

## Trace Metals in Drinking Water Standard

### High-Purity Standards

Catalogue number: CRM-TMDW  
Version No: 1.1  
Safety Data Sheet according to OSHA HazCom Standard (2012) requirements

Chemwatch Hazard Alert Code: 3

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S.GHS.USA.EN

## SECTION 1 IDENTIFICATION

### Product Identifier

Product name	Trace Metals in Drinking Water Standard
Synonyms	CRM-TMDW
Proper shipping name	Corrosive liquid, acidic, inorganic, n.o.s.
Other means of identification	CRM-TMDW

### Recommended use of the chemical and restrictions on use

Relevant identified uses	Use according to manufacturer's directions.
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### Name, address, and telephone number of the chemical manufacturer, importer, or other responsible party

Registered company name	High-Purity Standards
Address	PO Box 41727 SC 29423 United States
Telephone	843-767-7900
Fax	843-767-7906
Website	highpuritystandards.com
Email	Not Available

### Emergency phone number


Association / Organisation	INFOTRAC
Emergency telephone numbers	1-800-535-5053
Other emergency telephone numbers	1-352-323-3500

## SECTION 2 HAZARD(S) IDENTIFICATION

### Classification of the substance or mixture

Classification	Acute Toxicity (Oral) Category 4, Acute Toxicity (Dermal) Category 4, Metal Corrosion Category 1, Skin Corrosion/Irritation Category 1A
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### Label elements

GHS label elements	
SIGNAL WORD	<b>DANGER</b>

### Hazard statement(s)

H302	Harmful if swallowed.
H312	Harmful in contact with skin.
H290	May be corrosive to metals.
H314	Causes severe skin burns and eye damage.

### Hazard(s) not otherwise specified

Not Applicable

**Precautionary statement(s) Prevention**

<b>P260</b>	Do not breathe dust/fume/gas/mist/vapours/spray.
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**Precautionary statement(s) Response**

<b>P301+P330+P331</b>	IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.
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**Precautionary statement(s) Storage**

<b>P405</b>	Store locked up.
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**Precautionary statement(s) Disposal**

<b>P501</b>	Dispose of contents/container in accordance with local regulations.
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**SECTION 3 COMPOSITION / INFORMATION ON INGREDIENTS****Substances**

See section below for composition of Mixtures

**Mixtures**

CAS No	%[weight]	Name
7429-90-5	0.000012	<u>aluminium</u>
7440-36-0	0.000001	<u>antimony</u>
7440-38-2	0.000008	<u>arsenic</u>
7440-39-3	0.000005	<u>barium</u>
543-81-7	0.000002	<u>beryllium acetate</u>
7440-69-9	0.000001	<u>bismuth</u>
7440-43-9	0.000001	<u>cadmium</u>
7440-70-2	0.0035	<u>calcium</u>
7440-47-3	0.000002	<u>chromium</u>
7440-48-4	0.0000025	<u>cobalt</u>
7440-50-8	0.000002	<u>copper</u>
7439-89-6	0.00001	<u>iron</u>
7439-92-1	0.000004	<u>lead</u>
7439-93-2	0.000002	<u>lithium</u>
7439-95-4	0.0009	<u>magnesium</u>
6156-78-1	0.000004	<u>manganese(II) acetate tetrahydrate</u>
7439-98-7	0.00001	<u>molybdenum</u>
7440-02-0	0.000006	<u>nickel</u>
7440-09-7	0.00025	<u>potassium</u>
7440-17-7	0.000001	<u>rubidium</u>
7782-49-2	0.000001	<u>selenium</u>
7440-22-4	0.0000002	<u>silver</u>
7440-23-5	0.0006	<u>sodium</u>
7440-24-6	0.000025	<u>strontium</u>
13494-80-9	0.0000003	<u>tellurium</u>
7440-28-0	0.000001	<u>thallium</u>
7440-61-1	0.000001	<u>uranium natural</u>
7803-55-6	0.000003	<u>ammonium metavanadate</u>
7697-37-2	2	<u>nitric acid</u>
7664-39-3	0-0.49	<u>hydrofluoric acid</u>
7732-18-5	Balance	<u>water</u>
7440-66-6	0.000007	<u>zinc</u>

**SECTION 4 FIRST-AID MEASURES****Description of first aid measures****Eye Contact**

If this product comes in contact with the eyes:

- ▶ Immediately hold eyelids apart and flush the eye continuously with running water.
- ▶ Ensure complete irrigation of the eye by keeping eyelids apart and away from eye and moving the eyelids by occasionally lifting the upper and lower lids.
- ▶ Continue flushing until advised to stop by the Poisons Information Centre or a doctor, or for at least 15 minutes.

	<ul style="list-style-type: none"> <li>▶ Transport to hospital or doctor without delay.</li> <li>▶ Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.</li> </ul>
<b>Skin Contact</b>	<p>If there is evidence of severe skin irritation or skin burns:</p> <ul style="list-style-type: none"> <li>▶ Avoid further contact. Immediately remove contaminated clothing, including footwear.</li> <li>▶ Flush skin under running water for 15 minutes.</li> <li>▶ Avoiding contamination of the hands, massage calcium gluconate gel into affected areas, pay particular attention to creases in skin.</li> <li>▶ Contact the Poisons Information Centre.</li> <li>▶ Continue gel application for at least 15 minutes after burning sensation ceases.</li> <li>▶ If pain recurs, repeat application of calcium gluconate gel or apply every 20 minutes.</li> <li>▶ If no gel is available, continue washing for at least 15 minutes, using soap if available. If patient is conscious, give six calcium gluconate or calcium carbonate tablets in water by mouth.</li> <li>▶ Transport to hospital, or doctor, urgently.</li> </ul>
<b>Inhalation</b>	<ul style="list-style-type: none"> <li>▶ If fumes or combustion products are inhaled remove from contaminated area.</li> <li>▶ Lay patient down. Keep warm and rested.</li> <li>▶ Prostheses such as false teeth, which may block airway, should be removed, where possible, prior to initiating first aid procedures.</li> <li>▶ Apply artificial respiration if not breathing, preferably with a demand valve resuscitator, bag-valve mask device, or pocket mask as trained. Perform CPR if necessary.</li> <li>▶ Transport to hospital, or doctor, without delay.</li> <li>▶ Inhalation of vapours or aerosols (mists, fumes) may cause lung oedema.</li> <li>▶ Corrosive substances may cause lung damage (e.g. lung oedema, fluid in the lungs).</li> <li>▶ As this reaction may be delayed up to 24 hours after exposure, affected individuals need complete rest (preferably in semi-recumbent posture) and must be kept under medical observation even if no symptoms are (yet) manifested.</li> <li>▶ Before any such manifestation, the administration of a spray containing a dexamethasone derivative or beclomethasone derivative may be considered.</li> </ul> <p><b>This must definitely be left to a doctor or person authorised by him/her.</b> (ICSC13719)</p> <p>For massive exposures:</p> <ul style="list-style-type: none"> <li>▶ If dusts, vapours, aerosols, fumes or combustion products are inhaled, remove from contaminated area.</li> <li>▶ Lay patient down.</li> <li>▶ Keep warm and rested.</li> <li>▶ Prostheses such as false teeth, which may block airway, should be removed, where possible, prior to initiating first aid procedures.</li> <li>▶ Apply artificial respiration if not breathing, preferably with a demand valve resuscitator, bag-valve mask device, or pocket mask as trained. Perform CPR if necessary.</li> <li>▶ If victim is conscious, give six calcium gluconate or calcium carbonate tablets in water by mouth.</li> <li>▶ Transport to hospital, or doctor, urgently.</li> </ul>
<b>Ingestion</b>	<ul style="list-style-type: none"> <li>▶ For advice, contact a Poisons Information Centre or a doctor at once.</li> <li>▶ Urgent hospital treatment is likely to be needed.</li> <li>▶ <b>If swallowed do NOT induce vomiting.</b></li> <li>▶ If vomiting occurs, lean patient forward or place on left side (head-down position, if possible) to maintain open airway and prevent aspiration.</li> <li>▶ Observe the patient carefully.</li> <li>▶ Never give liquid to a person showing signs of being sleepy or with reduced awareness; i.e. becoming unconscious.</li> <li>▶ Give water to rinse out mouth, then provide liquid slowly and as much as casualty can comfortably drink.</li> <li>▶ Transport to hospital or doctor without delay.</li> </ul>

### Most important symptoms and effects, both acute and delayed

See Section 11

### Indication of any immediate medical attention and special treatment needed

Following acute or short term repeated exposure to hydrofluoric acid:

- ▶ Subcutaneous injections of Calcium Gluconate may be necessary around the burnt area. Continued application of Calcium Gluconate Gel or subcutaneous Calcium Gluconate should then continue for 3-4 days at a frequency of 4-6 times per day. If a "burning" sensation recurs, apply more frequently.
- ▶ Systemic effects of extensive hydrofluoric acid burns include renal damage, hypocalcaemia and consequent cardiac arrhythmias. Monitor haematological, respiratory, renal, cardiac and electrolyte status at least daily. Tests should include FBE, blood gases, chest X-ray, creatinine and electrolytes, urine output, Ca ions, Mg ions and phosphate ions. Continuous ECG monitoring may be required.
- ▶ Where serum calcium is low, or clinical, or ECG signs of hypocalcaemia develop, infusions of calcium gluconate, or if less serious, oral Sandocal, should be given. Hydrocortisone 500 mg in a four to six hourly infusion may help.
- ▶ Antibiotics should not be given as a routine, but only when indicated.
- ▶ Eye contact pain may be excruciating and 2-3 drops of 0.05% pentocaine hydrochloride may be instilled, followed by further irrigation

#### BIOLOGICAL EXPOSURE INDEX - BEI

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

Determinant	Index	Sampling Time	Comments
1. Methaemoglobin in blood	1.5% of haemoglobin	During or end of shift	B, NS, SQ

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

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

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

For acute or short term repeated exposures to fluorides:

- ▶ Fluoride absorption from gastro-intestinal tract may be retarded by calcium salts, milk or antacids.
- ▶ Fluoride particulates or fume may be absorbed through the respiratory tract with 20-30% deposited at alveolar level.
- ▶ Peak serum levels are reached 30 mins. post-exposure; 50% appears in the urine within 24 hours.
- ▶ For acute poisoning (endotracheal intubation if inadequate tidal volume), monitor breathing and evaluate/monitor blood pressure and pulse frequently since shock may supervene with little warning. Monitor ECG immediately; watch for arrhythmias and evidence of Q-T prolongation or T-wave changes. Maintain monitor. Treat shock vigorously with isotonic saline (in 5% glucose) to restore blood volume and enhance renal excretion.
- ▶ Where evidence of hypocalcaemic or normocalcaemic tetany exists, calcium gluconate (10 ml of a 10% solution) is injected to avoid tachycardia.

#### BIOLOGICAL EXPOSURE INDEX - BEI

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

Determinant	Index	Sampling Time	Comments
Fluorides in urine	3 mg/gm creatinine 10mg/gm creatinine	Prior to shift End of shift	B, NS B, NS

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

NS: Non-specific determinant; also observed after exposure to other exposures.

## SECTION 5 FIRE-FIGHTING MEASURES

### Extinguishing media

- There is no restriction on the type of extinguisher which may be used.
- Use extinguishing media suitable for surrounding area.

### Special hazards arising from the substrate or mixture

<b>Fire Incompatibility</b>	None known.
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### Special protective equipment and precautions for fire-fighters

Fire Fighting	
<b>Fire/Explosion Hazard</b>	<ul style="list-style-type: none"> <li>Non combustible.</li> <li>Not considered to be a significant fire risk.</li> <li>Acids may react with metals to produce hydrogen, a highly flammable and explosive gas.</li> <li>Heating may cause expansion or decomposition leading to violent rupture of containers.</li> <li>May emit corrosive, poisonous fumes. May emit acrid smoke.</li> </ul> <p>When aluminium oxide dust is dispersed in air, firefighters should wear protection against inhalation of dust particles, which can also contain hazardous substances from the fire absorbed on the alumina particles.</p> <p>May emit corrosive fumes.</p>

## SECTION 6 ACCIDENTAL RELEASE MEASURES

### Personal precautions, protective equipment and emergency procedures

See section 8

### Environmental precautions

See section 12

### Methods and material for containment and cleaning up

<b>Minor Spills</b>	<ul style="list-style-type: none"> <li>Drains for storage or use areas should have retention basins for pH adjustments and dilution of spills before discharge or disposal of material.</li> <li>Check regularly for spills and leaks.</li> <li>Clean up all spills immediately.</li> <li>Avoid breathing vapours and contact with skin and eyes.</li> <li>Control personal contact with the substance, by using protective equipment.</li> <li>Contain and absorb spill with sand, earth, inert material or vermiculite.</li> <li>Wipe up.</li> <li>Place in a suitable, labelled container for waste disposal.</li> </ul>
<b>Major Spills</b>	<ul style="list-style-type: none"> <li>Clear area of personnel and move upwind.</li> <li>Alert Fire Brigade and tell them location and nature of hazard.</li> <li>Wear breathing apparatus plus protective gloves.</li> <li>Prevent, by any means available, spillage from entering drains or water course.</li> <li>Stop leak if safe to do so.</li> <li>Contain spill with sand, earth or vermiculite.</li> <li>Collect recoverable product into labelled containers for recycling.</li> <li>Neutralise/decontaminate residue (see Section 13 for specific agent).</li> <li>Collect solid residues and seal in labelled drums for disposal.</li> <li>Wash area and prevent runoff into drains.</li> <li>After clean up operations, decontaminate and launder all protective clothing and equipment before storing and re-using.</li> <li>If contamination of drains or waterways occurs, advise emergency services.</li> </ul>

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

## SECTION 7 HANDLING AND STORAGE

### Precautions for safe handling

<b>Safe handling</b>	<ul style="list-style-type: none"> <li>Avoid all personal contact, including inhalation.</li> <li>Wear protective clothing when risk of exposure occurs.</li> <li>Use in a well-ventilated area.</li> <li><b>WARNING: To avoid violent reaction, ALWAYS add material to water and NEVER water to material.</b></li> <li>Avoid smoking, naked lights or ignition sources.</li> <li>Avoid contact with incompatible materials.</li> <li>When handling, <b>DO NOT eat, drink or smoke.</b></li> <li>Keep containers securely sealed when not in use.</li> <li>Avoid physical damage to containers.</li> <li>Always wash hands with soap and water after handling.</li> <li>Work clothes should be laundered separately. Launder contaminated clothing before re-use.</li> <li>Use good occupational work practice.</li> <li>Observe manufacturer's storage and handling recommendations contained within this SDS.</li> <li>Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions are maintained.</li> </ul>
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<b>Other information</b>	<ul style="list-style-type: none"> <li>▶ Store in original containers.</li> <li>▶ Keep containers securely sealed.</li> <li>▶ Store in a cool, dry, well-ventilated area.</li> <li>▶ Store away from incompatible materials and foodstuff containers.</li> <li>▶ Protect containers against physical damage and check regularly for leaks.</li> <li>▶ Observe manufacturer's storage and handling recommendations contained within this SDS.</li> </ul>
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#### Conditions for safe storage, including any incompatibilities

