisers
		Irritant-serious eye damage
		Harmful chemicals:-
		-LD50:200-500mg/kg(oral)
Possible human or animal carcinogens or mutagens, but for which data is inadequate	-LD50:400-2000mg/kg(sk)	
	-LC50: 2-20 mg/litre	
2	Local: Reversible effects to the skin, eyes or mucous membranes not severe enough to cause serious health impairment	Skin sensitisers
	Systemic: Changes readily reversible once exposure ceases	Skin irritants
1	No known adverse health effects	Not classified as hazardous

Appendix 3: Hazard rating based on hazard categories or hazard classification or risk phrases [23].

Effect	Acute/ Chronic	Routes of Exposure					Hazard Rating
		Inhalation	Dermal		Ingestion	Not specified	
			Skin	Eye			
Very Toxic	Acute	R26	R27		R28	R39	5
	Chronic	-	-		-	-	
Toxic	Acute	R23	R24		R25	R39	4
	Chronic	-	-		-	R48, R39	
Harmful	Acute	R20	R21		R22	R40	3
	Chronic	-	-		-	R48, R40	
Corrosive	Acute		R35				4
			R34				3
Irritant	Acute	R37	-	R41			3
		-	R38	R36			2
Sensitising	Acute	R42	-				3
		-	R43				2
Carcinogenic	Chronic	R49(1)				R45(1)	5
		R49(2)				R45(2)	4
		-				R40(3)	3
Mutagenic						R46(1)	5
						R46(2)	4
						R40(M2)	3
Teratogenic						R47(1)	5
						R47(2)	4

Appendix 4: Risk phrases code [23].

R1	Explosive when dry.
R2	Risk of explosion by shock, friction, fire or other source of ignition.
R3	Extreme risk of explosion by shock, friction, fire or other sources of ignition.
R4	Forms very sensitive explosive metallic compounds.
R5	Heating may cause an explosion.
R6	Explosive with or without contact with air.
R7	May cause fire.
R8	Contact with combustible material may cause fire.
R9	Explosive when mixed with combustible material.
R10	Flammable.
R11	Highly flammable.
R12	Extremely flammable.
R13	Extremely flammable liquefied gas
R14	Reacts violently with water.
R15	Contact with water liberates extremely flammable gases.
R16	Explosive when mixed with oxidizing substances.
R17	Spontaneously flammable in air.
R18	In use, may form inflammable/explosive vapour-air mixture.
R19	May form explosive peroxides.
R20	Harmful by inhalation.
R21	Harmful in contact with skin.

R22	Harmful if swallowed.
R23	Toxic by inhalation.
R24	Toxic in contact with skin.
R25	Toxic if swallowed.
R26	Very toxic by inhalation.
R27	Very toxic in contact with skin.
R28	Very toxic if swallowed.
R29	Contact with water liberates toxic gas.
R30	Can become highly flammable in use.
R31	Contact with acids liberates toxic gas.
R32	Contact with acid liberates very toxic gas.
R33	Danger of cumulative effects.
R34	Causes burns.
R35	Causes severe burns.
R36	Irritating to eyes.
R37	Irritating to respiratory system.
R38	Irritating to skin.
R39	Danger of very serious irreversible effects.
R40	Limited evidence of a carcinogenic effect.
R41	Risk of serious damage to the eyes.
R42	May cause sensitization by inhalation.
R43	May cause sensitization by skin contact.
R44	Risk of explosion if heated under confinement.
R45	May cause cancer.
R46	May cause heritable genetic damage.
R47	May cause birth defects
R48	Danger of serious damage to health by prolonged exposure.
R49	May cause cancer by inhalation.
R50	Very toxic to aquatic organisms.
R51	Toxic to aquatic organisms.
R52	Harmful to aquatic organisms.
R53	May cause long-term adverse effects in the aquatic environment.
R54	Toxic to flora.
R55	Toxic to fauna.
R56	Toxic to soil organisms.
R57	Toxic to bees.
R58	May cause long-term adverse effects in the environment.
R59	Dangerous to the ozone layer.
R60	May impair fertility.
R61	May cause harm to the unborn child.
R62	Risk of impaired fertility.
R63	Possible risk of harm to the unborn child.
R64	May cause harm to breastfed babies.
R65	Harmful: may cause lung damage if swallowed.
R66	Repeated exposure may cause skin dryness or cracking.
R67	Vapours may cause drowsiness and dizziness.
R68	Possible risk of irreversible effects.

