

SAFETY DATA SHEET



M-BOND CURING AGENT 600-610

www.vpgsensors.com

Date of issue: 17 February 2022
Date of First Issue: 20 March 2020
Version: 4.0

ACCORDING TO OSHA HCS (29 CFR 1910.1200)

SECTION 1: IDENTIFICATION

Product identifier used on the label

Product Name

M-Bond Curing Agent 600-610

Product code

Other means of identification

Not applicable

Recommended use of the chemical and restrictions on use

Recommended use

Adhesives

Restrictions on use

Anything other than the above.

Details of the supplier of the safety data sheet

Supplier

VISHAY MEASUREMENTS GROUP, INC.

Address of Supplier

Post Office Box 27777

Raleigh, NC 27611

USA

Telephone

+1 919-365-3800

Fax

+1 919-365-3945

E-Mail (competent person)

mm.us@vpgsensors.com

Emergency telephone number

Emergency Phone No.

+1 800-262-8200 (for spills and releases)

Languages spoken

English - CHEMTREC (24 hours)

SECTION 2: HAZARD(S) IDENTIFICATION

Classification of the chemical in accordance with paragraph (d) of §1910.1200

Physical hazards

Flammable Liquid, Category 2

Health hazards

Acute Toxicity - Oral, Category 4

Skin Sensitizer, Category 1

Eye Damage, Category 1

Respiratory Sensitizer, Category 1

STOT, Single Exposure, Category 3, Respiratory Tract Irritation

STOT, Single Exposure, Category 3, Narcotic Effects

Carcinogen, Category 2

Not classified

Environmental hazards

Label elements

Hazard Symbol



Signal Word(s)

Danger

Hazard Statement(s)

Highly flammable liquid and vapour.

Harmful if swallowed.

May cause an allergic skin reaction.

Causes serious eye damage.

May cause allergy or asthma symptoms or breathing difficulties if inhaled.

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	May cause respiratory irritation. May cause drowsiness or dizziness. Suspected of causing cancer.
Precautionary Statement(s) Prevention	Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking. Ground/bond container and receiving equipment. Use explosion-proof electrical/ventilating/lighting/equipment. Use non-sparking tools. Use only outdoors or in a well-ventilated area. Take precautionary measures against static discharge. Wear protective gloves/eye protection/face protection. Wash hands and exposed skin thoroughly after handling. Do not eat, drink or smoke when using this product. Avoid breathing vapours. [In case of inadequate ventilation] wear respiratory protection. Contaminated work clothing must not be allowed out of the workplace. IF exposed or concerned: Get medical advice/attention. IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/or shower. If skin irritation or rash occurs: Get medical advice/attention. IF SWALLOWED: Call a POISON CENTER/doctor if you feel unwell. IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER/doctor. IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER/doctor if you feel unwell. If experiencing respiratory symptoms: Call a POISON CENTER/doctor. Wash contaminated clothing before reuse.
Response	Store in a well-ventilated place. Keep container tightly closed. Store locked up. Dispose of contents/container to hazardous waste collection point.
Storage Disposal	May form explosive peroxides.
Other hazards	0 percent of the mixture consists of ingredient(s) of unknown acute inhalation toxicity 0 percent of the mixture consists of ingredient(s) of unknown acute oral toxicity 0 percent of the mixture consists of ingredient(s) of unknown acute dermal toxicity

SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS

Substances Not applicable

Mixtures Substances in preparations / mixtures

Classification: OSHA HCS (29 CFR 1910.1200)

Chemical identity of the substance	%W/W	Synonym(s)	CAS No.	Hazard classification
Tetrahydrofuran	>25 - <95	Furan, tetrahydro-	109-99-9	Flammable Liquid, Category 2 Acute Toxicity - Oral, Category 4 Eye Irritant, Category 2, (SCL ≥ 25%) STOT, Single Exposure, Category 3, Respiratory Tract Irritation (SCL ≥ 25%)