<b>Suitable container</b>	<ul style="list-style-type: none"> <li>▶ <b>DO NOT use aluminium or galvanised containers</b></li> <li>▶ Lined metal can, lined metal pail/ can.</li> <li>▶ Plastic pail.</li> <li>▶ Polyliner drum.</li> <li>▶ Packing as recommended by manufacturer.</li> <li>▶ Check all containers are clearly labelled and free from leaks.</li> </ul> <p>For low viscosity materials</p> <ul style="list-style-type: none"> <li>▶ Drums and jericans must be of the non-removable head type.</li> <li>▶ Where a can is to be used as an inner package, the can must have a screwed enclosure.</li> </ul> <p>For materials with a viscosity of at least 2680 cSt. (23 deg. C) and solids (between 15 C deg. and 40 deg C.):</p> <ul style="list-style-type: none"> <li>▶ Removable head packaging;</li> <li>▶ Cans with friction closures and</li> <li>▶ low pressure tubes and cartridges</li> </ul> <p>may be used.</p> <p>-</p> <p>Where combination packages are used, and the inner packages are of glass, porcelain or stoneware, there must be sufficient inert cushioning material in contact with inner and outer packages unless the outer packaging is a close fitting moulded plastic box and the substances are not incompatible with the plastic.</p> <ul style="list-style-type: none"> <li>▶ Material is corrosive to most metals, glass and other siliceous materials.</li> </ul>
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<b>Storage incompatibility</b>	<p>For aluminas (aluminium oxide):</p> <p>Incompatible with hot chlorinated rubber.</p> <p>In the presence of chlorine trifluoride may react violently and ignite.</p> <p>-May initiate explosive polymerisation of olefin oxides including ethylene oxide.</p> <p>-Produces exothermic reaction above 200 C with halocarbons and an exothermic reaction at ambient temperatures with halocarbons in the presence of other metals.</p> <p>-Produces exothermic reaction with oxygen difluoride.</p> <p>-May form explosive mixture with oxygen difluoride.</p> <p>-Forms explosive mixtures with sodium nitrate.</p> <p>-Reacts vigorously with vinyl acetate.</p> <p>Aluminium oxide is an amphoteric substance, meaning it can react with both acids and bases, such as hydrofluoric acid and sodium hydroxide, acting as an acid with a base and a base with an acid, neutralising the other and producing a salt.</p> <p>Inorganic acids are generally soluble in water with the release of hydrogen ions. The resulting solutions have pH's of less than 7.0.</p> <ul style="list-style-type: none"> <li>▶ Inorganic acids neutralise chemical bases (for example: amines and inorganic hydroxides) to form salts - neutralisation can generate dangerously large amounts of heat in small spaces.</li> <li>▶ The dissolution of inorganic acids in water or the dilution of their concentrated solutions with additional water may generate significant heat.</li> <li>▶ The addition of water to inorganic acids often generates sufficient heat in the small region of mixing to cause some of the water to boil explosively. The resulting "bumping" can spatter the acid.</li> <li>▶ Inorganic acids react with active metals, including such structural metals as aluminum and iron, to release hydrogen, a flammable gas.</li> <li>▶ Inorganic acids can initiate the polymerisation of certain classes of organic compounds.</li> <li>▶ Inorganic acids react with cyanide compounds to release gaseous hydrogen cyanide.</li> <li>▶ Inorganic acids generate flammable and/or toxic gases in contact with dithiocarbamates, isocyanates, mercaptans, nitrides, nitriles, sulfides, and strong reducing agents. Additional gas-generating reactions occur with sulfites, nitrites, thiosulfates (to give H2S and SO3), dithionites (SO2), and even carbonates.</li> <li>▶ Acids often catalyse (increase the rate of) chemical reactions.</li> </ul> <p>Salts of inorganic fluoride:</p> <ul style="list-style-type: none"> <li>▶ react with water forming acidic solutions.</li> <li>▶ are violent reactive with boron, bromine pentafluoride, bromine trifluoride, calcium disilicide, calcium hydride, oxygen difluoride, platinum, potassium.</li> <li>▶ in aqueous solutions are incompatible with sulfuric acid, alkalis, ammonia, aliphatic amines, alkanolamines, alkylene oxides, amides, epichlorohydrin, isocyanates, nitromethane, organic anhydrides, vinyl acetate.</li> <li>▶ corrode metals in presence of moisture</li> <li>▶ may be incompatible with glass and porcelain</li> <li>▶ Reacts with mild steel, galvanised steel / zinc producing hydrogen gas which may form an explosive mixture with air.</li> </ul> <p>Hydrogen fluoride:</p> <ul style="list-style-type: none"> <li>▶ reacts violently with strong oxidisers, acetic anhydride, alkalis, 2-aminoethanol, arsenic trioxide (with generation of heat), bismuthic acid, calcium oxide, chlorosulfonic acid, cyanogen fluoride, ethylenediamine, ethyleneimine, fluorine (fluorine gas reacts vigorously with a 50% hydrofluoric acid solution and may burst into flame), nitrogen trifluoride, N-phenylazopiperidine, oleum, oxygen difluoride, phosphorus pentoxide, potassium permanganate, potassium tetrafluorosilicate(2-), beta-propiolactone, propylene oxide, sodium, sodium tetrafluorosilicate, sulfuric acid, vinyl acetate</li> <li>▶ reacts (possibly violently) with aliphatic amines, alcohols, alkanolamines, alkylene oxides, aromatic amines, amides, ammonia, ammonium hydroxide, epichlorohydrin, isocyanates, metal acetylides, metal silicides, methanesulfonic acid, nitrogen compounds, organic anhydrides, oxides, silicon compounds, vinylidene fluoride</li> <li>▶ attacks glass and siliceous materials, concrete, ceramics, metals (flammable hydrogen gas may be produced), metal alloys, some plastics, rubber coatings, leather, and most other materials with the exception of lead, platinum, polyethylene, wax.</li> <li>▶ Avoid strong acids, acid chlorides, acid anhydrides and chloroformates.</li> </ul>
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## SECTION 8 EXPOSURE CONTROLS / PERSONAL PROTECTION

### Control parameters

#### OCCUPATIONAL EXPOSURE LIMITS (OEL)

#### INGREDIENT DATA

Source	Ingredient	Material name	TWA	STEL	Peak	Notes
US OSHA Permissible Exposure Levels (PELs) - Table Z1	aluminium	Aluminum, metal / Aluminum, metal-Respirable fraction	15 mg/m3 / 5 mg/m3	Not Available	Not Available	Total dust; (as Al) / (as Al)

## Trace Metals in Drinking Water Standard

US ACGIH Threshold Limit Values (TLV)	aluminium	Silver, and compounds - Metal, dust and fume	0.1 mg/m3	Not Available	Not Available	TLV® Basis: Argyria
US ACGIH Threshold Limit Values (TLV)	aluminium	Aluminum metal and insoluble compounds	1 mg/m3	Not Available	Not Available	TLV® Basis: Pneumoconiosis; LRT irr; neurotoxicity
US NIOSH Recommended Exposure Limits (RELs)	aluminium	Aluminium, Aluminum metal, Aluminum powder, Elemental aluminum	10 (total), 5 (resp) mg/m3	Not Available	Not Available	Not Available
US OSHA Permissible Exposure Levels (PELs) - Table Z1	antimony	Antimony and compounds	0.5 mg/m3	Not Available	Not Available	(as Sb)
US ACGIH Threshold Limit Values (TLV)	antimony	Antimony and compounds, as Sb	0.5 mg/m3	Not Available	Not Available	TLV® Basis: Skin & URT irr
US NIOSH Recommended Exposure Limits (RELs)	antimony	Antimony metal, Antimony powder, Stibium	0.5 mg/m3	Not Available	Not Available	[*Note: The REL also applies to other antimony compounds (as Sb).]
US OSHA Permissible Exposure Levels (PELs) - Table Z1	arsenic	Arsenic-inorganic compounds	0.01 mg/m3	Not Available	Not Available	see 1910.1018;(as As)
US ACGIH Threshold Limit Values (TLV)	arsenic	Arsenic and inorganic compounds, as As	0.01 mg/m3	Not Available	Not Available	TLV® Basis: Lung cancer; BEI
US NIOSH Recommended Exposure Limits (RELs)	arsenic	Arsenic metal: Arsenia	Not Available	Not Available	0.002 mg/m3	Ca See Appendix A
US OSHA Permissible Exposure Levels (PELs) - Table Z1	barium	Barium, soluble compounds	0.5 mg/m3	Not Available	Not Available	(as Ba)
US ACGIH Threshold Limit Values (TLV)	barium	Barium and soluble compounds, as Ba(1990)	0.5 mg/m3	Not Available	Not Available	TLV® Basis: Eye, skin, & GI irr; muscular stim
US OSHA Permissible Exposure Levels (PELs) - Table Z1	beryllium acetate	Silicates - Mica / Silicates - Soapstone / Silicates- Soapstone / Silicates - Talc / Silicates - Tremolite, asbestiform	0.1 mg/m3	Not Available	Not Available	See Table Z-3;less than 1% crystalline silica(respirable dust) / See Table Z-3;less than 1% crystalline silica, total dust / See Table Z-3;less than 1% crystalline silica, respirable dust / less than 1% crystalline silica;see 29 CFR 1910.1001;See Table Z-3;(containing asbestos); use asbestos limit; (STEL (Excursion limit)(as averaged over a sampling period of 30 minutes)) / less than 1% crystalline silica;See Table Z-3, (containing no asbestos), respirable dust / (as quartz), respirable dust;ess than 1% crystalline silica;see 1910.1001;(STEL (Excursion limit)(as averaged over a sampling period of 30 minutes))
US OSHA Permissible Exposure Levels (PELs) - Table Z1	beryllium acetate	Beryllium and beryllium compounds / Zirconium compounds	5 mg/m3	Not Available	Not Available	See Table Z-2;(as Be) / (as Zr)
US OSHA Permissible Exposure Levels (PELs) - Table Z2	beryllium acetate	Beryllium and beryllium compounds	0.002 mg/m3	Not Available	0.005 mg/m3	(Z37.29–1970)
US OSHA Permissible Exposure Levels (PELs) - Table Z3	beryllium acetate	Silicates: Mica / Silicates: Soapstone / Silicates: Talc / Silicates: Tremolite, asbestiforms	0.1 f/cc / 20 mppcf	Not Available	Not Available	(less than 1% crystalline silica) / (containing asbestos) Use asbestos limit;(less than 1% crystalline silica) / (see 29 CFR 1910.1001);(less than 1% crystalline silica)
US ACGIH Threshold Limit Values (TLV)	beryllium acetate	Beryllium and compounds, as Be / Beryllium and compounds, as Be - Soluble and insoluble compounds	0.00005 mg/m3	Not Available	Not Available	TLV® Basis: Beryllium sens; chronic beryllium disease (berylliosis)
US OSHA Permissible Exposure Levels (PELs) - Table Z1	cadmium	Cadmium	0.005 mg/m3	Not Available	Not Available	see 1910.1027;(as Cd)
US OSHA Permissible Exposure Levels (PELs) - Table Z2	cadmium	Cadmium fume / Cadmium dust	0.1 mg/m3 / 0.2 mg/m3	Not Available	0.3 mg/m3 / 0.6 mg/m3	(Z37.5–1970);This standard applies to any operations or sectors for which the Cadmium standard, 1910.1027, is stayed or otherwise not in effect
US ACGIH Threshold Limit Values (TLV)	cadmium	Cadmium	0.01 mg/m3	Not Available	Not Available	TLV® Basis: Kidney dam; BEI
US NIOSH Recommended Exposure Limits (RELs)	cadmium	Cadmium metal: Cadmium	Not Available	Not Available	Not Available	Ca See Appendix A [*Note: The REL applies to all Cadmium compounds (as Cd).]
US OSHA Permissible Exposure Levels (PELs) - Table Z1	chromium	Chromium metal and insol. salts	1 mg/m3	Not Available	Not Available	(as Cr)
US ACGIH Threshold Limit Values (TLV)	chromium	Chromium, and inorganic compounds, as Cr - Metal and Cr III	0.5 mg/m3	Not Available	Not Available	TLV® Basis: URT & skin irr

## Trace Metals in Drinking Water Standard

		compounds				
US NIOSH Recommended Exposure Limits (RELs)	chromium	Chrome, Chromium	0.5 mg/m3	Not Available	Not Available	See Appendix C
US OSHA Permissible Exposure Levels (PELs) - Table Z1	cobalt	Cobalt metal, dust, and fume	0.1 mg/m3	Not Available	Not Available	(as Co)
US ACGIH Threshold Limit Values (TLV)	cobalt	Hard metals containing Cobalt and Tungsten carbide, as Co	0.005 mg/m3	Not Available	Not Available	TLV® Basis: Pneumonitis
US NIOSH Recommended Exposure Limits (RELs)	cobalt	Cobalt metal dust, Cobalt metal fume	0.05 mg/m3	Not Available	Not Available	Not Available
US OSHA Permissible Exposure Levels (PELs) - Table Z1	copper	Selenium compounds	0.2 mg/m3	Not Available	Not Available	(as Se)
US OSHA Permissible Exposure Levels (PELs) - Table Z1	copper	Copper - Fume / Copper	0.1 mg/m3 / 1 mg/m3	Not Available	Not Available	(as Cu) / (as Cu);Dusts and mists
US ACGIH Threshold Limit Values (TLV)	copper	Copper - Fume, as Cu / Copper - Dusts and mists, as Cu	0.2 mg/m3 / 1 mg/m3	Not Available	Not Available	TLV® Basis: Irr; GI; metal fume fever; BEI
US NIOSH Recommended Exposure Limits (RELs)	copper	Copper metal dusts, Copper metal fumes	1 mg/m3	Not Available	Not Available	[*Note: The REL also applies to other copper compounds (as Cu) except Copper fume.]
US OSHA Permissible Exposure Levels (PELs) - Table Z1	iron	Manganese compounds / Manganese fume	Not Available	Not Available	5 mg/m3	(as Mn)
US OSHA Permissible Exposure Levels (PELs) - Table Z3	iron	Inert or Nuisance Dust	5 mg/m3 / 15 mg/m3 / 15 mppcf / 50 mppcf	Not Available	Not Available	Respirable fraction;All inert or nuisance dusts, whether mineral, inorganic, or organic, not listed specifically by substance name are covered by this limit, which is the same as the Particulates Not Otherwise Regulated (PNOR) limit in Table Z-1. / Total dust;All inert or nuisance dusts, whether mineral, inorganic, or organic, not listed specifically by substance name are covered by this limit, which is the same as the Particulates Not Otherwise Regulated (PNOR) limit in Table Z-1.
US OSHA Permissible Exposure Levels (PELs) - Table Z1	lead	Lead, inorganic	0.05 mg/m3	Not Available	Not Available	(as Pb);see 1910.1025;If an employee is exposed to lead for more than 8 hours in any work day, the permissible exposure limit, as a time weighted average (TWA) for that day, shall be reduced according to the following formula: Maximum permissible limit (in µg/m3 )=400÷hours worked in the day.
US OSHA Permissible Exposure Levels (PELs) - Table Z2	lead	Cadmium fume / Cadmium dust	0.1 mg/m3 / 0.2 mg/m3	Not Available	0.3 mg/m3 / 0.6 mg/m3	(Z37.5–1970);This standard applies to any operations or sectors for which the Cadmium standard, 1910.1027, is stayed or otherwise not in effect
US ACGIH Threshold Limit Values (TLV)	lead	Lead and inorganic compounds, as Pb	0.05 mg/m3	Not Available	Not Available	TLV® Basis: CNS & PNS impair; hematologic eff; BEI
US ACGIH Threshold Limit Values (TLV)	lead	Cadmium and compounds, as Cd	0.002 mg/m3	Not Available	Not Available	TLV® Basis: Kidney dam; BEI
US NIOSH Recommended Exposure Limits (RELs)	lead	Lead metal, Plumbum	0.050 mg/m3	Not Available	Not Available	See Appendix C [*Note: The REL also applies to other lead compounds (as Pb) -- see Appendix C.]
US NIOSH Recommended Exposure Limits (RELs)	lithium	Synonyms vary depending upon the specific aluminum compound.	5 mg/m3 / 2 mg/m3	Not Available	Not Available	Not Available
US OSHA Permissible Exposure Levels (PELs) - Table Z1	magnesium	Manganese compounds / Manganese fume	Not Available	Not Available	5 mg/m3	(as Mn)
US OSHA Permissible Exposure Levels (PELs) - Table Z3	magnesium	Inert or Nuisance Dust	5 mg/m3 / 15 mg/m3 / 15 mppcf / 50 mppcf	Not Available	Not Available	Respirable fraction;All inert or nuisance dusts, whether mineral, inorganic, or organic, not listed specifically by substance name are covered by this limit, which is the same as the Particulates Not Otherwise Regulated (PNOR) limit in Table Z-1. / Total dust;All inert or nuisance dusts, whether mineral, inorganic, or organic, not listed specifically by substance name are covered by this limit, which is the same as the Particulates Not Otherwise Regulated (PNOR) limit in Table Z-1.
US NIOSH Recommended Exposure Limits (RELs)	magnesium	Synonyms vary depending upon the specific aluminum compound.	5 mg/m3 / 2 mg/m3	Not Available	Not Available	Not Available
US OSHA Permissible Exposure Levels (PELs) - Table Z1	manganese(II) acetate tetrahydrate	Manganese compounds / Manganese fume	Not Available	Not Available	5 mg/m3	(as Mn)
US OSHA Permissible Exposure Levels (PELs) - Table Z1	molybdenum	Molybdenum - Insoluble compounds	15 mg/m3	Not Available	Not Available	Total dust; (as Mo)
US ACGIH Threshold Limit Values (TLV)	molybdenum	Molybdenum, as Mo	0.5 mg/m3	Not Available	Not Available	TLV® Basis: LRT irr