Appendix 5: Frequency rating based on frequency of exposure [23].

Rating	Description	Definition
5	Frequent	Potential exposure one or more time per shift or per day
4	Probable	Exposure greater than one time per week
3	Occasional	Exposure greater than one time per month
2	Remote	Exposure greater than one time per year
1	Improbable	Exposure less than one per year

Appendix 6: Duration rating based on duration of exposure [23].

Rating	Total Duration of Exposure*		
	% Work hour	Duration	
		Per 8-hr shift	Per 40-hr week
5	> 87.5%	> 7 hrs/shift	>35 hrs/week
4	50 - 87.5%	4 to 7 hrs/shift	20 to 35 hrs/week
3	25 - 50%	2 to 4 hrs/shift	10 to 20 hrs/week
2	12.5 - 25%	1 to 2 hrs/shift	5 to 10 hrs/week
1	< 12.5%	< 1 hr/ 8 hr shift	< 5 hrs/week

Note: * Total duration of exposure = (Number of exposure) x (Average duration of each exposure)

Appendix 7: Magnitude rating based on airborne exposure measurement [23].

Time-Weighted Average (TWA) or Maximum Concentration	Magnitude Rating
$\geq 3 \times \text{P.E.L.}^*$	5
$\geq \text{P.E.L.}$ but $< 3 \times \text{P.E.L.}$	4
$\geq 0.5 \text{ P.E.L.}$ but $< \text{P.E.L.}$	3
$\geq 0.1 \text{ P.E.L.}$ but $< 0.5 \text{ P.E.L.}$	2
$< 0.1 \text{ P.E.L.}$	1

Note: * $3 \times \text{PEL}$ (Permissible Exposure Limit) is the Maximum Exposure Limit under the USECHH Regulations 2000.

Appendix 8: Magnitude rating for additive effects [23].

Sum of Ratios of Air Concentration to PEL	Magnitude Rating
> 3	5
1 - 3	4
0.5 - 1	3
0.1 - 0.5	2
< 0.1	1

Appendix 9: Degree of chemical release or presence [23].

Degree	Observation
Low	<ul style="list-style-type: none"> · Low or little release into the air. · No contamination of air, clothing and work surfaces with chemicals capable of skin absorption or causing irritation or corrosion.
Moderate	<ul style="list-style-type: none"> · Moderate release such as: <ol style="list-style-type: none"> a) Solvents with medium drying time in uncovered containers or exposed to work environment*; b) Detectable odour of chemicals with odour thresholds exceeding the PELs**. · Evidence of contamination of air, clothing and work surfaces with chemicals capable of skin absorption or causing irritation or corrosion.

High	<ul style="list-style-type: none"> Substantial release such as:
	a) Solvents with fast drying time in uncovered containers*;
	b) Sprays or dust clouds in poorly ventilated areas;
	c) Chemicals with high rates of evaporation exposed to work environment;
	d) Strong odour of chemicals with odour thresholds exceeding the PELs.
<ul style="list-style-type: none"> Gross contamination of air, clothing and work surfaces with chemicals capable of skin absorption or causing irritation or corrosion. 	

Note: *Refer to Table A12 in Appendix

**Refer to Table A13 in Appendix

Appendix 10: Degree of chemical absorbed or contacted [23].

Degree	Observation/Condition
LOW	<ul style="list-style-type: none"> Low breathing rate (light work)* Source far from breathing zone Contact with chemical other than those described under "Moderate" and "High". Small area of contact with chemicals capable of skin absorption -limited to palm (intact skin). <2% or 0.04m2 No indication of any skin conditions. Intact/normal skin No contamination of skin or eyes
MODERATE	<ul style="list-style-type: none"> Moderate breathing rate (moderate work)*. Source close to breathing zone Contact with eye or skin irritants, sensitizers or chemicals capable of skin penetration, except those described under 'High'. Moderate area of contact- one or both hands up to the elbows. Skin area >2% or 0.04m2 Skin dryness and detectable skin condition. Dry, red skin
HIGH	<ul style="list-style-type: none"> High breathing rate (heavy work)*. Source within breathing zone. Gross contamination of eye or skin with skin or eye irritants, sensitizers or chemicals capable of skin absorption -skin soaked or immersed in chemical capable of skin penetration. Area of contact not only confined to hands but also other parts of body. Skin area>50% or 1m2 <ul style="list-style-type: none"> Follicle rich areas. Skin damaged. Severe drying, peeling and cracking.