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				STOT, Single Exposure, Category 3, Narcotic Effects Carcinogen, Category 2
1,2,4,5-Benzenetetracarboxylic Dianhydride	>5 - <25	Pyromellitic dianhydride	89-32-7	Eye Damage, Category 1 Skin Sensitizer, Category 1 Respiratory Sensitizer, Category 1

SECTION 4: FIRST AID MEASURES



Description of first aid measures

Self-protection of the first aider

Use personal protective equipment as required. Wear appropriate personal protective equipment, avoid direct contact. Ensure adequate ventilation. Avoid breathing vapours. Avoid all contact. Contaminated clothing should be laundered before reuse.

Inhalation

IF INHALED: If breathing is difficult, remove to fresh air and keep at rest in a position comfortable for breathing. If experiencing respiratory symptoms: Call a POISON CENTER/doctor. If unconscious, place in recovery position and get medical attention immediately. Apply artificial respiration if necessary (do not employ mouth-to-mouth method).

Skin Contact

IF ON SKIN: Remove contaminated clothing and wash all affected areas with plenty of water. Wash contaminated clothing before reuse. If skin irritation or rash occurs: Get medical advice/attention. IF exposed or concerned: Get medical advice/attention.

Eye Contact

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Hold eye open and rinse slowly and gently with water for 15-20 minutes. If eye irritation persists: Get medical advice/attention.

Ingestion

IF SWALLOWED: Rinse mouth. Make victim drink plenty of water. Do not give anything by mouth to an unconscious person. Do not induce vomiting unless instructed to do so by medical personnel. Call a POISON CENTER/doctor if you feel unwell. IF exposed or concerned: Get medical advice/attention.

Most important symptoms and effects, both acute and delayed

Harmful if swallowed. May cause an allergic skin reaction. Causes serious eye damage. May cause allergy or asthma symptoms or breathing difficulties if inhaled. May cause respiratory irritation. May cause drowsiness or dizziness. Suspected of causing cancer.

Indication of any immediate medical attention and special treatment needed

Treat symptomatically. Treatment by an ophthalmologist due to possible caustic burn of the eyes may be required.

SECTION 5: FIRE-FIGHTING MEASURES

Extinguishing media

Suitable Extinguishing Media

As appropriate for surrounding fire. Extinguish with carbon dioxide, dry chemical, foam or waterspray.

Unsuitable extinguishing Media

Do not use water jet. Direct water jet may spread the fire.

Special hazards arising from the substance or mixture

Highly flammable liquid and vapour. May decompose in a fire giving off toxic fumes. Carbon monoxide, Carbon dioxide, Phenolic and Explosive Peroxides. Vapours are heavier than air and may travel considerable distances to a source of ignition and flashback. Prevent liquid entering sewers, basements and workpits; vapour may create explosive atmosphere. May form explosive peroxides.

Special protective equipment and precautions for fire fighters

Fire fighters should wear complete protective clothing including self-contained breathing apparatus. Do not breathe fumes. Keep containers cool by spraying with water if exposed to fire. Avoid run off to waterways and sewers.

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SECTION 6: ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures

Ensure adequate ventilation. Stop leak if safe to do so. Eliminate all ignition sources if safe to do so. Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking. Use personal protective equipment as required. See Section: 8. Avoid breathing vapours.

Environmental precautions

Avoid release to the environment. Do not allow to enter drains, sewers or watercourses. Spillages or uncontrolled discharges into watercourses must be alerted to the Environment Agency or other appropriate regulatory body.

Methods and material for containment and cleaning up

Use non-sparking equipment when picking up flammable spill. Adsorb spillages onto sand, earth or any suitable adsorbent material. Transfer to a container for disposal. Ventilate the area and wash spill site after material pick-up is complete. Dispose of this material and its container as hazardous waste

SECTION 7: HANDLING AND STORAGE

Precautions for safe handling

Ensure operatives are trained to minimise exposures. Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Avoid all contact. Avoid breathing vapours. Ensure adequate ventilation. Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking. May form explosive peroxides. Take precautionary measures against static discharges. Use personal protective equipment as required. See Section: 8. Do not eat, drink or smoke when using this product. Wash hands before breaks and after work.