## Trace Metals in Drinking Water Standard

US NIOSH Recommended Exposure Limits (RELS)	molybdenum	Molybdenum metal	Not Available	Not Available	Not Available	See Appendix D
US OSHA Permissible Exposure Levels (PELs) - Table Z1	nickel	Nickel, metal and insoluble compounds	1 mg/m3	Not Available	Not Available	(as Ni)
US ACGIH Threshold Limit Values (TLV)	nickel	Nickel and inorganic compounds including Nickel subsulfide, as Ni - Elemental	1.5 mg/m3	Not Available	Not Available	TLV® Basis: Dermatitis; pneumoconiosis
US NIOSH Recommended Exposure Limits (RELS)	nickel	Nickel metal: Elemental nickel, Nickel catalyst	0.015 mg/m3	Not Available	Not Available	Ca See Appendix A [*Note: The REL does not apply to Nickel carbonyl.]
US OSHA Permissible Exposure Levels (PELs) - Table Z1	selenium	Selenium compounds	0.2 mg/m3	Not Available	Not Available	(as Se)
US ACGIH Threshold Limit Values (TLV)	selenium	Selenium and compounds, as Se	0.2 mg/m3	Not Available	Not Available	TLV® Basis: Eye & URT irr
US NIOSH Recommended Exposure Limits (RELS)	selenium	Elemental selenium, Selenium alloy	0.2 mg/m3	Not Available	Not Available	[*Note: The REL also applies to other selenium compounds (as Se) except Selenium hexafluoride.]
US OSHA Permissible Exposure Levels (PELs) - Table Z1	silver	Silver, metal and soluble compounds	0.01 mg/m3	Not Available	Not Available	(as Ag)
US OSHA Permissible Exposure Levels (PELs) - Table Z1	silver	Selenium compounds	0.2 mg/m3	Not Available	Not Available	(as Se)
US ACGIH Threshold Limit Values (TLV)	silver	Silver, and compounds - Metal, dust and fume	0.1 mg/m3	Not Available	Not Available	TLV® Basis: Argyria
US ACGIH Threshold Limit Values (TLV)	silver	Silver, and compounds - Soluble compounds, as Ag	0.01 mg/m3	Not Available	Not Available	TLV® Basis: Argyria
US ACGIH Threshold Limit Values (TLV)	silver	Selenium and compounds, as Se	0.2 mg/m3	Not Available	Not Available	TLV® Basis: Eye & URT irr
US NIOSH Recommended Exposure Limits (RELS)	silver	Silver metal: Argentum	0.01 mg/m3	Not Available	Not Available	Not Available
US OSHA Permissible Exposure Levels (PELs) - Table Z1	tellurium	Tellurium and compounds	0.1 mg/m3	Not Available	Not Available	(as Te)
US ACGIH Threshold Limit Values (TLV)	tellurium	Tellurium and compounds (NOS), as Te, excluding hydrogen telluride	0.1 mg/m3	Not Available	Not Available	TLV® Basis: Halitosis
US NIOSH Recommended Exposure Limits (RELS)	tellurium	Aurum paradoxum, Metallum problematicum	0.1 mg/m3	Not Available	Not Available	[*Note: The REL also applies to other tellurium compounds (as Te) except Tellurium hexafluoride and Bismuth telluride.]
US ACGIH Threshold Limit Values (TLV)	thallium	Thallium and compounds, as Tl	0.02 mg/m3	Not Available	Not Available	TLV® Basis: GI dam; peripheral neuropathy
US NIOSH Recommended Exposure Limits (RELS)	thallium	Synonyms vary depending upon the specific aluminum compound.	5 mg/m3 / 2 mg/m3	Not Available	Not Available	Not Available
US OSHA Permissible Exposure Levels (PELs) - Table Z1	uranium natural	Uranium - Soluble compounds	0.05 mg/m3	Not Available	Not Available	(as U)
US OSHA Permissible Exposure Levels (PELs) - Table Z1	uranium natural	Uranium - Insoluble compounds	0.25 mg/m3	Not Available	Not Available	(as U)
US ACGIH Threshold Limit Values (TLV)	uranium natural	Uranium (natural) Soluble and insoluble compounds, as U	0.2 mg/m3	0.6 mg/m3	Not Available	TLV® Basis: Kidney dam; BEI
US NIOSH Recommended Exposure Limits (RELS)	uranium natural	Uranium metal: Uranium I	0.2 mg/m3	0.6 mg/m3	Not Available	Ca See Appendix A
US OSHA Permissible Exposure Levels (PELs) - Table Z1	nitric acid	Nitric acid	5 mg/m3 / 2 ppm	Not Available	Not Available	Not Available
US ACGIH Threshold Limit Values (TLV)	nitric acid	Nitric acid	2 ppm	4 ppm	Not Available	TLV® Basis: URT & eye irr; dental erosion
US NIOSH Recommended Exposure Limits (RELS)	nitric acid	Aqua fortis, Engravers acid, Hydrogen nitrate, Red fuming nitric acid (RFNA), White fuming nitric acid (WFNA)	5 mg/m3 / 2 ppm	10 mg/m3 / 4 ppm	Not Available	Not Available



US OSHA Permissible Exposure Levels (PELs) - Table Z1	hydrofluoric acid	Hydrogen fluoride	Not Available	Not Available	Not Available	See Table Z-2;(as F)
US OSHA Permissible Exposure Levels (PELs) - Table Z2	hydrofluoric acid	Hydrogen fluoride	3 ppm	Not Available	Not Available	(Z37.28-1969)
US ACGIH Threshold Limit Values (TLV)	hydrofluoric acid	Hydrogen fluoride, as F	0.5 ppm	Not Available	2 ppm	TLV® Basis: URT, LRT, skin, & eye irr; fluorosis; BEI
US NIOSH Recommended Exposure Limits (RELs)	hydrofluoric acid	Anhydrous hydrogen fluoride; Aqueous hydrogen fluoride (i.e., Hydrofluoric acid); HF-A	2.5 mg/m3 / 3 ppm	Not Available	5 mg/m3 / 6 ppm	[15-minute]
US OSHA Permissible Exposure Levels (PELs) - Table Z3	zinc	Inert or Nuisance Dust	5 mg/m3 / 15 mppcf / 50 mppcf	Not Available	Not Available	Respirable fraction;All inert or nuisance dusts, whether mineral, inorganic, or organic, not listed specifically by substance name are covered by this limit, which is the same as the Particulates Not Otherwise Regulated (PNOR) limit in Table Z-1. / Total dust;All inert or nuisance dusts, whether mineral, inorganic, or organic, not listed specifically by substance name are covered by this limit, which is the same as the Particulates Not Otherwise Regulated (PNOR) limit in Table Z-1.
US NIOSH Recommended Exposure Limits (RELs)	zinc	Synonyms vary depending upon the specific aluminum compound.	5 mg/m3 / 2 mg/m3	Not Available	Not Available	Not Available

**EMERGENCY LIMITS**

Ingredient	Material name	TEEL-1	TEEL-2	TEEL-3
antimony	Antimony	1.5 mg/m3	13 mg/m3	80 mg/m3
barium	Barium	1.5 mg/m3	180 mg/m3	1,100 mg/m3
bismuth	Bismuth	15 mg/m3	170 mg/m3	990 mg/m3
cadmium	Cadmium	Not Available	Not Available	Not Available
chromium	Chromium	1.5 mg/m3	17 mg/m3	99 mg/m3
cobalt	Cobalt	0.18 mg/m3	2 mg/m3	20 mg/m3
copper	Copper	3 mg/m3	33 mg/m3	200 mg/m3
iron	Iron	3.2 mg/m3	35 mg/m3	150 mg/m3
lead	Lead	0.15 mg/m3	120 mg/m3	700 mg/m3
lithium	Lithium	3.3 mg/m3	36 mg/m3	220 mg/m3
magnesium	Magnesium	18 mg/m3	200 mg/m3	1,200 mg/m3
manganese(II) acetate tetrahydrate	Acetic acid, manganese(2+) salt, tetrahydrate	13 mg/m3	22 mg/m3	740 mg/m3
manganese(II) acetate tetrahydrate	Acetic acid, manganese(II) salt (2:1)	9.4 mg/m3	16 mg/m3	96 mg/m3
molybdenum	Molybdenum	30 mg/m3	330 mg/m3	2,000 mg/m3
nickel	Nickel	4.5 mg/m3	50 mg/m3	99 mg/m3
potassium	Potassium	2.3 mg/m3	25 mg/m3	150 mg/m3
rubidium	Rubidium	3.9 mg/m3	43 mg/m3	260 mg/m3
selenium	Selenium	0.6 mg/m3	6.6 mg/m3	40 mg/m3
silver	Silver	0.3 mg/m3	170 mg/m3	990 mg/m3
sodium	Sodium	13 mg/m3	140 mg/m3	870 mg/m3
strontium	Strontium	30 mg/m3	330 mg/m3	2,000 mg/m3
tellurium	Tellurium	1.8 mg/m3	20 mg/m3	110 mg/m3
thallium	Thallium	0.06 mg/m3	13 mg/m3	20 mg/m3
uranium natural	Uranium	0.6 mg/m3	5 mg/m3	30 mg/m3
ammonium metavanadate	Ammonium vanadate; (Ammonium vanadium oxide; Ammonium metavanadate)	0.01 mg/m3	0.11 mg/m3	80 mg/m3
nitric acid	Nitric acid	Not Available	Not Available	Not Available
hydrofluoric acid	Hydrogen fluoride; (Hydrofluoric acid)	Not Available	Not Available	Not Available
zinc	Zinc	6 mg/m3	21 mg/m3	120 mg/m3


Ingredient	Original IDLH	Revised IDLH
aluminium	N.E. / N.E.	10 mg/m3
antimony	80 mg/m3	50 mg/m3
arsenic	100 mg/m3	5 mg/m3
barium	1,100 mg/m3	50 mg/m3
beryllium acetate	10 mg/m3	4 mg/m3
bismuth	Not Available	Not Available
cadmium	50 mg/m3 / 9 mg/m3	9 mg/m3 / 9 [Unch] mg/m3

calcium	Not Available	Not Available
chromium	N.E. / N.E.	250 mg/m3
cobalt	20 mg/m3	20 [Unch] mg/m3
copper	N.E. / N.E.	100 mg/m3
iron	N.E. / N.E.	500 mg/m3
lead	700 mg/m3	100 mg/m3
lithium	Not Available	Not Available
magnesium	N.E. / N.E.	500 mg/m3
manganese(II) acetate tetrahydrate	N.E. / N.E.	500 mg/m3
molybdenum	N.E. / N.E.	5,000 mg/m3
nickel	N.E. / N.E.	10 mg/m3
potassium	Not Available	Not Available
rubidium	Not Available	Not Available
selenium	Unknown mg/m3 / Unknown ppm	1 mg/m3
silver	N.E. / Unknown mg/m3 / N.E. / Unknown ppm	10 mg/m3 / 1 mg/m3
sodium	Not Available	Not Available
strontium	Not Available	Not Available
tellurium	N.E. / N.E.	25 mg/m3
thallium	Not Available	Not Available
uranium natural	20 mg/m3 / 30 mg/m3	10 mg/m3
ammonium metavanadate	Not Available	Not Available
nitric acid	100 ppm	25 ppm
hydrofluoric acid	30 ppm	30 [Unch] ppm
water	Not Available	Not Available
zinc	Not Available	Not Available

## Exposure controls

<b>Appropriate engineering controls</b>	<p>Engineering controls are used to remove a hazard or place a barrier between the worker and the hazard. Well-designed engineering controls can be highly effective in protecting workers and will typically be independent of worker interactions to provide this high level of protection.</p> <p>The basic types of engineering controls are:</p> <p>Process controls which involve changing the way a job activity or process is done to reduce the risk.</p> <p>Enclosure and/or isolation of emission source which keeps a selected hazard "physically" away from the worker and ventilation that strategically "adds" and "removes" air in the work environment. Ventilation can remove or dilute an air contaminant if designed properly. The design of a ventilation system must match the particular process and chemical or contaminant in use.</p> <p>Employers may need to use multiple types of controls to prevent employee overexposure.</p> <p>Local exhaust ventilation usually required. If risk of overexposure exists, wear approved respirator. Correct fit is essential to obtain adequate protection. Supplied-air type respirator may be required in special circumstances. Correct fit is essential to ensure adequate protection.</p> <p>An approved self contained breathing apparatus (SCBA) may be required in some situations.</p> <p>Provide adequate ventilation in warehouse or closed storage area. Air contaminants generated in the workplace possess varying "escape" velocities which, in turn, determine the "capture velocities" of fresh circulating air required to effectively remove the contaminant.</p>										
	<table border="1"> <thead> <tr> <th>Type of Contaminant:</th> <th>Air Speed:</th> </tr> </thead> <tbody> <tr> <td>solvent, vapours, degreasing etc., evaporating from tank (in still air).</td> <td>0.25-0.5 m/s (50-100 f/min.)</td> </tr> <tr> <td>aerosols, fumes from pouring operations, intermittent container filling, low speed conveyer transfers, welding, spray drift, plating acid fumes, pickling (released at low velocity into zone of active generation)</td> <td>0.5-1 m/s (100-200 f/min.)</td> </tr> <tr> <td>direct spray, spray painting in shallow booths, drum filling, conveyer loading, crusher dusts, gas discharge (active generation into zone of rapid air motion)</td> <td>1-2.5 m/s (200-500 f/min.)</td> </tr> <tr> <td>grinding, abrasive blasting, tumbling, high speed wheel generated dusts (released at high initial velocity into zone of very high rapid air motion).</td> <td>2.5-10 m/s (500-2000 f/min.)</td> </tr> </tbody> </table>	Type of Contaminant:	Air Speed:	solvent, vapours, degreasing etc., evaporating from tank (in still air).	0.25-0.5 m/s (50-100 f/min.)	aerosols, fumes from pouring operations, intermittent container filling, low speed conveyer transfers, welding, spray drift, plating acid fumes, pickling (released at low velocity into zone of active generation)	0.5-1 m/s (100-200 f/min.)	direct spray, spray painting in shallow booths, drum filling, conveyer loading, crusher dusts, gas discharge (active generation into zone of rapid air motion)	1-2.5 m/s (200-500 f/min.)	grinding, abrasive blasting, tumbling, high speed wheel generated dusts (released at high initial velocity into zone of very high rapid air motion).	2.5-10 m/s (500-2000 f/min.)
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<p>Within each range the appropriate value depends on:</p> <table border="1"> <thead> <tr> <th>Lower end of the range</th> <th>Upper end of the range</th> </tr> </thead> <tbody> <tr> <td>1: Room air currents minimal or favourable to capture</td> <td>1: Disturbing room air currents</td> </tr> <tr> <td>2: Contaminants of low toxicity or of nuisance value only.</td> <td>2: Contaminants of high toxicity</td> </tr> <tr> <td>3: Intermittent, low production.</td> <td>3: High production, heavy use</td> </tr> <tr> <td>4: Large hood or large air mass in motion</td> <td>4: Small hood-local control only</td> </tr> </tbody> </table>	Lower end of the range	Upper end of the range	1: Room air currents minimal or favourable to capture	1: Disturbing room air currents	2: Contaminants of low toxicity or of nuisance value only.	2: Contaminants of high toxicity	3: Intermittent, low production.	3: High production, heavy use	4: Large hood or large air mass in motion	4: Small hood-local control only	
Lower end of the range	Upper end of the range										
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<p>Simple theory shows that air velocity falls rapidly with distance away from the opening of a simple extraction pipe. Velocity generally decreases with the square of distance from the extraction point (in simple cases). Therefore the air speed at the extraction point should be adjusted, accordingly, after reference to distance from the contaminating source. The air velocity at the extraction fan, for example, should be a minimum of 1-2 m/s (200-400 f/min) for extraction of solvents generated in a tank 2 meters distant from the extraction point. Other mechanical considerations, producing performance deficits within the extraction apparatus, make it essential that theoretical air velocities are multiplied by factors of 10 or more when extraction systems are installed or used.</p>											

## Trace Metals in Drinking Water Standard

<b>Personal protection</b>	
<b>Eye and face protection</b>	<ul style="list-style-type: none"> <li>▶ Safety glasses with unperforated side shields may be used where continuous eye protection is desirable, as in laboratories; spectacles are not sufficient where complete eye protection is needed such as when handling bulk-quantities, where there is a danger of splashing, or if the material may be under pressure.</li> <li>▶ Chemical goggles whenever there is a danger of the material coming in contact with the eyes; goggles must be properly fitted.</li> <li>▶ Full face shield (20 cm, 8 in minimum) may be required for supplementary but never for primary protection of eyes; these afford face protection.</li> <li>▶ Alternatively a gas mask may replace splash goggles and face shields.</li> <li>▶ Contact lenses may pose a special hazard; soft contact lenses may absorb and concentrate irritants. A written policy document, describing the wearing of lenses or restrictions on use, should be created for each workplace or task. This should include a review of lens absorption and adsorption for the class of chemicals in use and an account of injury experience. Medical and first-aid personnel should be trained in their removal and suitable equipment should be readily available. In the event of chemical exposure, begin eye irrigation immediately and remove contact lens as soon as practicable. Lens should be removed at the first signs of eye redness or irritation - lens should be removed in a clean environment only after workers have washed hands thoroughly. [CDC NIOSH Current Intelligence Bulletin 59], [AS/NZS 1336 or national equivalent]</li> </ul>
<b>Skin protection</b>	See Hand protection below
<b>Hands/feet protection</b>	<ul style="list-style-type: none"> <li>▶ Elbow length PVC gloves</li> <li>▶ When handling corrosive liquids, wear trousers or overalls outside of boots, to avoid spills entering boots.</li> </ul>
<b>Body protection</b>	See Other protection below
<b>Other protection</b>	<ul style="list-style-type: none"> <li>▶ Overalls.</li> <li>▶ PVC Apron.</li> <li>▶ PVC protective suit may be required if exposure severe.</li> <li>▶ Eyewash unit.</li> <li>▶ Ensure there is ready access to a safety shower.</li> </ul>
<b>Thermal hazards</b>	Not Available