Note: *Refer to Table A15

Appendix 11: Magnitude rating based on qualitative estimation [23].

Degree of Release	Degree of Absorption	Magnitude Rating
Low	Low	1
	Moderate	2
	High	3
Moderate	Low	1
	Moderate	2
	High	3

High	Low	1
	Moderate	2
	High	3

Appendix 12: Solvent drying time.

Solvent	Dry time relation	Degree of drying	
Ethyl Ether C.P	1	FAST	
Petrolene	1.8		
Carbon Tetrachloride	1.9		
Acetone	2		
Methyl Acetate 2.0	2		
Ethyl Acetate 85-88%	2.5		
Trichlorethylene	2.5		
Benzol (Industrial)	2.6		
Methyl Ethyl Ketone	2.7		
Isopropyl Acetate 85%	2.7		
Ethylene Dichloride	3		
Solvsol 19/27	3.7		
Ethylene Chloride	4		
Propylene Dichloride	4.1		
Troluoil	4.1		
Methanol	5		MEDIUM
Toluol (Industrial)	5		
Methyl Propyl Ketone	5.2		
V.M & P	5.8		
Perchlorethylene	6		
Nor. Propyl Acetate	6.1		
Sec. Butyl Acetate	6.5		
Solox (Anhydrous)	6.5		
Isobutyl Acetate 90%	7		
Apco thinner	7		
Ethyl Alcohol, Den. No. 1	7.7		
Solox	8		
Isopropyl Alcohol 99%	8.6		
Nor. Propyl Alcohol	9.1		
Solvsol 24/34	9.4		
Nor. Butyl Acetate	9.6		
Diethyl Carbonate	9.6		
Methyl Butyl Ketone	9.7		
Xylol (Industrial)	9.7		
Monochlor Benzol	10		
Tertiary Butyl Alcohol	11.9		
Sec. Butyl Alcohol	14		

Sec. Amyl Acetate	16.9	SLOW
Amyl Acetate	17.4	
Isobutyl Alcohol	17.7	
Methyl Cellosolve	18	
Butyl Propionate	18	
Pentacetate	20	
Turpentine	20	
Butanol	21	
Sec. Amyl Alcohol	25	
2-50- W Hi-Flash Naphtha	27.5	
Amyl Alcohol (Fusel Oil)	32.1	
Di Isopropyl Ketone	33.9	
Ethyl Cellosolve	36.2	
Odorless Mineral Spirits	38.6	
Ethyl Lactate	40	
Sec. Hexyl Alcohol	41.7	
Solvsol 30/40	43.2	
Pentanol	45	
Hi-Solvency Mineral Spirits	46.7	
No. 380 Mineral Spirits	47	
No. 10 Mineral Spirits	55	
Distilled Water	60	
Apco No. 125	60.5	
Cellosolve Acetate	65	
Sec. Butyl Lactate	73	
Sec. Hexyl Acetate	76.5	
Butyl Cellosolve	88.5	
Dipentene	89.2	
No. 140 Thinner	91	
Octyl Acetate	152.5	
Isobutyl Lactate	156.5	
Hexalin	177.5	
Solvsol 40/50	270	
Methyl Hexalin	276.5	
Butyl Lactate	339	
Excellence	384	
Special Heavy Naphtha	403	
Dispersol	425	
No. 50 Kerosene	626.7	
Triethylene Glycol	Over 5200.0	
Dibutyl Phthalate	Over 5200.0	
		NIL

Appendix 13: Odour level thresholds.