Conditions for safe storage, including any incompatibilities

Ground/bond container and receiving equipment. Keep only in original container. Store in a well-ventilated place. Keep container tightly closed. Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking. May form explosive peroxides. Keep away from direct sunlight.

Storage temperature

Ambient. Keep at temperature not exceeding (°C): 32

Incompatible materials

Stable under normal conditions.

SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

Occupational Exposure Limits

Substances	CAS No.	LTEL (8 hr TWA ppm)	LTEL (8 hr TWA mg/m³)	STEL (ppm)	STEL (mg/m³)	Note	Source
Tetrahydrofuran	109-99-9	50	-	100	-	Skin; A3	ACGIH
		200	590	250	735	-	NIOSH
		200	590	-	-	-	OSHA (Z-1)

Source:

ACGIH: American Conference of Governmental Industrial Hygienists - Threshold limit values (TLV) 2019

NIOSH: National Institute for Occupational Safety and Health (NIOSH) Recommended exposure limits (RELs)

OSHA: Occupational Safety and Health Standards - Permissible Exposure Limit (PEL), 1910.1000 TABLE Z-1

Skin: Danger of cutaneous absorption (skin, mucous membranes and eyes) by contact with vapors, liquids and solids;

A3: Confirmed Animal Carcinogen with Unknown Relevance to Humans. See "Appendix A: Carcinogenicity" of ACGIH book.

Biological Exposure Indices

None assigned.

Appropriate engineering controls

Ensure operatives are trained to minimise exposures. Ensure adequate ventilation. Atmospheric levels should be controlled in compliance with the occupational exposure limit. A washing facility/water for eye and skin cleaning purposes should be present.

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Individual protection measures, such as personal protective equipment (PPE)

General hygiene measures for the handling of chemicals are applicable. Keep good industrial hygiene. Avoid all contact. Avoid breathing vapours. Wash hands before breaks and after work. Keep work clothes separately. Do not eat, drink or smoke at the work place.
IF exposed: Flush with fresh water if contact with skin or eyes.

Protective clothing should be selected specifically for the working place, depending on concentration and quantity of the hazardous substances handled. The resistance of the protective clothing to chemicals should be ascertained with the respective supplier.

Eye/face protection



Wear protective eye glasses for protection against liquid splashes. Wear eye protection with side protection (EN166).

Skin protection



Hand protection:

Wear impervious gloves (EN374). Protective index 6, corresponding > 480 minutes of permeation time according to EN 374.

Gloves should be changed regularly to avoid permeation problems. Breakthrough time of the glove material: refer to the information provided by the gloves' producer. Protective clothing should be selected specifically for the working place, depending on concentration and quantity of the hazardous substances handled. The resistance of the protective clothing to chemicals should be ascertained with the respective supplier.

Recommended:: Polyethylene-Nylon Laminate Gauntlet

Body protection:

Wear impervious protective clothing, including boots, lab coat, apron or coveralls, as appropriate, to prevent skin contact.

Respiratory protection



In case of inadequate ventilation wear respiratory protection. A suitable mask with filter type A (EN141 or EN405) may be appropriate.

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties

Appearance
Odor
Odor Threshold
pH
Melting Point/Freezing Point
Initial boiling point and boiling range
Flash Point
Evaporation rate (Butyl acetate = 1)
Flammability (solid, gas)
Upper/lower flammability or explosive limits
Vapour pressure
Vapour density
Relative density
Solubility(ies)
Partition coefficient: n-octanol/water
Auto-ignition temperature

Almost colourless to pale yellow / Amber Liquid
Ether-like Odour
Not available.
Not established.
Not established.
66°C (Mixture)
-14°C (Tetrahydrofuran) [Closed cup]
>1
Flam. Liq. 2; Highly flammable liquid and vapour.
Flammable Limits (Lower) (%v/v): 1.8, Flammable Limits (Upper) (%v/v) 11.8.
145 mmHg @ 15°C
2.5 (Air = 1)
0.9 g/cm³ (H₂O = 1) (Mixture)
Soluble in: Water
Not available.
Not available.