**Respiratory protection**

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

**SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES****Information on basic physical and chemical properties**

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

**SECTION 10 STABILITY AND REACTIVITY**

<b>Reactivity</b>	See section 7
<b>Chemical stability</b>	<ul style="list-style-type: none"> <li>▶ Contact with alkaline material liberates heat</li> </ul>
<b>Possibility of hazardous reactions</b>	See section 7
<b>Conditions to avoid</b>	See section 7
<b>Incompatible materials</b>	See section 7
<b>Hazardous decomposition products</b>	See section 5

**SECTION 11 TOXICOLOGICAL INFORMATION**

## Information on toxicological effects

<b>Inhaled</b>	<p>Inhalation of vapours or aerosols (mists, fumes), generated by the material during the course of normal handling, may be harmful. The material can cause respiratory irritation in some persons. The body's response to such irritation can cause further lung damage. Corrosive acids can cause irritation of the respiratory tract, with coughing, choking and mucous membrane damage. There may be dizziness, headache, nausea and weakness.</p> <p>Acute effects of fluoride inhalation include irritation of nose and throat, coughing and chest discomfort. A single acute over-exposure may even cause nose bleed.</p> <p>Acute inhalation exposures to hydrogen fluoride (hydrofluoric acid) vapours produce severe eye, nose, and throat irritation; delayed fever, cyanosis, and pulmonary edema; and may cause death.</p> <p>Even fairly low airborne concentrations of hydrogen fluoride produce rapid onset of eye, nose, and throat irritation. Hydrogen fluoride has a strong irritating odor that is discernible at concentrations of about 0.04 ppm. Higher concentrations of the vapour/ mist may cause corrosion of the throat, nose and lungs, leading to severe inflammation, pulmonary oedema or possible hypocalcaemia.</p> <p>Vapour concentration of 10 ppm is regarded as intolerable but a vapour concentration of 30 ppm. is considered by NIOSH as: Immediately Dangerous to Life and Health (IDLH).</p> <p>In humans, inhalation of hydrogen fluoride gas may cause immediate or delayed-onset pulmonary oedema after a 1-hour exposure. In addition, exposure to high concentrations of the vapors of hydrofluoric acid characteristically results in ulcerative tracheobronchitis and haemorrhagic pulmonary edema; this local reaction is equivalent to that caused by gaseous hydrogen chloride. From accidental, occupational, and volunteer exposures, it is estimated that the lowest lethal concentration for a 5-minute human exposure to hydrogen fluoride is in the range of 50 to 250 ppm. Significant exposures by dermal or inhalation route may cause hypocalcaemia and hypomagnesaemia; cardiac arrhythmias may follow. Acute renal failure has also been documented after an ultimately fatal inhalation exposure</p> <p>Fluorides are not bound to any extent to plasma proteins. In human serum the fluoride occurs equally as nonionic and ionic forms. when fluoride intake is high the ionic form predominates.</p> <p>Repeated sublethal exposures to hydrogen fluoride produce liver and kidney damage.</p> <p>Rats, rabbits, guinea pigs, and dogs subject to hydrogen fluoride inhalation experienced significant irritation of the conjunctivae, nasal tissues, and respiratory system after acute inhalation exposures at near-lethal levels. Pathological lesions were observed in the kidney and liver, and the severity of the lesions was dose related. The external nares and nasal vestibules were black, and, at dosages causing considerable mortality, those areas showed zones of mucosal and submucosal necrosis.</p>
<b>Ingestion</b>	<p>Accidental ingestion of the material may be harmful; animal experiments indicate that ingestion of less than 150 gram may be fatal or may produce serious damage to the health of the individual.</p> <p>Ingestion of acidic corrosives may produce burns around and in the mouth, the throat and oesophagus. Immediate pain and difficulties in swallowing and speaking may also be evident.</p> <p>Fluoride causes severe loss of calcium in the blood, with symptoms appearing several hours later including painful and rigid muscle contractions of the limbs. Cardiovascular collapse can occur and may cause death with increased heart rate and other heart rhythm irregularities.</p>
<b>Skin Contact</b>	<p>Skin contact with the material may be harmful; systemic effects may result following absorption.</p> <p>Though considered non-harmful, slight irritation may result from contact because of the abrasive nature of the aluminium oxide particles. Thus it may cause itching and skin reaction and inflammation.</p> <p>Skin contact with acidic corrosives may result in pain and burns; these may be deep with distinct edges and may heal slowly with the formation of scar tissue.</p> <p>Contact of the skin with liquid hydrofluoric acid (hydrogen fluoride) may cause severe burns, erythema, and swelling, vesiculation, and serious crusting. With more serious burns, ulceration, blue-gray discoloration, and necrosis may occur. Solutions of hydrofluoric acid, as dilute as 2%, may cause severe skin burns.</p> <p>Fluorides are easily absorbed through the skin and cause death of soft tissue and erode bone. Healing is delayed and death of tissue may continue to spread beneath skin.</p> <p>Open cuts, abraded or irritated skin should not be exposed to this material</p> <p>Entry into the blood-stream, through, for example, cuts, abrasions or lesions, may produce systemic injury with harmful effects. Examine the skin prior to the use of the material and ensure that any external damage is suitably protected.</p>
<b>Eye</b>	<p>If applied to the eyes, this material causes severe eye damage.</p> <p>Direct eye contact with acid corrosives may produce pain, tears, sensitivity to light and burns. Mild burns of the epithelia generally recover rapidly and completely.</p> <p>Experiments in which a 20-percent aqueous solution of hydrofluoric acid (hydrogen fluoride) was instilled into the eyes of rabbits caused immediate damage in the form of total corneal opacification and conjunctival ischemia; within an hour, corneal stroma edema occurred, followed by necrosis of anterior ocular structures.</p>
<b>Chronic</b>	<p>Long-term exposure to respiratory irritants may result in disease of the airways involving difficult breathing and related systemic problems.</p> <p>Substance accumulation, in the human body, may occur and may cause some concern following repeated or long-term occupational exposure.</p> <p>Animal testing shows long term exposure to aluminium oxides may cause lung disease and cancer, depending on the size of the particle. The smaller the size, the greater the tendencies of causing harm.</p> <p>Repeated or prolonged exposure to acids may result in the erosion of teeth, swelling and/or ulceration of mouth lining. Irritation of airways to lung, with cough, and inflammation of lung tissue often occurs.</p> <p>Extended exposure to inorganic fluorides causes fluorosis, which includes signs of joint pain and stiffness, tooth discoloration, nausea and vomiting, loss of appetite, diarrhoea or constipation, weight loss, anaemia, weakness and general unwellness. There may also be frequent urination and thirst.</p> <p>Hydrogen fluoride easily penetrates the skin and causes destruction and corrosion of the bone and underlying tissue. Ingestion causes severe pains and burns in the mouth and throat and blood calcium levels are dangerously reduced.</p>

<b>Trace Metals in Drinking Water Standard</b>	<b>TOXICITY</b>	<b>IRRITATION</b>
	Not Available	Not Available
<b>aluminium</b>	<b>TOXICITY</b>	<b>IRRITATION</b>
	Oral (rat) LD50: >2000 mg/kg <sup>[1]</sup>	Not Available
<b>antimony</b>	<b>TOXICITY</b>	<b>IRRITATION</b>
	Dermal (rabbit) LD50: >8000 mg/kg <sup>[1]</sup>	Not Available
	Oral (rat) LD50: 100 mg/kg <sup>[2]</sup>	
<b>arsenic</b>	<b>TOXICITY</b>	<b>IRRITATION</b>
	Oral (rat) LD50: 763 mg/kg <sup>[2]</sup>	Not Available

## Trace Metals in Drinking Water Standard

barium	TOXICITY	IRRITATION
	Not Available	Not Available
beryllium acetate	TOXICITY	IRRITATION
	Not Available	Not Available
bismuth	TOXICITY	IRRITATION
	Oral (rat) LD50: 2000 mg/kg <sup>[1]</sup>	Not Available
cadmium	TOXICITY	IRRITATION
	Inhalation (monkey) LC50: 0.03 mg/L15 min <sup>[1]</sup>	Not Available
	Inhalation (monkey) LC50: 0.0467 mg/L15 min <sup>[1]</sup>	
	Inhalation (monkey) LC50: 0.204 mg/L15 min <sup>[1]</sup>	
	Inhalation (monkey) LC50: 0.23 mg/L15 min <sup>[1]</sup>	
	Inhalation (monkey) LC50: 0.94 mg/L15 min <sup>[1]</sup>	
	Inhalation (mouse) LC50: >0.00902 mg/L15 min <sup>[1]</sup>	
	Inhalation (rabbit) LC50: >0.0224 mg/L15 min <sup>[1]</sup>	
	Inhalation (rat) LC50: 0.025 mg/L/30m <sup>[2]</sup>	
Oral (rat) LD50: >63-<259 mg/kg <sup>[1]</sup>		
calcium	TOXICITY	IRRITATION
	Dermal (rabbit) LD50: >2500 mg/kg <sup>[1]</sup>	Not Available
	Oral (rat) LD50: >2000 mg/kg <sup>[1]</sup>	
chromium	TOXICITY	IRRITATION
	Not Available	Not Available
cobalt	TOXICITY	IRRITATION
	dermal (rat) LD50: >2000 mg/kg <sup>[1]</sup>	Not Available
	Oral (rat) LD50: 6170 mg/kg <sup>[2]</sup>	
copper	TOXICITY	IRRITATION
	dermal (rat) LD50: >2000 mg/kg <sup>[1]</sup>	Not Available
	Inhalation (rat) LC50: 0.733 mg/l/4hr <sup>[1]</sup>	
	Inhalation (rat) LC50: 1.03 mg/l/4hr <sup>[1]</sup>	
	Inhalation (rat) LC50: 1.67 mg/l/4hr <sup>[1]</sup>	
Oral (rat) LD50: 300-500 mg/kg <sup>[1]</sup>		
iron	TOXICITY	IRRITATION
	Oral (rat) LD50: 7500 mg/kg <sup>[1]</sup>	Not Available
lead	TOXICITY	IRRITATION
	dermal (rat) LD50: >2000 mg/kg <sup>[1]</sup>	Not Available
	Inhalation (rat) LC50: >5.05 mg/l/4hr <sup>[1]</sup>	
	Oral (rat) LD50: >2000 mg/kg <sup>[1]</sup>	
lithium	TOXICITY	IRRITATION
	Not Available	Not Available
magnesium	TOXICITY	IRRITATION

## Trace Metals in Drinking Water Standard

	Oral (rat) LD50: >2000 mg/kg <sup>[1]</sup>	Not Available
manganese(II) acetate tetrahydrate	TOXICITY	IRRITATION
	Oral (rat) LD50: 3730 mg/kg <sup>[2]</sup>	Not Available
molybdenum	TOXICITY	IRRITATION
	dermal (rat) LD50: >2000 mg/kg <sup>[1]</sup>	Not Available
	Oral (rat) LD50: >2000 mg/kg <sup>[1]</sup>	
nickel	TOXICITY	IRRITATION
	Oral (rat) LD50: 5000 mg/kg <sup>[2]</sup>	Not Available
potassium	TOXICITY	IRRITATION
	Not Available	Not Available
rubidium	TOXICITY	IRRITATION
	Not Available	Not Available
selenium	TOXICITY	IRRITATION
	Oral (rat) LD50: 6700 mg/kg <sup>[2]</sup>	Not Available
silver	TOXICITY	IRRITATION
	Oral (rat) LD50: >2000 mg/kg <sup>[1]</sup>	Not Available
sodium	TOXICITY	IRRITATION
	Not Available	Not Available
strontium	TOXICITY	IRRITATION
	Not Available	Not Available
tellurium	TOXICITY	IRRITATION
	Inhalation (rat) LC50: >2.42 mg/L/4hr <sup>[2]</sup>	Not Available
	Oral (rat) LD50: 83 mg/kg <sup>[2]</sup>	
thallium	TOXICITY	IRRITATION
	Not Available	Not Available
uranium natural	TOXICITY	IRRITATION
	Oral (rat) LD50: 750 mg/kg <sup>[2]</sup>	Not Available
ammonium metavanadate	TOXICITY	IRRITATION
	dermal (rat) LD50: 2102 mg/kg <sup>[2]</sup>	Not Available
	Inhalation (rat) LC50: 0.0078 mg/L/4hr <sup>[2]</sup>	
	Oral (rat) LD50: 58.1 mg/kg <sup>[2]</sup>	
nitric acid	TOXICITY	IRRITATION
	Inhalation (rat) LC50: 0.13 mg/L/4hr <sup>[2]</sup>	Not Available
	Inhalation (rat) LC50: 2500 ppm/1h * <sup>[2]</sup>	
hydrofluoric acid	TOXICITY	IRRITATION
	Inhalation (rat) LC50: 1.1 mg/L/60M <sup>[2]</sup>	Eye (human): 50 mg - SEVERE

	Inhalation (rat) LC50: 1276 ppm/1hr <sup>[2]</sup>	
water	<b>TOXICITY</b>	<b>IRRITATION</b>
	Oral (rat) LD50: >90000 mg/kg <sup>[2]</sup>	Not Available
zinc	<b>TOXICITY</b>	<b>IRRITATION</b>
	Dermal (rabbit) LD50: 1130 mg/kg <sup>[2]</sup>	Not Available
	Oral (rat) LD50: >2000 mg/kg <sup>[1]</sup>	

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

<b>ARSENIC</b>	Arsenic compounds are classified by the European Union as toxic by inhalation and ingestion and toxic to aquatic life and long lasting in the environment. Tumorigenic - Carcinogenic by RTECS criteria.
<b>CALCIUM</b>	The solid may react violently on contact with wet skin tissue, i.e. eyes, mouth, causing chemical and thermal burns. The acute effects include burns, ulceration, or tissue death, severe eye damage (corneal burns or opacification), and probable blindness. Inhalation of dust or fumes (especially from a fire involving calcium) will cause shortness of breath, nausea, headache, nose and respiratory tract irritation and in extreme, pneumonitis
<b>CHROMIUM</b>	On skin and inhalation exposure, chromium and its compounds (except hexavalent) can be a potent sensitiser, as particulates. Tenth Annual Report on Carcinogens: Substance known to be Carcinogenic [National Toxicology Program: U.S. Dep. Gastrointestinal tumours, lymphoma, musculoskeletal tumours and tumours at site of application recorded.
<b>COBALT</b>	Allergic reactions involving the respiratory tract are usually due to interactions between IgE antibodies and allergens and occur rapidly. Attention should be paid to atopic diathesis, characterised by increased susceptibility to nasal inflammation, asthma and eczema. Exogenous allergic alveolitis is induced essentially by allergen specific immune-complexes of the IgG type; cell-mediated reactions (T lymphocytes) may be involved.
<b>COPPER</b>	for copper and its compounds (typically copper chloride): <b>Acute toxicity:</b> There are no reliable acute oral toxicity results available. WARNING: Inhalation of high concentrations of copper fume may cause "metal fume fever", an acute industrial disease of short duration. tiredness, influenza like respiratory tract irritation with fever.
<b>LEAD</b>	WARNING: Lead is a cumulative poison and has the potential to cause abortion and intellectual impairment to unborn children of pregnant workers.
<b>NICKEL</b>	Tenth Annual Report on Carcinogens: Substance anticipated to be Carcinogen [National Toxicology Program: U.S. Dep. Oral (rat) TDLo: 500 mg/kg/5D-I Inhalation (rat) TCLo: 0.1 mg/m <sup>3</sup> /24H/17W-C
<b>TELLURIUM</b>	Changes to respiratory system, kidney, ureter, bladder and specific developmental abnormalities involving central nervous, craniofacial, musculoskeletal system.
<b>THALLIUM</b>	Structural changes in nerves and sheath, changes in extraocular muscles, hair loss recorded
<b>URANIUM NATURAL</b>	exposure (to) natural: uranium NAT-U None
<b>NITRIC ACID</b>	for acid mists, aerosols, vapours Data from assays for genotoxic activity in vitro suggest that eukaryotic cells are susceptible to genetic damage when the pH falls to about 6.5. The material may cause severe skin irritation after prolonged or repeated exposure and may produce on contact skin redness, swelling, the production of vesicles, scaling and thickening of the skin. Oral (?) LD50: 50-500 mg/kg * [Various Manufacturers]
<b>HYDROFLUORIC ACID</b>	(liver and kidney damage) [Manufacturer] for hydrogen fluoride (as vapour)
<b>ZINC</b>	The material may cause skin irritation after prolonged or repeated exposure and may produce on contact skin redness, swelling, the production of vesicles, scaling and thickening of the skin.
<b>ALUMINIUM &amp; BARIUM &amp; CALCIUM &amp; CHROMIUM &amp; LITHIUM &amp; MOLYBDENUM &amp; POTASSIUM &amp; SODIUM &amp; STRONTIUM &amp; HYDROFLUORIC ACID &amp; WATER</b>	No significant acute toxicological data identified in literature search.
<b>ARSENIC &amp; BERYLLIUM ACETATE</b>	<b>WARNING:</b> This substance has been classified by the IARC as Group 1: <b>CARCINOGENIC TO HUMANS.</b>
<b>BARIUM &amp; BERYLLIUM ACETATE &amp; CALCIUM &amp; LITHIUM &amp; MANGANESE(II) ACETATE TETRAHYDRATE &amp; POTASSIUM &amp; RUBIDIUM &amp; SODIUM &amp; AMMONIUM METAVANADATE &amp; NITRIC ACID &amp; HYDROFLUORIC ACID</b>	Asthma-like symptoms may continue for months or even years after exposure to the material ceases.
<b>BERYLLIUM ACETATE &amp; COBALT &amp; NICKEL</b>	The following information refers to contact allergens as a group and may not be specific to this product.
<b>CHROMIUM &amp; SELENIUM</b>	The substance is classified by IARC as Group 3: <b>NOT</b> classifiable as to its carcinogenicity to humans.
<b>COBALT &amp; NICKEL</b>	<b>WARNING:</b> This substance has been classified by the IARC as Group 2B: Possibly Carcinogenic to Humans.