	*TLV (ppm)	**OT (ppm)	OT/TLV
Acetaldehyde	c25	0.5	0.02
Acetic acid (glacial)	10	2	0.2
Acetone	750	2	0.003
Acrolein	0.1	2	20

Acrylonitrile	2	20	10
Allyl alcohol	2	2	1
Ammonia	25	20	0.8
Aniline	2	1	0.5
Arsine	0.05	0.5	10
Benzene	10	2	0.2
Butane	800	5000	6.25
2-Butanone (MEK)	200	5	0.025
n-Butyl Acetate	150	10	0.07
Carbon disulphide	10	0.1	0.01
Carbon tetrachloride	5	70	14
Chlorine	0.5	3	6
Chloroform	10	100	10
Cyclohexane	300	300	1
Dioxane	25	150	6
Ethyl Acetate	400	10	0.025
Ethyl alcohol	1000	5	0.005
Ethyl ether	400	1	0.0025
Ethylene oxide	1	1	1
Formaldehyde	c0.3	1	3.3
Hexone (MIBK)	50	0.5	0.01
Hydrogen chloride	c5	10	2
Hydrogen cyanide	c4.7	1	0.2
Hydrogen selenide	0.05	0.5	10
Hydrogen sulphide	10	0.0002	0.00002
Isopropyl alcohol (IPA)	400	50	0.125
Methyl alcohol	200	10	0.05
Methyl methacrylate	100	0.2	0.002
Methylene chloride	50	200	4
Nitrobenzene	1	0.005	0.005
Nitrogen dioxide	3	1	0.3
Perchloroethylene (tetrachloro-ethene)	25	5	0.2
Phenol	5	0.3	0.06
Phosgene	0.1	0.5	5
Phosphine	0.3	0.02	0.07
Pyridine	5	0.01	0.002
Stibine	0.1	0.05	0.5
Styrene, monomer	50	0.05	0.001
Toluene	50	2	0.04
Toluene-2,4-diisocyanate	0.005	0.2	40
Trichloroethylene (TCE)	50	20	0.4
Vinyl toluene	50	25	0.5
Xylene	100	0.5	0.005

Note: * Taken from: American Conference of Governmental Industrial Hygienists, 2002. [Threshold Limit Values and Biological Exposure Indices]; TLVs and BEIs: based on the Documentation of the Threshold Limit Values for Chemical Substances and Physical Agents & Biological Exposure Indices. ACGIH.

** Taken from reference [2].

Appendix 14: Degree of chemical absorbed or contacted [23].

Degree	Observation/Condition
Low	<ul style="list-style-type: none"> · Low breathing rate (light work)* · Source far from breathing zone · Contact with chemical other than those described under "Moderate" and "High". · Small area of contact with chemicals capable of skin absorption -limited to palm (intact skin). <2% or 0.04 m2 · No indication of any skin conditions. Intact/normal skin <ul style="list-style-type: none"> · No contamination of skin or eyes
Moderate	<ul style="list-style-type: none"> · Moderate breathing rate (moderate work)*. · Source close to breathing zone · Contact with eye or skin irritants, sensitizers or chemicals capable of skin penetration, except those described under 'High'. · Moderate area of contact- one or both hands up to the elbows. Skin area >2% or 0.04 m2 · Skin dryness and detectable skin condition. Dry, red skin
High	<ul style="list-style-type: none"> · High breathing rate (heavy work)*. · Source within breathing zone. · Gross contamination of eye or skin with skin or eye irritants, sensitizers or chemicals capable of skin absorption -skin soaked or immersed in chemical capable of skin penetration. · Area of contact not only confined to hands but also other parts of body. Skin area>50% or 1 m2 <ul style="list-style-type: none"> · Follicle rich areas. · Skin damaged. · Severe drying, peeling and cracking.

Note: *Refer to Table A15

Appendix 15: Degree of physical activities and breathing rate [23].

Physical Activity	Breathing Rate
<p>Light Work</p> <ul style="list-style-type: none"> · Sitting, moderate arm and trunk movements (E.g. desk work, typing) · Sitting, moderate arm and leg movements (E.g. playing organ, driving car in traffic) · Standing, light work at machine or bench, mostly arms 	LOW
<p>Moderate Work</p> <ul style="list-style-type: none"> · Sitting, heavy arms and legs movement · Standing, light work at machine or bench, some walking about · Standing, moderate work at machine or bench, some walking about · Walking about, with moderate lifting or pushing 	MEDIUM
<p>Heavy Work</p> <ul style="list-style-type: none"> · Intermittent heavy lifting, pushing or pulling (E.g. pick and shovel work) · Hardest sustained work 	HIGH