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Decomposition Temperature	Not available.
Viscosity	Not available.
Other information	
Volatile Organic Compound Content (%)	705 g/L
Explosive properties	Not explosive. May form explosive peroxides.
Oxidising properties	Not oxidising.

SECTION 10: STABILITY AND REACTIVITY

Reactivity	Stable under normal conditions. May form peroxides on prolonged storage if air is present.
Chemical stability	Stable under normal conditions.
Possibility of hazardous reactions	Highly flammable liquid and vapour. The vapour may be invisible, heavier than air and spread along ground. May form explosive peroxides. Contact with aliphatic amines will cause irreversible polymerization with considerable heat build-up. May polymerise on prolonged heating.
Conditions to avoid	Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking. Keep away from direct sunlight. Keep at a temperature not exceeding (°C): 32. Avoid contact with air. Avoid contact with heat and ignition sources and oxidizers. Avoid distillation to dryness, which can form explosive peroxides.
Incompatible materials	Oxidizing agents, Corrosive Substances, Reducing agent, Strong Acids and Alkalis. Mild steel. Reacts violently with - Oxidizing agents and Acids.
Hazardous decomposition product(s)	May decompose in a fire giving off toxic fumes. Carbon monoxide, Carbon dioxide, Phenolic and Explosive Peroxides.

SECTION 11: TOXICOLOGICAL INFORMATION

Information on toxicological effects (Substances in preparations / mixtures)

Acute toxicity - Ingestion	Mixture: Acute Toxicity (oral), Category 4; Harmful if swallowed. Acute Toxicity Estimate Mixture Calculation: Estimated LC50 > 500 mg/kg bw/day.
Acute toxicity - Inhalation	Mixture: Based upon the available data, the classification criteria are not met. Acute Toxicity Estimate Mixture Calculation: Estimated LC50 >20.0 mg/l.
Acute toxicity - Skin Contact	Mixture: Based upon the available data, the classification criteria are not met. Acute Toxicity Estimate Mixture Calculation: Estimated LC50 > 2000 mg/kg bw/day.
Skin corrosion/irritation	Mixture: Based upon the available data, the classification criteria are not met.
Serious eye damage/irritation	Mixture: Serious eye damage, Category 1; Causes serious eye damage.
Respiratory or skin sensitization	Mixture: Skin sensitizer, Category 1; May cause an allergic skin reaction. Respiratory sensitizer, Category 1; May cause allergy or asthma symptoms or breathing difficulties if inhaled.

Tetrahydrofuran	Acute Toxicity (oral), Category 4; Harmful if swallowed. Test Result: LD50 <1 mg/kg bw (Standard acute method) (Unnamed publication, 1971).
1,2,4,5-Benzenetetracarboxylic Dianhydride	Eye irritation, Category 2; Causes eye irritation. (SCL ≥ 25%). EU Harmonised Classification. Test Result: Corrosive to eyes. (rabbit) (Unnamed publication, 1971). Serious eye damage, Category 1; Causes serious eye damage. Test Result: Severe irritant to the eye. (Baur et al, 1995)
1,2,4,5-Benzenetetracarboxylic Dianhydride	Skin sensitizer, Category 1; May cause an allergic skin reaction. Respiratory sensitizer, Category 1; May cause allergy or asthma symptoms or breathing difficulties if inhaled. Test Result: Skin sensitisation has been reported in humans. (Venables, 1989)