<b>NITRIC ACID &amp; HYDROFLUORIC ACID</b>	The material may produce severe irritation to the eye causing pronounced inflammation.
<b>NITRIC ACID &amp; HYDROFLUORIC ACID</b>	The material may produce respiratory tract irritation, and result in damage to the lung including reduced lung function.
<b>Acute Toxicity</b>	✓
<b>Skin Irritation/Corrosion</b>	✓
<b>Serious Eye Damage/Irritation</b>	⊘
<b>Respiratory or Skin sensitisation</b>	⊘
<b>Mutagenicity</b>	⊘
<b>Carcinogenicity</b>	⊘
<b>Reproductivity</b>	⊘
<b>STOT - Single Exposure</b>	⊘
<b>STOT - Repeated Exposure</b>	⊘
<b>Aspiration Hazard</b>	⊘

**Legend:** ✗ – Data available but does not fill the criteria for classification  
 ✓ – Data available to make classification  
 ⊘ – Data Not Available to make classification

## SECTION 12 ECOLOGICAL INFORMATION

### Toxicity

Ingredient	Endpoint	Test Duration (hr)	Species	Value	Source
aluminium	LC50	96	Fish	0.078-0.108mg/L	2
aluminium	EC50	48	Crustacea	0.7364mg/L	2
aluminium	EC50	96	Algae or other aquatic plants	0.0054mg/L	2
aluminium	BCF	360	Algae or other aquatic plants	9mg/L	4
aluminium	EC50	120	Fish	0.000051mg/L	5
aluminium	NOEC	72	Algae or other aquatic plants	>=0.004mg/L	2
antimony	LC50	96	Fish	0.93mg/L	2
antimony	EC50	48	Crustacea	1mg/L	2
antimony	EC50	72	Algae or other aquatic plants	>2.4mg/L	2
antimony	EC50	96	Crustacea	0.5mg/L	2
antimony	NOEC	720	Fish	>0.0075mg/L	2
arsenic	LC50	96	Fish	9.9mg/L	4
arsenic	EC50	336	Algae or other aquatic plants	0.63mg/L	4
arsenic	NOEC	336	Algae or other aquatic plants	<0.75mg/L	4
barium	LC50	96	Fish	>500mg/L	4
barium	EC50	96	Algae or other aquatic plants	26mg/L	4
barium	BCF	24	Crustacea	0.000002mg/L	4
barium	EC50	240	Algae or other aquatic plants	8.10306mg/L	4
barium	NOEC	48	Crustacea	68mg/L	4
cadmium	LC50	96	Fish	0.001mg/L	4
cadmium	EC50	48	Crustacea	0.0033mg/L	5
cadmium	EC50	72	Algae or other aquatic plants	0.018mg/L	2
cadmium	BCF	960	Fish	500mg/L	4
cadmium	EC50	336	Crustacea	0.00065mg/L	5
cadmium	NOEC	168	Fish	0.00001821mg/L	4
calcium	EC50	24	Crustacea	6934mg/L	5
calcium	NOEC	48	Crustacea	33.3mg/L	2
chromium	LC50	96	Fish	13.9mg/L	4
chromium	EC50	48	Crustacea	0.0225mg/L	5
chromium	EC50	72	Algae or other aquatic plants	0.104mg/L	4
chromium	BCF	1440	Algae or other aquatic plants	0.0495mg/L	4
chromium	EC50	48	Crustacea	0.0245mg/L	5
chromium	NOEC	672	Fish	0.00019mg/L	4
cobalt	LC50	96	Fish	1.406mg/L	2
cobalt	EC50	48	Crustacea	>0.89mg/L	2
cobalt	EC50	72	Algae or other aquatic plants	0.144mg/L	2
cobalt	BCF	1344	Fish	0.99mg/L	4
cobalt	EC50	70	Algae or other aquatic plants	0.02mg/L	2
cobalt	NOEC	168	Algae or other aquatic plants	0.0018mg/L	2
copper	LC50	96	Fish	0.0028mg/L	2
copper	EC50	48	Crustacea	0.001mg/L	5
copper	EC50	72	Algae or other aquatic plants	0.013335mg/L	4

Continued...



## Trace Metals in Drinking Water Standard

copper	BCF	960	Fish	200mg/L	4
copper	EC50	96	Crustacea	0.001mg/L	5
copper	NOEC	96	Crustacea	0.0008mg/L	4
iron	LC50	96	Fish	0.05mg/L	2
iron	EC50	96	Algae or other aquatic plants	3.7mg/L	4
iron	BCF	24	Crustacea	0.000002mg/L	4
iron	EC50	504	Crustacea	4.49mg/L	2
iron	NOEC	504	Fish	0.52mg/L	2
lead	LC50	96	Fish	0.0079mg/L	2
lead	EC50	48	Crustacea	0.029mg/L	2
lead	EC50	72	Algae or other aquatic plants	0.0205mg/L	2
lead	BCFD	8	Fish	4.324mg/L	4
lead	EC50	48	Algae or other aquatic plants	0.0217mg/L	2
lead	NOEC	672	Fish	0.00003mg/L	4
lithium	EC50	24	Crustacea	1492mg/L	5
lithium	NOEC	816	Fish	2.87mg/L	2
magnesium	LC50	96	Fish	541mg/L	2
magnesium	EC50	72	Algae or other aquatic plants	>20mg/L	2
magnesium	EC50	72	Algae or other aquatic plants	>20mg/L	2
magnesium	NOEC	72	Algae or other aquatic plants	>25.5mg/L	2
molybdenum	LC50	96	Fish	609.1mg/L	2
molybdenum	EC50	72	Algae or other aquatic plants	289.2mg/L	2
molybdenum	BCF	336	Algae or other aquatic plants	64mg/L	4
molybdenum	EC50	336	Algae or other aquatic plants	64mg/L	4
molybdenum	NOEC	672	Crustacea	0.67mg/L	2
nickel	LC50	96	Fish	0.0000475mg/L	4
nickel	EC50	48	Crustacea	0.013mg/L	5
nickel	EC50	72	Algae or other aquatic plants	0.0407mg/L	2
nickel	BCF	1440	Algae or other aquatic plants	0.47mg/L	4
nickel	EC50	720	Crustacea	0.0062mg/L	2
nickel	NOEC	72	Algae or other aquatic plants	0.0035mg/L	2
potassium	EC50	24	Crustacea	400mg/L	5
selenium	LC50	96	Fish	>0.0262mg/L	2
selenium	EC50	48	Crustacea	>0.1603mg/L	2
selenium	EC50	72	Algae or other aquatic plants	>0.00173mg/L	2
selenium	BCF	504	Crustacea	0.711mg/L	4
selenium	EC50	96	Algae or other aquatic plants	0.355mg/L	2
selenium	NOEC	72	Algae or other aquatic plants	0.000547mg/L	2
silver	LC50	96	Fish	0.00148mg/L	2
silver	EC50	48	Crustacea	0.00024mg/L	4
silver	EC50	96	Algae or other aquatic plants	0.001628837mg/L	4
silver	BCF	336	Crustacea	0.02mg/L	4
silver	EC50	48	Crustacea	0.00024mg/L	4
silver	NOEC	480	Crustacea	0.00031mg/L	2
sodium	EC50	48	Crustacea	1640mg/L	4
sodium	EC50	504	Crustacea	1020mg/L	4
tellurium	LC50	96	Fish	18.413mg/L	3
tellurium	EC50	48	Crustacea	5.79mg/L	2
tellurium	EC50	72	Algae or other aquatic plants	>11.7mg/L	2
tellurium	EC50	384	Crustacea	4.440mg/L	3
tellurium	NOEC	72	Algae or other aquatic plants	3.34mg/L	2
thallium	LC50	96	Fish	21mg/L	4
thallium	EC50	96	Algae or other aquatic plants	0.13mg/L	4
thallium	EC50	240	Algae or other aquatic plants	0.040876mg/L	4
thallium	NOEC	720	Fish	0.04mg/L	5
uranium natural	LC50	96	Fish	6.2mg/L	4
uranium natural	EC50	96	Fish	5.5mg/L	5
uranium natural	NOEC	96	Fish	3.9mg/L	5
ammonium metavanadate	LC50	96	Fish	0.693mg/L	2

ammonium metavanadate	EC50	48	Crustacea	2.387mg/L	2
ammonium metavanadate	EC50	72	Algae or other aquatic plants	0.9894mg/L	2
ammonium metavanadate	EC50	72	Algae or other aquatic plants	1.162mg/L	2
ammonium metavanadate	NOEC	72	Algae or other aquatic plants	0.0168mg/L	2
nitric acid	NOEC	16	Crustacea	107mg/L	4
hydrofluoric acid	LC50	96	Fish	51mg/L	2
hydrofluoric acid	EC50	48	Crustacea	=270mg/L	1
hydrofluoric acid	EC50	96	Crustacea	26-48mg/L	2
hydrofluoric acid	NOEC	504	Fish	4mg/L	2
zinc	LC50	96	Fish	0.00272mg/L	4
zinc	EC50	48	Crustacea	0.04mg/L	5
zinc	EC50	72	Algae or other aquatic plants	0.106mg/L	4
zinc	BCF	360	Algae or other aquatic plants	9mg/L	4
zinc	EC50	120	Fish	0.00033mg/L	5
zinc	NOEC	336	Algae or other aquatic plants	0.00075mg/L	4

**Legend:**

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

**Ecotoxicity:**

The tolerance of water organisms towards pH margin and variation is diverse. Recommended pH values for test species listed in OECD guidelines are between 6.0 and almost 9. Acute testing with fish showed 96h-LC50 at about pH 3.5

For Fluorides: Small amounts of fluoride have beneficial effects however; excessive intake over long periods may cause dental and/or skeletal fluorosis. Fluorides are absorbed by humans following inhalation of workplace and ambient air that has been contaminated, ingestion of drinking water and foods and dermal contact. Populations living in areas with high fluoride levels in groundwater may be exposed to higher levels of fluorides in their drinking water or in beverages prepared with the water. Among these populations, outdoor labourers, people living in hot climates, and people with excessive thirst will generally have the greatest daily intake of fluorides because they consume greater amounts of water.

Atmospheric Fate: Both hydrogen fluoride and particulate fluorides will be transported in the atmosphere and deposited on land or water by wet and dry deposition. Non-volatile inorganic fluoride particulates are removed from the atmosphere via condensation or nucleation processes. Fluorides adsorbed on particulate matter in the atmosphere are generally stable and are not readily hydrolyzed, although they may be degraded by radiation if they persist in the atmosphere. Fluorine and the silicon fluorides (fluosilicates, silicofluorides) are hydrolyzed in the atmosphere to form hydrogen fluoride. Hydrogen fluoride may combine with water vapour to produce an aerosol or fog of aqueous hydrofluoric acid. Inorganic fluoride compounds, with the exception of sulfur hexafluoride, are not expected to remain in the troposphere for long periods or to migrate to the stratosphere. Estimates of the residence time of sulfur hexafluoride in the atmosphere range from 500 to several thousand years. Fluoride in aerosols can be transported over large distances by wind or as a result of atmospheric turbulence. Fluorosilicic acid and hydrofluoric acid in high aquatic concentrations such as may be found in industrial waste ponds may volatilize, releasing silicon tetrafluoride and hydrogen fluoride into the atmosphere. Soluble inorganic fluorides may also form aerosols at the air/water interface or vaporize into the atmosphere whereas undissolved species generally undergo sedimentation.

Terrestrial Fate: Soils - Atmospheric fluorides may be transported to soils and surface waters through both wet and dry deposition processes where they may form complexes and bind strongly to soil and sediment. Solubilisation of inorganic fluorides from minerals may also be enhanced by the presence of bentonite clays and humic acid. Factors that influence the mobility of inorganic fluorides in soil are pH and the formation of aluminium and calcium complexes. In more acidic soils, concentrations of inorganic fluoride were considerably higher in the deeper horizons. The low affinity of fluorides for organic material results in leaching from the more acidic surface horizon and increased retention by clay minerals and silts in the more alkaline, deeper horizons. The maximum adsorption of fluoride to soil was reported to occur at pH 5.5. In acidic soils with pH below 6, most of the fluoride is in complexes with either aluminium or iron. Fluoride in alkaline soils at pH 6.5 and above is almost completely fixed in soils as calcium fluoride, if sufficient calcium carbonate is available. Fluoride is extremely immobile in soil.

Aquatic Fate: Fresh Water: - In water, the transport and transformation of inorganic fluorides are influenced by pH, water hardness and the presence of ion-exchange materials such as clays. In natural water, fluoride forms strong complexes with aluminium in water, and fluorine chemistry in water is largely regulated by aluminium concentration and pH. Below pH 5, fluoride is almost entirely complexed with aluminium and consequently, the concentration of free F<sup>-</sup> is low. Once dissolved, inorganic fluorides remain in solution under conditions of low pH and hardness and in the presence of ion-exchange material. Sea Water - Fluoride forms stable complexes with calcium and magnesium, which are present in sea water. Calcium carbonate precipitation dominates the removal of dissolved fluoride from sea water. The residence time for fluoride in ocean sediment is calculated to be 2-3 million years.

Ecotoxicity: Fluorides have been shown to accumulate in animals that consume fluoride-containing foliage. However, accumulation is primarily in skeletal tissue and therefore, it is unlikely that fluoride will biomagnify up the food chain.

Prevent, by any means available, spillage from entering drains or water courses.

**DO NOT discharge into sewer or waterways.**

**Persistence and degradability**

Ingredient	Persistence: Water/Soil	Persistence: Air
tellurium	HIGH	HIGH
ammonium metavanadate	HIGH	HIGH
water	LOW	LOW

**Bioaccumulative potential**

Ingredient	Bioaccumulation
tellurium	LOW (LogKOW = 2.229)
ammonium metavanadate	LOW (LogKOW = 2.229)
water	LOW (LogKOW = -1.38)

**Mobility in soil**

Ingredient	Mobility
tellurium	LOW (KOC = 23.74)
ammonium metavanadate	LOW (KOC = 35.04)
water	LOW (KOC = 14.3)


**SECTION 13 DISPOSAL CONSIDERATIONS**

## Waste treatment methods

<b>Product / Packaging disposal</b>	<ul style="list-style-type: none"> <li>▶ Containers may still present a chemical hazard/ danger when empty.</li> <li>▶ Return to supplier for reuse/ recycling if possible.</li> </ul> <p>Otherwise:</p> <ul style="list-style-type: none"> <li>▶ If container can not be cleaned sufficiently well to ensure that residuals do not remain or if the container cannot be used to store the same product, then puncture containers, to prevent re-use, and bury at an authorised landfill.</li> <li>▶ Where possible retain label warnings and SDS and observe all notices pertaining to the product.</li> <li>▶ Recycle wherever possible.</li> <li>▶ Consult manufacturer for recycling options or consult local or regional waste management authority for disposal if no suitable treatment or disposal facility can be identified.</li> <li>▶ Treat and neutralise at an approved treatment plant. Treatment should involve: Neutralisation with soda-ash or soda-lime followed by: burial in a land-fill specifically licensed to accept chemical and / or pharmaceutical wastes or incineration in a licensed apparatus (after admixture with suitable combustible material).</li> <li>▶ Decontaminate empty containers with 5% aqueous sodium hydroxide or soda ash, followed by water. Observe all label safeguards until containers are cleaned and destroyed.</li> </ul>
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## SECTION 14 TRANSPORT INFORMATION

## Labels Required

<b>Marine Pollutant</b>		NO
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## Land transport (DOT)

<b>UN number</b>	3264	
<b>UN proper shipping name</b>	Corrosive liquid, acidic, inorganic, n.o.s.	
<b>Transport hazard class(es)</b>	Class	8
	Subrisk	Not Applicable
<b>Packing group</b>	II	
<b>Environmental hazard</b>	Not Applicable	
<b>Special precautions for user</b>	Hazard Label	8
	Special provisions	386, B2, IB2, T11, TP2, TP27

## Air transport (ICAO-IATA / DGR)

<b>UN number</b>	3264	
<b>UN proper shipping name</b>	Corrosive liquid, acidic, inorganic, n.o.s. *	
<b>Transport hazard class(es)</b>	ICAO/IATA Class	8
	ICAO / IATA Subrisk	Not Applicable
	ERG Code	8L
<b>Packing group</b>	II	
<b>Environmental hazard</b>	Not Applicable	
<b>Special precautions for user</b>	Special provisions	A3A803
	Cargo Only Packing Instructions	855
	Cargo Only Maximum Qty / Pack	30 L
	Passenger and Cargo Packing Instructions	851
	Passenger and Cargo Maximum Qty / Pack	1 L
	Passenger and Cargo Limited Quantity Packing Instructions	Y840
	Passenger and Cargo Limited Maximum Qty / Pack	0.5 L

## Sea transport (IMDG-Code / GGVSee)

<b>UN number</b>	3264	
<b>UN proper shipping name</b>	CORROSIVE LIQUID, ACIDIC, INORGANIC, N.O.S.	
<b>Transport hazard class(es)</b>	IMDG Class	8
	IMDG Subrisk	Not Applicable
<b>Packing group</b>	II	

<b>Environmental hazard</b>	Not Applicable	
<b>Special precautions for user</b>	EMS Number	F-A, S-B
	Special provisions	274
	Limited Quantities	1 L

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

Source	Product name	Pollution Category	Ship Type
IMO MARPOL (Annex II) - List of Noxious Liquid Substances Carried in Bulk	Nitric acid (70% and over) Nitric acid (less than 70%)	Y; Y	2 2

**SECTION 15 REGULATORY INFORMATION****Safety, health and environmental regulations / legislation specific for the substance or mixture****ALUMINIUM(7429-90-5) IS FOUND ON THE FOLLOWING REGULATORY LISTS**

US - Alaska Limits for Air Contaminants	US - Washington Permissible exposure limits of air contaminants
US - California OEHHA/ARB - Acute Reference Exposure Levels and Target Organs (RELS)	US - Wyoming Toxic and Hazardous Substances Table Z1 Limits for Air Contaminants
US - California OEHHA/ARB - Chronic Reference Exposure Levels and Target Organs (CRELs)	US ACGIH Threshold Limit Values (TLV)
US - California Permissible Exposure Limits for Chemical Contaminants	US ACGIH Threshold Limit Values (TLV) - Carcinogens
US - California Proposition 65 - Carcinogens	US ATSDR Minimal Risk Levels for Hazardous Substances (MRLs)
US - Hawaii Air Contaminant Limits	US Clean Air Act - Hazardous Air Pollutants
US - Massachusetts - Right To Know Listed Chemicals	US CWA (Clean Water Act) - Priority Pollutants
US - Michigan Exposure Limits for Air Contaminants	US CWA (Clean Water Act) - Toxic Pollutants
US - Minnesota Permissible Exposure Limits (PELs)	US EPCRA Section 313 Chemical List
US - Oregon Permissible Exposure Limits (Z-1)	US National Toxicology Program (NTP) 14th Report Part A Known to be Human Carcinogens
US - Pennsylvania - Hazardous Substance List	US NIOSH Recommended Exposure Limits (RELs)
US - Rhode Island Hazardous Substance List	US OSHA Permissible Exposure Levels (PELs) - Table Z1
US - Tennessee Occupational Exposure Limits - Limits For Air Contaminants	US Priority List for the Development of Proposition 65 Safe Harbor Levels - No Significant Risk Levels (NSRLs) for Carcinogens and Maximum Allowable Dose Levels (MADLs) for Chemicals Causing Reproductive Toxicity
US - Vermont Permissible Exposure Limits Table Z-1-A Final Rule Limits for Air Contaminants	US Toxic Substances Control Act (TSCA) - Chemical Substance Inventory
US - Vermont Permissible Exposure Limits Table Z-1-A Transitional Limits for Air Contaminants	

**ANTIMONY(7440-36-0) IS FOUND ON THE FOLLOWING REGULATORY LISTS**

US - Alaska Limits for Air Contaminants	US - Vermont Permissible Exposure Limits Table Z-1-A Transitional Limits for Air Contaminants
US - California Permissible Exposure Limits for Chemical Contaminants	US - Washington Permissible exposure limits of air contaminants
US - Hawaii Air Contaminant Limits	US - Wyoming Toxic and Hazardous Substances Table Z1 Limits for Air Contaminants
US - Idaho - Limits for Air Contaminants	US ACGIH Threshold Limit Values (TLV)
US - Massachusetts - Right To Know Listed Chemicals	US Clean Air Act - Hazardous Air Pollutants
US - Michigan Exposure Limits for Air Contaminants	US CWA (Clean Water Act) - Priority Pollutants
US - Minnesota Permissible Exposure Limits (PELs)	US CWA (Clean Water Act) - Toxic Pollutants
US - Oregon Permissible Exposure Limits (Z-1)	US EPCRA Section 313 Chemical List
US - Pennsylvania - Hazardous Substance List	US NIOSH Recommended Exposure Limits (RELs)
US - Rhode Island Hazardous Substance List	US OSHA Permissible Exposure Levels (PELs) - Table Z1
US - Tennessee Occupational Exposure Limits - Limits For Air Contaminants	US Toxic Substances Control Act (TSCA) - Chemical Substance Inventory
US - Vermont Permissible Exposure Limits Table Z-1-A Final Rule Limits for Air Contaminants	

**ARSENIC(7440-38-2) IS FOUND ON THE FOLLOWING REGULATORY LISTS**

US - Alaska Limits for Air Contaminants	US - Washington Permissible exposure limits of air contaminants
US - California OEHHA/ARB - Acute Reference Exposure Levels and Target Organs (RELS)	US - Washington Toxic air pollutants and their ASIL, SQER and de minimis emission values
US - California OEHHA/ARB - Chronic Reference Exposure Levels and Target Organs (CRELs)	US ACGIH Threshold Limit Values (TLV)
US - California Permissible Exposure Limits for Chemical Contaminants	US ACGIH Threshold Limit Values (TLV) - Carcinogens
US - Hawaii Air Contaminant Limits	US ATSDR Minimal Risk Levels for Hazardous Substances (MRLs)
US - Idaho - Limits for Air Contaminants	US Clean Air Act - Hazardous Air Pollutants
US - Massachusetts - Right To Know Listed Chemicals	US CWA (Clean Water Act) - Priority Pollutants
US - Minnesota Permissible Exposure Limits (PELs)	US CWA (Clean Water Act) - Toxic Pollutants
US - New Jersey Right to Know - Special Health Hazard Substance List (SHHSL): Carcinogens	US EPCRA Section 313 Chemical List
US - Pennsylvania - Hazardous Substance List	US National Toxicology Program (NTP) 14th Report Part A Known to be Human Carcinogens
US - Tennessee Occupational Exposure Limits - Limits For Air Contaminants	US NIOSH Recommended Exposure Limits (RELs)
US - Vermont Permissible Exposure Limits Table Z-1-A Final Rule Limits for Air Contaminants	US OSHA Permissible Exposure Levels (PELs) - Table Z1
US - Vermont Permissible Exposure Limits Table Z-1-A Transitional Limits for Air Contaminants	US Toxic Substances Control Act (TSCA) - Chemical Substance Inventory

**BARIUM(7440-39-3) IS FOUND ON THE FOLLOWING REGULATORY LISTS**

US - Alaska Limits for Air Contaminants  
 US - Hawaii Air Contaminant Limits  
 US - Idaho - Limits for Air Contaminants  
 US - Massachusetts - Right To Know Listed Chemicals  
 US - Minnesota Permissible Exposure Limits (PELs)  
 US - Pennsylvania - Hazardous Substance List  
 US - Rhode Island Hazardous Substance List  
 US - Tennessee Occupational Exposure Limits - Limits For Air Contaminants  
 US - Vermont Permissible Exposure Limits Table Z-1-A Final Rule Limits for Air Contaminants

US - Vermont Permissible Exposure Limits Table Z-1-A Transitional Limits for Air Contaminants  
 US - Washington Permissible exposure limits of air contaminants  
 US ACGIH Threshold Limit Values (TLV)  
 US ACGIH Threshold Limit Values (TLV) - Carcinogens  
 US EPA Carcinogens Listing  
 US EPCRA Section 313 Chemical List  
 US OSHA Permissible Exposure Levels (PELs) - Table Z1  
 US Toxic Substances Control Act (TSCA) - Chemical Substance Inventory

**BERYLLIUM ACETATE(543-81-7) IS FOUND ON THE FOLLOWING REGULATORY LISTS**

US - Alaska Limits for Air Contaminants  
 US - California OEHHA/ARB - Chronic Reference Exposure Levels and Target Organs (CRELs)  
 US - California Permissible Exposure Limits for Chemical Contaminants  
 US - Hawaii Air Contaminant Limits  
 US - Idaho - Acceptable Maximum Peak Concentrations  
 US - Idaho - Limits for Air Contaminants  
 US - Michigan Exposure Limits for Air Contaminants  
 US - Minnesota Permissible Exposure Limits (PELs)  
 US - Oregon Permissible Exposure Limits (Z-1)  
 US - Oregon Permissible Exposure Limits (Z-2)  
 US - Tennessee Occupational Exposure Limits - Limits For Air Contaminants  
 US - Vermont Permissible Exposure Limits Table Z-1-A Final Rule Limits for Air Contaminants  
 US - Vermont Permissible Exposure Limits Table Z-1-A Transitional Limits for Air Contaminants  
 US - Washington Permissible exposure limits of air contaminants

US - Washington Toxic air pollutants and their ASIL, SQER and de minimis emission values  
 US - Wyoming Toxic and Hazardous Substances Table Z1 Limits for Air Contaminants  
 US - Wyoming Toxic and Hazardous Substances Table Z-2 Acceptable ceiling concentration, Acceptable maximum peak above the acceptable ceiling concentration for an 8-hr shift  
 US ACGIH Threshold Limit Values (TLV)  
 US ACGIH Threshold Limit Values (TLV) - Carcinogens  
 US Clean Air Act - Hazardous Air Pollutants  
 US CWA (Clean Water Act) - Priority Pollutants  
 US CWA (Clean Water Act) - Toxic Pollutants  
 US EPA Carcinogens Listing  
 US EPCRA Section 313 Chemical List  
 US National Toxicology Program (NTP) 14th Report Part A Known to be Human Carcinogens  
 US OSHA Permissible Exposure Levels (PELs) - Table Z1  
 US OSHA Permissible Exposure Levels (PELs) - Table Z2  
 US OSHA Permissible Exposure Levels (PELs) - Table Z3

**BISMUTH(7440-69-9) IS FOUND ON THE FOLLOWING REGULATORY LISTS**

US Toxic Substances Control Act (TSCA) - Chemical Substance Inventory

**CADMIUM(7440-43-9) IS FOUND ON THE FOLLOWING REGULATORY LISTS**

US - Alaska Limits for Air Contaminants  
 US - California - Proposition 65 - Priority List for the Development of MADLs for Chemicals Causing Reproductive Toxicity  
 US - California OEHHA/ARB - Chronic Reference Exposure Levels and Target Organs (CRELs)  
 US - California Permissible Exposure Limits for Chemical Contaminants  
 US - California Proposition 65 - Carcinogens  
 US - California Proposition 65 - Maximum Allowable Dose Levels (MADLs) for Chemicals Causing Reproductive Toxicity  
 US - California Proposition 65 - No Significant Risk Levels (NSRLs) for Carcinogens  
 US - Hawaii Air Contaminant Limits  
 US - Idaho - Acceptable Maximum Peak Concentrations  
 US - Idaho - Limits for Air Contaminants  
 US - Massachusetts - Right To Know Listed Chemicals  
 US - Michigan Exposure Limits for Air Contaminants  
 US - Minnesota Permissible Exposure Limits (PELs)  
 US - New Jersey Right to Know - Special Health Hazard Substance List (SHHSL): Carcinogens  
 US - Oregon Permissible Exposure Limits (Z-1)  
 US - Oregon Permissible Exposure Limits (Z-2)  
 US - Pennsylvania - Hazardous Substance List  
 US - Rhode Island Hazardous Substance List  
 US - Tennessee Occupational Exposure Limits - Limits For Air Contaminants  
 US - Vermont Permissible Exposure Limits Table Z-1-A Final Rule Limits for Air Contaminants

US - Vermont Permissible Exposure Limits Table Z-1-A Transitional Limits for Air Contaminants  
 US - Washington Permissible exposure limits of air contaminants  
 US - Washington Toxic air pollutants and their ASIL, SQER and de minimis emission values  
 US - Wyoming Toxic and Hazardous Substances Table Z1 Limits for Air Contaminants  
 US - Wyoming Toxic and Hazardous Substances Table Z-2 Acceptable ceiling concentration, Acceptable maximum peak above the acceptable ceiling concentration for an 8-hr shift  
 US ACGIH Threshold Limit Values (TLV)  
 US ACGIH Threshold Limit Values (TLV) - Carcinogens  
 US ATSDR Minimal Risk Levels for Hazardous Substances (MRLs)  
 US Clean Air Act - Hazardous Air Pollutants  
 US CWA (Clean Water Act) - Priority Pollutants  
 US CWA (Clean Water Act) - Toxic Pollutants  
 US EPA Carcinogens Listing  
 US EPCRA Section 313 Chemical List  
 US National Toxicology Program (NTP) 14th Report Part A Known to be Human Carcinogens  
 US NIOSH Recommended Exposure Limits (RELs)  
 US OSHA Carcinogens Listing  
 US OSHA Permissible Exposure Levels (PELs) - Table Z1  
 US OSHA Permissible Exposure Levels (PELs) - Table Z2  
 US Toxic Substances Control Act (TSCA) - Chemical Substance Inventory

**CALCIUM(7440-70-2) IS FOUND ON THE FOLLOWING REGULATORY LISTS**

US - Massachusetts - Right To Know Listed Chemicals  
 US - Pennsylvania - Hazardous Substance List

US - Rhode Island Hazardous Substance List  
 US Toxic Substances Control Act (TSCA) - Chemical Substance Inventory

**CHROMIUM(7440-47-3) IS FOUND ON THE FOLLOWING REGULATORY LISTS**

US - Alaska Limits for Air Contaminants	US - Vermont Permissible Exposure Limits Table Z-1-A Transitional Limits for Air Contaminants
US - California OEHHA/ARB - Acute Reference Exposure Levels and Target Organs (RELS)	US - Washington Permissible exposure limits of air contaminants
US - California OEHHA/ARB - Chronic Reference Exposure Levels and Target Organs (CRELs)	US - Wyoming Toxic and Hazardous Substances Table Z1 Limits for Air Contaminants
US - California Permissible Exposure Limits for Chemical Contaminants	US ACGIH Threshold Limit Values (TLV)
US - California Proposition 65 - Carcinogens	US ACGIH Threshold Limit Values (TLV) - Carcinogens
US - Hawaii Air Contaminant Limits	US Clean Air Act - Hazardous Air Pollutants
US - Idaho - Limits for Air Contaminants	US CWA (Clean Water Act) - Priority Pollutants
US - Massachusetts - Right To Know Listed Chemicals	US CWA (Clean Water Act) - Toxic Pollutants
US - Michigan Exposure Limits for Air Contaminants	US EPCRA Section 313 Chemical List
US - Oregon Permissible Exposure Limits (Z-1)	US National Toxicology Program (NTP) 14th Report Part A Known to be Human Carcinogens
US - Pennsylvania - Hazardous Substance List	US NIOSH Recommended Exposure Limits (RELS)
US - Rhode Island Hazardous Substance List	US OSHA Permissible Exposure Levels (PELs) - Table Z1
US - Tennessee Occupational Exposure Limits - Limits For Air Contaminants	US Priority List for the Development of Proposition 65 Safe Harbor Levels - No Significant Risk Levels (NSRLs) for Carcinogens and Maximum Allowable Dose Levels (MADLs) for Chemicals Causing Reproductive Toxicity
US - Vermont Permissible Exposure Limits Table Z-1-A Final Rule Limits for Air Contaminants	US Toxic Substances Control Act (TSCA) - Chemical Substance Inventory