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Germ cell mutagenicity	Test Result: Severely irritating to respiratory system. (Venables, 1989)
Carcinogenicity	Mixture: Based upon the available data, the classification criteria are not met.
	Mixture: Carcinogen, Category 2; Suspected of causing cancer.
	Tetrahydrofuran Carcinogen, Category 2; Suspected of causing cancer.
	EU Harmonised Classification.
Reproductive toxicity	Test Result: NOAEC 1800 ppm Suspected carcinogen (Unnamed, 1998)
STOT - single exposure	Mixture: Based upon the available data, the classification criteria are not met.
	Mixture: STOT-single exposure, Category 3; May cause respiratory irritation.
	STOT-single exposure, Category 3; May cause drowsiness or dizziness.
	Tetrahydrofuran STOT-single exposure, Category 3; May cause respiratory irritation. (SCL ≥ 25%).
	EU Harmonised Classification.
	STOT-single exposure, Category 3; May cause drowsiness or dizziness.
STOT - repeated exposure	Test Result: Irritation to respiratory tract (Rat), LC50: 375mg/L air (Unnamed publication, 1979).
Aspiration hazard	Test Result: Central nervous depression, NOEC (rats): 500ppm (Malley et al, 2001)
	Mixture: Based upon the available data, the classification criteria are not met.
	Mixture: Based upon the available data, the classification criteria are not met.
Information on likely routes of exposure	
Inhalation	Possible – accidental exposure
Ingestion	Unlikely – accidental exposure
Skin Contact	Possible – accidental exposure
Eye Contact	Unlikely – accidental exposure
Early onset symptoms related to exposure	Harmful if swallowed. May cause an allergic skin reaction. Causes serious eye damage. May cause allergy or asthma symptoms or breathing difficulties if inhaled. May cause respiratory irritation. May cause drowsiness or dizziness.
Delayed health effects from exposure	Suspected of causing cancer.
Other information	
NTP Report on Carcinogens	Not listed
IARC Monographs	Tetrahydrofuran: Group 2B.
OSHA Designated Carcinogen	Not listed

SECTION 12: ECOLOGICAL INFORMATION

Ecotoxicity	Based upon the available data, the classification criteria are not met.
Persistence and degradability	Estimated Mixture LC50 >100 mg/l (Fish)
Bioaccumulative potential	This product is readily biodegradable in water.
Mobility in soil	The product has low potential for bioaccumulation.
Other adverse effects	The product is predicted to have high mobility in soil. (Water Soluble)
	None known.

SECTION 13: DISPOSAL CONSIDERATIONS

Waste treatment methods	Dispose of this material and its container as hazardous waste. Send after pre-treatment to a appropriate hazardous waste incinerator facility according to legislation. Dispose of contents in accordance with local, state or national legislation.
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SECTION 14: TRANSPORT INFORMATION

UN number	ADR/RID	IMDG	IATA
	UN 1133	UN 1133	UN 1133

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UN proper shipping name	ADHESIVES containing flammable liquid	ADHESIVES containing flammable liquid	ADHESIVES containing flammable liquid
Transport hazard class(es)	3	3	3
Packing group	II	II	II
Environmental hazards	Not classified	Not classified as a Marine Pollutant.	Not classified
Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code	See Section: 2		
Special precautions for user	Not applicable.		

SECTION 15: REGULATORY INFORMATION

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

US Federal Regulations

TSCA (Toxic Substance Control Act)	Tetrahydrofuran: Listed 1,2,4,5-Benzenetetracarboxylic Dianhydride: Listed
EPCRA/ SARA 302 - Extremely Hazardous Substances	Not listed
SARA Title III Section 313 Toxic Release Inventory	Not listed
NIOSH Occupational Carcinogen List	Not listed
OSHA (List of Highly Hazardous Chemicals, Toxics and Reactives)	Not listed
NTP Report on Carcinogens	Not listed
Poison Prevention Packaging Act	Not listed