**COBALT(7440-48-4) IS FOUND ON THE FOLLOWING REGULATORY LISTS**

US - Alaska Limits for Air Contaminants	US - Vermont Permissible Exposure Limits Table Z-1-A Transitional Limits for Air Contaminants
US - California Permissible Exposure Limits for Chemical Contaminants	US - Washington Permissible exposure limits of air contaminants
US - California Proposition 65 - Carcinogens	US - Washington Toxic air pollutants and their ASIL, SQER and de minimis emission values
US - Hawaii Air Contaminant Limits	US - Wyoming Toxic and Hazardous Substances Table Z1 Limits for Air Contaminants
US - Idaho - Limits for Air Contaminants	US ACGIH Threshold Limit Values (TLV)
US - Massachusetts - Right To Know Listed Chemicals	US ACGIH Threshold Limit Values (TLV) - Carcinogens
US - Michigan Exposure Limits for Air Contaminants	US ATSDR Minimal Risk Levels for Hazardous Substances (MRLs)
US - Minnesota Permissible Exposure Limits (PELs)	US Clean Air Act - Hazardous Air Pollutants
US - New Jersey Right to Know - Special Health Hazard Substance List (SHHSL): Carcinogens	US EPCRA Section 313 Chemical List
US - Oregon Permissible Exposure Limits (Z-1)	US National Toxicology Program (NTP) 14th Report Part B.
US - Pennsylvania - Hazardous Substance List	US NIOSH Recommended Exposure Limits (RELS)
US - Rhode Island Hazardous Substance List	US OSHA Permissible Exposure Levels (PELs) - Table Z1
US - Tennessee Occupational Exposure Limits - Limits For Air Contaminants	US Priority List for the Development of Proposition 65 Safe Harbor Levels - No Significant Risk Levels (NSRLs) for Carcinogens and Maximum Allowable Dose Levels (MADLs) for Chemicals Causing Reproductive Toxicity
US - Vermont Permissible Exposure Limits Table Z-1-A Final Rule Limits for Air Contaminants	US Toxic Substances Control Act (TSCA) - Chemical Substance Inventory

**COPPER(7440-50-8) IS FOUND ON THE FOLLOWING REGULATORY LISTS**

US - Alaska Limits for Air Contaminants	US - Washington Permissible exposure limits of air contaminants
US - California OEHHA/ARB - Acute Reference Exposure Levels and Target Organs (RELS)	US - Washington Toxic air pollutants and their ASIL, SQER and de minimis emission values
US - California Permissible Exposure Limits for Chemical Contaminants	US - Wyoming Toxic and Hazardous Substances Table Z1 Limits for Air Contaminants
US - Hawaii Air Contaminant Limits	US ACGIH Threshold Limit Values (TLV)
US - Idaho - Limits for Air Contaminants	US ATSDR Minimal Risk Levels for Hazardous Substances (MRLs)
US - Massachusetts - Right To Know Listed Chemicals	US Clean Air Act - Hazardous Air Pollutants
US - Michigan Exposure Limits for Air Contaminants	US CWA (Clean Water Act) - Priority Pollutants
US - Minnesota Permissible Exposure Limits (PELs)	US CWA (Clean Water Act) - Toxic Pollutants
US - Oregon Permissible Exposure Limits (Z-1)	US EPA Carcinogens Listing
US - Pennsylvania - Hazardous Substance List	US EPCRA Section 313 Chemical List
US - Rhode Island Hazardous Substance List	US National Toxicology Program (NTP) 14th Report Part B.
US - Tennessee Occupational Exposure Limits - Limits For Air Contaminants	US NIOSH Recommended Exposure Limits (RELS)
US - Vermont Permissible Exposure Limits Table Z-1-A Final Rule Limits for Air Contaminants	US OSHA Permissible Exposure Levels (PELs) - Table Z1
US - Vermont Permissible Exposure Limits Table Z-1-A Transitional Limits for Air Contaminants	US Toxic Substances Control Act (TSCA) - Chemical Substance Inventory

**IRON(7439-89-6) IS FOUND ON THE FOLLOWING REGULATORY LISTS**

US - Alaska Limits for Air Contaminants	US - Vermont Permissible Exposure Limits Table Z-1-A Final Rule Limits for Air Contaminants
US - California OEHHA/ARB - Chronic Reference Exposure Levels and Target Organs (CRELs)	US - Vermont Permissible Exposure Limits Table Z-1-A Transitional Limits for Air Contaminants
US - California Permissible Exposure Limits for Chemical Contaminants	US - Washington Permissible exposure limits of air contaminants
US - Hawaii Air Contaminant Limits	US - Washington Toxic air pollutants and their ASIL, SQER and de minimis emission values
US - Idaho - Limits for Air Contaminants	US - Wyoming Toxic and Hazardous Substances Table Z1 Limits for Air Contaminants
US - Michigan Exposure Limits for Air Contaminants	US Clean Air Act - Hazardous Air Pollutants
US - Minnesota Permissible Exposure Limits (PELs)	US OSHA Permissible Exposure Levels (PELs) - Table Z1
US - Oregon Permissible Exposure Limits (Z-1)	US OSHA Permissible Exposure Levels (PELs) - Table Z3
US - Tennessee Occupational Exposure Limits - Limits For Air Contaminants	US Toxic Substances Control Act (TSCA) - Chemical Substance Inventory

**LEAD(7439-92-1) IS FOUND ON THE FOLLOWING REGULATORY LISTS**

US - Alaska Limits for Air Contaminants	US - Vermont Permissible Exposure Limits Table Z-1-A Transitional Limits for Air Contaminants
US - California - Proposition 65 - Priority List for the Development of MADLs for Chemicals Causing Reproductive Toxicity	US - Washington Permissible exposure limits of air contaminants
US - California OEHHA/ARB - Chronic Reference Exposure Levels and Target Organs (CRELs)	US - Washington Toxic air pollutants and their ASIL, SQER and de minimis emission values
US - California Permissible Exposure Limits for Chemical Contaminants	US ACGIH Threshold Limit Values (TLV)
US - California Proposition 65 - Carcinogens	US ACGIH Threshold Limit Values (TLV) - Carcinogens
US - California Proposition 65 - Maximum Allowable Dose Levels (MADLs) for Chemicals Causing Reproductive Toxicity	US Clean Air Act - Hazardous Air Pollutants
US - California Proposition 65 - No Significant Risk Levels (NSRLs) for Carcinogens	US CWA (Clean Water Act) - Priority Pollutants
US - Hawaii Air Contaminant Limits	US CWA (Clean Water Act) - Toxic Pollutants
US - Idaho - Acceptable Maximum Peak Concentrations	US EPA Carcinogens Listing
US - Idaho - Limits for Air Contaminants	US EPCRA Section 313 Chemical List
US - Massachusetts - Right To Know Listed Chemicals	US National Toxicology Program (NTP) 14th Report Part A Known to be Human Carcinogens
US - Minnesota Permissible Exposure Limits (PELs)	US National Toxicology Program (NTP) 14th Report Part B.
US - New Jersey Right to Know - Special Health Hazard Substance List (SHHSL): Carcinogens	US NIOSH Recommended Exposure Limits (RELs)
US - Pennsylvania - Hazardous Substance List	US OSHA Permissible Exposure Levels (PELs) - Table Z1
US - Rhode Island Hazardous Substance List	US OSHA Permissible Exposure Levels (PELs) - Table Z2
US - Tennessee Occupational Exposure Limits - Limits For Air Contaminants	US Toxic Substances Control Act (TSCA) - Chemical Substance Inventory
US - Vermont Permissible Exposure Limits Table Z-1-A Final Rule Limits for Air Contaminants	

**LITHIUM(7439-93-2) IS FOUND ON THE FOLLOWING REGULATORY LISTS**

International Air Transport Association (IATA) Dangerous Goods Regulations - Prohibited List Passenger and Cargo Aircraft	US - Rhode Island Hazardous Substance List
US - California Permissible Exposure Limits for Chemical Contaminants	US NIOSH Recommended Exposure Limits (RELs)
US - Massachusetts - Right To Know Listed Chemicals	US Toxic Substances Control Act (TSCA) - Chemical Substance Inventory
US - Pennsylvania - Hazardous Substance List	

**MAGNESIUM(7439-95-4) IS FOUND ON THE FOLLOWING REGULATORY LISTS**

US - Alaska Limits for Air Contaminants	US - Tennessee Occupational Exposure Limits - Limits For Air Contaminants
US - California OEHHA/ARB - Chronic Reference Exposure Levels and Target Organs (CRELs)	US - Vermont Permissible Exposure Limits Table Z-1-A Final Rule Limits for Air Contaminants
US - California Permissible Exposure Limits for Chemical Contaminants	US - Vermont Permissible Exposure Limits Table Z-1-A Transitional Limits for Air Contaminants
US - Hawaii Air Contaminant Limits	US - Washington Permissible exposure limits of air contaminants
US - Idaho - Limits for Air Contaminants	US - Washington Toxic air pollutants and their ASIL, SQER and de minimis emission values
US - Massachusetts - Right To Know Listed Chemicals	US - Wyoming Toxic and Hazardous Substances Table Z1 Limits for Air Contaminants
US - Michigan Exposure Limits for Air Contaminants	US Clean Air Act - Hazardous Air Pollutants
US - Minnesota Permissible Exposure Limits (PELs)	US NIOSH Recommended Exposure Limits (RELs)
US - Oregon Permissible Exposure Limits (Z-1)	US OSHA Permissible Exposure Levels (PELs) - Table Z1
US - Pennsylvania - Hazardous Substance List	US OSHA Permissible Exposure Levels (PELs) - Table Z3
US - Rhode Island Hazardous Substance List	US Toxic Substances Control Act (TSCA) - Chemical Substance Inventory

**MANGANESE(II) ACETATE TETRAHYDRATE(6156-78-1) IS FOUND ON THE FOLLOWING REGULATORY LISTS**

US - Alaska Limits for Air Contaminants	US - Vermont Permissible Exposure Limits Table Z-1-A Final Rule Limits for Air Contaminants
US - California OEHHA/ARB - Chronic Reference Exposure Levels and Target Organs (CRELs)	US - Vermont Permissible Exposure Limits Table Z-1-A Transitional Limits for Air Contaminants
US - California Permissible Exposure Limits for Chemical Contaminants	US - Washington Permissible exposure limits of air contaminants
US - Hawaii Air Contaminant Limits	US - Washington Toxic air pollutants and their ASIL, SQER and de minimis emission values
US - Idaho - Limits for Air Contaminants	US - Wyoming Toxic and Hazardous Substances Table Z1 Limits for Air Contaminants
US - Michigan Exposure Limits for Air Contaminants	US Clean Air Act - Hazardous Air Pollutants
US - Minnesota Permissible Exposure Limits (PELs)	US EPCRA Section 313 Chemical List
US - Oregon Permissible Exposure Limits (Z-1)	US OSHA Permissible Exposure Levels (PELs) - Table Z1
US - Tennessee Occupational Exposure Limits - Limits For Air Contaminants	US Toxic Substances Control Act (TSCA) - Chemical Substance Inventory

**MOLYBDENUM(7439-98-7) IS FOUND ON THE FOLLOWING REGULATORY LISTS**

US - Alaska Limits for Air Contaminants	US - Vermont Permissible Exposure Limits Table Z-1-A Final Rule Limits for Air Contaminants
US - Hawaii Air Contaminant Limits	US - Vermont Permissible Exposure Limits Table Z-1-A Transitional Limits for Air Contaminants
US - Idaho - Limits for Air Contaminants	US - Washington Permissible exposure limits of air contaminants
US - Massachusetts - Right To Know Listed Chemicals	US ACGIH Threshold Limit Values (TLV)
US - Minnesota Permissible Exposure Limits (PELs)	US ACGIH Threshold Limit Values (TLV) - Carcinogens
US - Pennsylvania - Hazardous Substance List	US NIOSH Recommended Exposure Limits (RELs)
US - Rhode Island Hazardous Substance List	US OSHA Permissible Exposure Levels (PELs) - Table Z1
US - Tennessee Occupational Exposure Limits - Limits For Air Contaminants	US Toxic Substances Control Act (TSCA) - Chemical Substance Inventory

**NICKEL(7440-02-0) IS FOUND ON THE FOLLOWING REGULATORY LISTS**

US - Alaska Limits for Air Contaminants  
 US - California OEHHA/ARB - Acute Reference Exposure Levels and Target Organs (RELS)  
 US - California OEHHA/ARB - Chronic Reference Exposure Levels and Target Organs (CRELs)  
 US - California Permissible Exposure Limits for Chemical Contaminants  
 US - California Proposition 65 - Carcinogens  
 US - Hawaii Air Contaminant Limits  
 US - Idaho - Limits for Air Contaminants  
 US - Massachusetts - Right To Know Listed Chemicals  
 US - Michigan Exposure Limits for Air Contaminants  
 US - Minnesota Permissible Exposure Limits (PELs)  
 US - New Jersey Right to Know - Special Health Hazard Substance List (SHHSL): Carcinogens  
 US - Oregon Permissible Exposure Limits (Z-1)  
 US - Pennsylvania - Hazardous Substance List  
 US - Rhode Island Hazardous Substance List  
 US - Tennessee Occupational Exposure Limits - Limits For Air Contaminants  
 US - Vermont Permissible Exposure Limits Table Z-1-A Final Rule Limits for Air Contaminants

US - Vermont Permissible Exposure Limits Table Z-1-A Transitional Limits for Air Contaminants  
 US - Washington Permissible exposure limits of air contaminants  
 US - Wyoming Toxic and Hazardous Substances Table Z1 Limits for Air Contaminants  
 US ACGIH Threshold Limit Values (TLV)  
 US ACGIH Threshold Limit Values (TLV) - Carcinogens  
 US ATSDR Minimal Risk Levels for Hazardous Substances (MRLs)  
 US Clean Air Act - Hazardous Air Pollutants  
 US CWA (Clean Water Act) - Priority Pollutants  
 US CWA (Clean Water Act) - Toxic Pollutants  
 US EPCRA Section 313 Chemical List  
 US National Toxicology Program (NTP) 14th Report Part B.  
 US NIOSH Recommended Exposure Limits (RELs)  
 US OSHA Permissible Exposure Levels (PELs) - Table Z1  
 US Priority List for the Development of Proposition 65 Safe Harbor Levels - No Significant Risk Levels (NSRLs) for Carcinogens and Maximum Allowable Dose Levels (MADLs) for Chemicals Causing Reproductive Toxicity  
 US Toxic Substances Control Act (TSCA) - Chemical Substance Inventory

**POTASSIUM(7440-09-7) IS FOUND ON THE FOLLOWING REGULATORY LISTS**

International Air Transport Association (IATA) Dangerous Goods Regulations - Prohibited List Passenger and Cargo Aircraft  
 US - Massachusetts - Right To Know Listed Chemicals  
 US - Pennsylvania - Hazardous Substance List

US - Rhode Island Hazardous Substance List  
 US Toxic Substances Control Act (TSCA) - Chemical Substance Inventory

**RUBIDIUM(7440-17-7) IS FOUND ON THE FOLLOWING REGULATORY LISTS**

International Air Transport Association (IATA) Dangerous Goods Regulations - Prohibited List Passenger and Cargo Aircraft

US Toxic Substances Control Act (TSCA) - Chemical Substance Inventory

**SELENIUM(7782-49-2) IS FOUND ON THE FOLLOWING REGULATORY LISTS**

US - Alaska Limits for Air Contaminants  
 US - California OEHHA/ARB - Acute Reference Exposure Levels and Target Organs (RELS)  
 US - California OEHHA/ARB - Chronic Reference Exposure Levels and Target Organs (CRELs)  
 US - Hawaii Air Contaminant Limits  
 US - Idaho - Limits for Air Contaminants  
 US - Massachusetts - Right To Know Listed Chemicals  
 US - Minnesota Permissible Exposure Limits (PELs)  
 US - Pennsylvania - Hazardous Substance List  
 US - Rhode Island Hazardous Substance List  
 US - Tennessee Occupational Exposure Limits - Limits For Air Contaminants  
 US - Vermont Permissible Exposure Limits Table Z-1-A Final Rule Limits for Air Contaminants  
 US - Vermont Permissible Exposure Limits Table Z-1-A Transitional Limits for Air Contaminants

US - Washington Permissible exposure limits of air contaminants  
 US - Washington Toxic air pollutants and their ASIL, SQER and de minimis emission values  
 US ACGIH Threshold Limit Values (TLV)  
 US ATSDR Minimal Risk Levels for Hazardous Substances (MRLs)  
 US Clean Air Act - Hazardous Air Pollutants  
 US CWA (Clean Water Act) - Priority Pollutants  
 US CWA (Clean Water Act) - Toxic Pollutants  
 US EPA Carcinogens Listing  
 US EPCRA Section 313 Chemical List  
 US NIOSH Recommended Exposure Limits (RELs)  
 US OSHA Permissible Exposure Levels (PELs) - Table Z1  
 US Toxic Substances Control Act (TSCA) - Chemical Substance Inventory

**SILVER(7440-22-4) IS FOUND ON THE FOLLOWING REGULATORY LISTS**

US - Alaska Limits for Air Contaminants  
 US - California OEHHA/ARB - Acute Reference Exposure Levels and Target Organs (RELS)  
 US - California Permissible Exposure Limits for Chemical Contaminants  
 US - Hawaii Air Contaminant Limits  
 US - Idaho - Limits for Air Contaminants  
 US - Massachusetts - Right To Know Listed Chemicals  
 US - Michigan Exposure Limits for Air Contaminants  
 US - Minnesota Permissible Exposure Limits (PELs)  
 US - Pennsylvania - Hazardous Substance List  
 US - Rhode Island Hazardous Substance List  
 US - Tennessee Occupational Exposure Limits - Limits For Air Contaminants  
 US - Vermont Permissible Exposure Limits Table Z-1-A Final Rule Limits for Air Contaminants

US - Vermont Permissible Exposure Limits Table Z-1-A Transitional Limits for Air Contaminants  
 US - Washington Permissible exposure limits of air contaminants  
 US - Wyoming Toxic and Hazardous Substances Table Z1 Limits for Air Contaminants  
 US ACGIH Threshold Limit Values (TLV)  
 US Clean Air Act - Hazardous Air Pollutants  
 US CWA (Clean Water Act) - Priority Pollutants  
 US CWA (Clean Water Act) - Toxic Pollutants  
 US EPA Carcinogens Listing  
 US EPCRA Section 313 Chemical List  
 US NIOSH Recommended Exposure Limits (RELs)  
 US OSHA Permissible Exposure Levels (PELs) - Table Z1  
 US Toxic Substances Control Act (TSCA) - Chemical Substance Inventory

**SODIUM(7440-23-5) IS FOUND ON THE FOLLOWING REGULATORY LISTS**

International Air Transport Association (IATA) Dangerous Goods Regulations - Prohibited List Passenger and Cargo Aircraft  
 US - Massachusetts - Right To Know Listed Chemicals  
 US - Pennsylvania - Hazardous Substance List

US - Rhode Island Hazardous Substance List  
 US CWA (Clean Water Act) - List of Hazardous Substances  
 US Toxic Substances Control Act (TSCA) - Chemical Substance Inventory

**STRONTIUM(7440-24-6) IS FOUND ON THE FOLLOWING REGULATORY LISTS**

US ATSDR Minimal Risk Levels for Hazardous Substances (MRLs)

US Toxic Substances Control Act (TSCA) - Chemical Substance Inventory

**TELLURIUM(13494-80-9) IS FOUND ON THE FOLLOWING REGULATORY LISTS**



US - Alaska Limits for Air Contaminants  
 US - California Permissible Exposure Limits for Chemical Contaminants  
 US - Hawaii Air Contaminant Limits  
 US - Idaho - Limits for Air Contaminants  
 US - Massachusetts - Right To Know Listed Chemicals  
 US - Michigan Exposure Limits for Air Contaminants  
 US - Minnesota Permissible Exposure Limits (PELs)  
 US - Oregon Permissible Exposure Limits (Z-1)  
 US - Pennsylvania - Hazardous Substance List  
 US - Rhode Island Hazardous Substance List

US - Tennessee Occupational Exposure Limits - Limits For Air Contaminants  
 US - Vermont Permissible Exposure Limits Table Z-1-A Final Rule Limits for Air Contaminants  
 US - Vermont Permissible Exposure Limits Table Z-1-A Transitional Limits for Air Contaminants  
 US - Washington Permissible exposure limits of air contaminants  
 US - Wyoming Toxic and Hazardous Substances Table Z1 Limits for Air Contaminants  
 US ACGIH Threshold Limit Values (TLV)  
 US NIOSH Recommended Exposure Limits (RELs)  
 US OSHA Permissible Exposure Levels (PELs) - Table Z1  
 US Toxic Substances Control Act (TSCA) - Chemical Substance Inventory

**THALLIUM(7440-28-0) IS FOUND ON THE FOLLOWING REGULATORY LISTS**

US - California Permissible Exposure Limits for Chemical Contaminants  
 US - Massachusetts - Right To Know Listed Chemicals  
 US - Minnesota Permissible Exposure Limits (PELs)  
 US - Pennsylvania - Hazardous Substance List  
 US - Rhode Island Hazardous Substance List  
 US ACGIH Threshold Limit Values (TLV)

US CWA (Clean Water Act) - Priority Pollutants  
 US CWA (Clean Water Act) - Toxic Pollutants  
 US EPCRA Section 313 Chemical List  
 US NIOSH Recommended Exposure Limits (RELs)  
 US Toxic Substances Control Act (TSCA) - Chemical Substance Inventory

**URANIUM NATURAL(7440-61-1) IS FOUND ON THE FOLLOWING REGULATORY LISTS**

US - Alaska Limits for Air Contaminants  
 US - California Permissible Exposure Limits for Chemical Contaminants  
 US - California Proposition 65 - Carcinogens  
 US - Hawaii Air Contaminant Limits  
 US - Idaho - Limits for Air Contaminants  
 US - Massachusetts - Right To Know Listed Chemicals  
 US - Michigan Exposure Limits for Air Contaminants  
 US - Minnesota Permissible Exposure Limits (PELs)  
 US - Oregon Permissible Exposure Limits (Z-1)  
 US - Pennsylvania - Hazardous Substance List  
 US - Rhode Island Hazardous Substance List  
 US - Tennessee Occupational Exposure Limits - Limits For Air Contaminants

US - Vermont Permissible Exposure Limits Table Z-1-A Final Rule Limits for Air Contaminants  
 US - Vermont Permissible Exposure Limits Table Z-1-A Transitional Limits for Air Contaminants  
 US - Washington Permissible exposure limits of air contaminants  
 US - Wyoming Toxic and Hazardous Substances Table Z1 Limits for Air Contaminants  
 US ACGIH Threshold Limit Values (TLV)  
 US ACGIH Threshold Limit Values (TLV) - Carcinogens  
 US ATSDR Minimal Risk Levels for Hazardous Substances (MRLs)  
 US Clean Air Act - Hazardous Air Pollutants  
 US NIOSH Recommended Exposure Limits (RELs)  
 US OSHA Permissible Exposure Levels (PELs) - Table Z1  
 US Priority List for the Development of Proposition 65 Safe Harbor Levels - No Significant Risk Levels (NSRLs) for Carcinogens and Maximum Allowable Dose Levels (MADLs) for Chemicals Causing Reproductive Toxicity  
 US Toxic Substances Control Act (TSCA) - Chemical Substance Inventory

**AMMONIUM METAVANADATE(7803-55-6) IS FOUND ON THE FOLLOWING REGULATORY LISTS**

US - California OEHHA/ARB - Acute Reference Exposure Levels and Target Organs (RELs)  
 US - Massachusetts - Right To Know Listed Chemicals  
 US - Pennsylvania - Hazardous Substance List

US EPCRA Section 313 Chemical List  
 US Toxic Substances Control Act (TSCA) - Chemical Substance Inventory

**NITRIC ACID(7697-37-2) IS FOUND ON THE FOLLOWING REGULATORY LISTS**

International Air Transport Association (IATA) Dangerous Goods Regulations - Prohibited List Passenger and Cargo Aircraft  
 US - Alaska Limits for Air Contaminants  
 US - California OEHHA/ARB - Acute Reference Exposure Levels and Target Organs (RELs)  
 US - California OEHHA/ARB - Chronic Reference Exposure Levels and Target Organs (CRELs)  
 US - California Permissible Exposure Limits for Chemical Contaminants  
 US - California Proposition 65 - Carcinogens  
 US - Hawaii Air Contaminant Limits  
 US - Idaho - Limits for Air Contaminants  
 US - Massachusetts - Right To Know Listed Chemicals  
 US - Michigan Exposure Limits for Air Contaminants  
 US - Minnesota Permissible Exposure Limits (PELs)  
 US - Oregon Permissible Exposure Limits (Z-1)  
 US - Pennsylvania - Hazardous Substance List  
 US - Rhode Island Hazardous Substance List  
 US - Tennessee Occupational Exposure Limits - Limits For Air Contaminants  
 US - Vermont Permissible Exposure Limits Table Z-1-A Final Rule Limits for Air Contaminants

US - Vermont Permissible Exposure Limits Table Z-1-A Transitional Limits for Air Contaminants  
 US - Washington Permissible exposure limits of air contaminants  
 US - Washington Toxic air pollutants and their ASIL, SQER and de minimis emission values  
 US - Wyoming Toxic and Hazardous Substances Table Z1 Limits for Air Contaminants  
 US ACGIH Threshold Limit Values (TLV)  
 US Clean Air Act - Hazardous Air Pollutants  
 US CWA (Clean Water Act) - List of Hazardous Substances  
 US CWA (Clean Water Act) - Priority Pollutants  
 US CWA (Clean Water Act) - Toxic Pollutants  
 US EPCRA Section 313 Chemical List  
 US National Toxicology Program (NTP) 14th Report Part A Known to be Human Carcinogens  
 US NIOSH Recommended Exposure Limits (RELs)  
 US OSHA Permissible Exposure Levels (PELs) - Table Z1  
 US Priority List for the Development of Proposition 65 Safe Harbor Levels - No Significant Risk Levels (NSRLs) for Carcinogens and Maximum Allowable Dose Levels (MADLs) for Chemicals Causing Reproductive Toxicity  
 US SARA Section 302 Extremely Hazardous Substances  
 US Toxic Substances Control Act (TSCA) - Chemical Substance Inventory

**HYDROFLUORIC ACID(7664-39-3) IS FOUND ON THE FOLLOWING REGULATORY LISTS**

US - Alaska Limits for Air Contaminants	US - Vermont Permissible Exposure Limits Table Z-1-A Transitional Limits for Air Contaminants
US - California OEHHA/ARB - Acute Reference Exposure Levels and Target Organs (RELS)	US - Washington Permissible exposure limits of air contaminants
US - California OEHHA/ARB - Chronic Reference Exposure Levels and Target Organs (CRELs)	US - Washington Toxic air pollutants and their ASIL, SQER and de minimis emission values
US - California Permissible Exposure Limits for Chemical Contaminants	US - Wyoming Toxic and Hazardous Substances Table Z1 Limits for Air Contaminants
US - Hawaii Air Contaminant Limits	US - Wyoming Toxic and Hazardous Substances Table Z-2 Acceptable ceiling concentration, Acceptable maximum peak above the acceptable ceiling concentration for an 8-hr shift
US - Idaho - Acceptable Maximum Peak Concentrations	US ACGIH Threshold Limit Values (TLV)
US - Idaho - Limits for Air Contaminants	US ACGIH Threshold Limit Values (TLV) - Carcinogens
US - Massachusetts - Right To Know Listed Chemicals	US ATSDR Minimal Risk Levels for Hazardous Substances (MRLs)
US - Michigan Exposure Limits for Air Contaminants	US Clean Air Act - Hazardous Air Pollutants
US - Minnesota Permissible Exposure Limits (PELs)	US CWA (Clean Water Act) - List of Hazardous Substances
US - Oregon Permissible Exposure Limits (Z-1)	US EPCRA Section 313 Chemical List
US - Oregon Permissible Exposure Limits (Z-2)	US NIOSH Recommended Exposure Limits (RELS)
US - Pennsylvania - Hazardous Substance List	US OSHA Permissible Exposure Levels (PELs) - Table Z1
US - Rhode Island Hazardous Substance List	US OSHA Permissible Exposure Levels (PELs) - Table Z2
US - Tennessee Occupational Exposure Limits - Limits For Air Contaminants	US SARA Section 302 Extremely Hazardous Substances
US - Vermont Permissible Exposure Limits Table Z-1-A Final Rule Limits for Air Contaminants	US Toxic Substances Control Act (TSCA) - Chemical Substance Inventory

**WATER(7732-18-5) IS FOUND ON THE FOLLOWING REGULATORY LISTS**

US - Pennsylvania - Hazardous Substance List	US Toxic Substances Control Act (TSCA) - Chemical Substance Inventory
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**ZINC(7440-66-6) IS FOUND ON THE FOLLOWING REGULATORY LISTS**

US - California OEHHA/ARB - Chronic Reference Exposure Levels and Target Organs (CRELs)	US - Wyoming Toxic and Hazardous Substances Table Z1 Limits for Air Contaminants
US - California Permissible Exposure Limits for Chemical Contaminants	US ATSDR Minimal Risk Levels for Hazardous Substances (MRLs)
US - Hawaii Air Contaminant Limits	US CWA (Clean Water Act) - Priority Pollutants
US - Massachusetts - Right To Know Listed Chemicals	US CWA (Clean Water Act) - Toxic Pollutants
US - Michigan Exposure Limits for Air Contaminants	US EPA Carcinogens Listing
US - Oregon Permissible Exposure Limits (Z-1)	US EPCRA Section 313 Chemical List
US - Pennsylvania - Hazardous Substance List	US NIOSH Recommended Exposure Limits (RELS)
US - Rhode Island Hazardous Substance List	US OSHA Permissible Exposure Levels (PELs) - Table Z3
US - Tennessee Occupational Exposure Limits - Limits For Air Contaminants	US Toxic Substances Control Act (TSCA) - Chemical Substance Inventory
US - Washington Permissible exposure limits of air contaminants	

**Federal Regulations**

**Superfund Amendments and Reauthorization Act of 1986 (SARA)**

**SECTION 311/312 HAZARD CATEGORIES**

Immediate (acute) health hazard	Yes
Delayed (chronic) health hazard	No
Fire hazard	No
Pressure hazard	No
Reactivity hazard	No

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

Name	Reportable Quantity in Pounds (lb)	Reportable Quantity in kg
Antimony	5000	2270
Arsenic	1	0.454
Cadmium	10	4.54
Chromium	5000	2270
Copper	5000	2270
Lead	10	4.54
Nickel	100	45.4
Selenium	100	45.4
Silver	1000	454
Sodium	10	4.54
Thallium	1000	454
Ammonium vanadate	1000	454
Nitric acid	1000	454
Hydrofluoric acid	100	45.4
Zinc	1000	454

**State Regulations**

**US. CALIFORNIA PROPOSITION 65**

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

**US - CALIFORNIA PREPOSITION 65 - CARCINOGENS & REPRODUCTIVE TOXICITY (CRT): LISTED SUBSTANCE**

Nickel compounds, Cadmium and cadmium compounds: Cadmium, Cobalt metal powder, Lead and lead compounds: Lead, Nickel (Metallic), Radionuclides Listed

National Inventory	Status
Australia - AICS	N (beryllium acetate)
Canada - DSL	N (rubidium; beryllium acetate)
Canada - NDSL	N (sodium; bismuth; strontium; thallium; lead; calcium; zinc; potassium; ammonium metavanadate; magnesium; copper; lithium; water; antimony; barium; selenium; aluminium; molybdenum; arsenic; cobalt; nickel; manganese(II) acetate tetrahydrate; iron; tellurium; chromium; silver; hydrofluoric acid; uranium natural; beryllium acetate; cadmium; nitric acid)
China - IECSC	N (rubidium; uranium natural; beryllium acetate)
Europe - EINEC / ELINCS / NLP	Y
Japan - ENCS	N (sodium; bismuth; strontium; thallium; lead; calcium; zinc; potassium; magnesium; copper; lithium; water; antimony; barium; selenium; aluminium; molybdenum; arsenic; cobalt; nickel; iron; tellurium; chromium; silver; rubidium; uranium natural; beryllium acetate; cadmium)
Korea - KECI	N (beryllium acetate)
New Zealand - NZIoC	N (beryllium acetate)
Philippines - PICCS	N (beryllium acetate)
USA - TSCA	N (beryllium acetate)
<b>Legend:</b>	Y = All ingredients are on the inventory N = Not determined or one or more ingredients are not on the inventory and are not exempt from listing (see specific ingredients in brackets)

## SECTION 16 OTHER INFORMATION

### Other information

#### Ingredients with multiple cas numbers

Name	CAS No
aluminium	7429-90-5, 91728-14-2
calcium	7440-70-2, 8047-59-4
copper	7440-50-8, 133353-46-5, 133353-47-6, 195161-80-9, 65555-90-0, 72514-83-1
uranium natural	7440-61-1, 53125-22-7
hydrofluoric acid	7664-39-3, 790596-14-4

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

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

### Definitions and abbreviations

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

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