US State Regulations

California Proposition 65 list of chemicals	Tetrahydrofuran: Listed (Listing by the Labour Code mechanism, Group member list: 2-Ethylhexyl acrylate, Methy acrylate, Trimethylolpropane triacrylate) 1,2,4,5-Benzenetetracarboxylic Dianhydride: Yes (Candidate Chemicals List)
California State Safer Consumer Products Regulations	Not listed
Maine State, Toxic Chemicals in Children's Products Act	Tetrahydrofuran: Listed
New Jersey State Worker and Community RTK Act	Tetrahydrofuran: Listed
Pennsylvania State, Worker and Community RTK Act	Tetrahydrofuran: Listed
Rhode Island State, Hazardous Substances RTK Act	Tetrahydrofuran: Listed

Non-Regional

IARC Monographs - List of Classifications	Tetrahydrofuran: Group 2B.
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SECTION 16: OTHER INFORMATION

The following sections contain revisions or new statements: Updated substance / mixture classification. New SDS Regulation Hazcom 2012 format, all sections have been updated to include new information. Please review SDS with care.

Version	4.0
Revision date	17 February 2022
Date of First Issue	20 March 2012

References:

Existing Safety Data Sheet (SDS).

EU data: Existing ECHA registration(s) for and Harmonised Classification(s) for Tetrahydrofuran (CAS No. 109-99-9) and 1,2,4,5-Benzenetetracarboxylic Dianhydride (CAS No. 89-32-7). Existing ECHA registration(s) for Tetrahydrofuran (CAS No. 109-99-9).

Literature References:

1. Baur X; Czuppon AB; Rauluk I; Zimmermann FB; Schmitt B; Egen-Korthaus M; Tenkoff N; Degens PO, 1995, A Clinical and Immunological Study on 92 Workers Occupationally Exposed to Anhydrides, International Archives of Occupational and Environmental Health, Vol. 67, No. 6, pages 395-403, 32 references, 1995
2. Venables KM, 1989, Low Molecular Weight Chemicals, Hypersensitivity, and Direct Toxicity: The Acid Anhydrides, British Journal of Industrial Medicine, Vol. 46, No. 4, pages 222-232, 112 references, 1989
3. Malley, L.A., Christoph G.R., Stadler, J.C., Hansen, J.F., Biesemeir, J.A. and Jasti, S. (2001). Acute and subchronic neurotoxicology evaluation of tetrahydrofuran by inhalation in rats. Drug Chem. Toxicol., 24(3): 201-219

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GHS Classification of the substance or mixture	Classification Procedure
Flammable Liquid, Category 2	Flash Point Test Result
Acute Toxicity - Oral, Category 4	Acute Toxicity Estimate (ATE) Calculation.
Skin Sensitizer, Category 1	Threshold Calculation
Eye Damage, Category 1	Threshold Calculation
Respiratory Sensitizer, Category 1	Threshold Calculation
STOT, Single Exposure, Category 3 - Respiratory Tract Irritation	Threshold Calculation
STOT, Single Exposure, Category 3 - Narcotic Effects	Threshold Calculation
Carcinogen, Category 2	Threshold Calculation

LEGEND

ACGIH	American Conference of Governmental Industrial Hygienists
ADR/RID	European Agreement concerning the International Carriage of Dangerous Goods by Road/ Regulations concerning the International Carriage of Dangerous Goods by Rail
CAS	Chemical Abstracts Service
EC	European Community
EU	European Union
ICAO/IATA	International Civil Aviation Organization / International Air Transport Association
IMDG	International Maritime Dangerous Goods
IARC	International Agency for Research on Cancer
NIOSH	National Institute for Occupational Safety & Health
NOAEC	No observed adverse effect concentration
NTP	National Toxicology Program
OSHA	Occupational Safety & Health Administration
PEL	Permissible Exposure Limit
REL	Recommended exposure limit
SCL	Specific Concentration Limit
STEL	Short-term Exposure Limit
TLV	Threshold Limit Value
TSCA	Toxic Substance Control Act
TWA	Time Weighted Average
UN	United Nations

Training advice: Consideration should be given to the work procedures involved and the potential extent of exposure as they may determine whether a higher level of protection is required.

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