



## CWW-TM-D Certified Waste Water- Trace Metals Solution D

### High-Purity Standards

Catalogue number: CWW-TM-D

Version No: 1.2

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                  | CWW-TM-D Certified Waste Water- Trace Metals Solution D |
| Synonyms                      | CWW-TM-D  |
| Proper shipping name          | Corrosive liquid, acidic, inorganic, n.o.s.             |
| Other means of identification | CWW-TM-D  |

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

|                          |   |
|--------------------------|---|
| Relevant identified uses | Use according to manufacturer's directions. |
|--------------------------|---|

### 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 | Serious Eye Damage Category 1, Acute Toxicity (Oral) Category 4, Acute Toxicity (Dermal) Category 3, Metal Corrosion Category 1, Skin Corrosion/Irritation Category 1A |
|----------------|--|

### Label elements

|                    |   |
|--------------------|---|
| GHS label elements |   |
|--------------------|---|

|             |               |
|-------------|---------------|
| SIGNAL WORD | <b>DANGER</b> |
|-------------|---------------|

### Hazard statement(s)

|      |  |
|------|--|
| H302 | Harmful if swallowed.                    |
| H311 | Toxic in contact with skin.              |
| H290 | May be corrosive to metals.              |
| H314 | Causes severe skin burns and eye damage. |

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**Hazard(s) not otherwise specified**

Not Applicable

**Precautionary statement(s) Prevention**

|      |  |
|------|--|
| P260 | Do not breathe dust/fume/gas/mist/vapours/spray. |
|------|--|

**Precautionary statement(s) Response**

|                |  |
|----------------|--|
| P301+P330+P331 | IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. |
|----------------|--|

**Precautionary statement(s) Storage**

|      |                  |
|------|------------------|
| P405 | Store locked up. |
|------|------------------|

**Precautionary statement(s) Disposal**

|      |   |
|------|---|
| P501 | Dispose of contents/container in accordance with local regulations. |
|------|---|

**SECTION 3 COMPOSITION / INFORMATION ON INGREDIENTS****Substances**

See section below for composition of Mixtures

**Mixtures**

| CAS No    | %[weight] | Name                                      |
|-----------|-----------|---|
| 7429-90-5 | 0.01      | <u>aluminium</u>                          |
| 7440-36-0 | 0.0025    | <u>antimony</u>                           |
| 7440-38-2 | 0.0025    | <u>arsenic</u>                            |
| 7440-39-3 | 0.01      | <u>barium</u>                             |
| 7440-41-7 | 0.0025    | <u>beryllium</u>                          |
| 7440-42-8 | 0.01      | <u>boron</u>                              |
| 7440-43-9 | 0.0025    | <u>cadmium</u>                            |
| 7440-47-3 | 0.01      | <u>chromium</u>                           |
| 7440-48-4 | 0.01      | <u>cobalt</u>                             |
| 7440-50-8 | 0.01      | <u>copper</u>                             |
| 7439-89-6 | 0.01      | <u>iron</u>                               |
| 7439-92-1 | 0.01      | <u>lead</u>                               |
| 6156-78-1 | 0.01      | <u>manganese(II) acetate tetrahydrate</u> |
| 7439-97-6 | 0.0002    | <u>mercury (elemental)</u>                |
| 7439-98-7 | 0.01      | <u>molybdenum</u>                         |
| 7440-02-0 | 0.01      | <u>nickel</u>                             |
| 7782-49-2 | 0.0025    | <u>selenium</u>                           |
| 7440-22-4 | 0.0025    | <u>silver</u>                             |
| 7440-24-6 | 0.01      | <u>strontium</u>                          |
| 7440-28-0 | 0.0025    | <u>thallium</u>                           |
| 7803-55-6 | 0.01      | <u>ammonium metavanadate</u>              |
| 7440-66-6 | 0.01      | <u>zinc</u>                               |
| 7697-37-2 | 10        | <u>nitric acid</u>                        |
| 7664-39-3 | 0-0.49    | <u>hydrofluoric acid</u>                  |
| 7732-18-5 | Balance   | <u>water</u>                              |

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

|                     |  |
|---------------------|--|
| <b>Eye Contact</b>  | <p>If this product comes in contact with the eyes:</p> <ul style="list-style-type: none"> <li>▶ Immediately hold eyelids apart and flush the eye continuously with running water.</li> <li>▶ 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.</li> <li>▶ Continue flushing until advised to stop by the Poisons Information Centre or a doctor, or for at least 15 minutes.</li> <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>For thermal burns:</p> <ul style="list-style-type: none"> <li>▶ Decontaminate area around burn.</li> <li>▶ Consider the use of cold packs and topical antibiotics.</li> </ul> <p>For first-degree burns (affecting top layer of skin)</p> <ul style="list-style-type: none"> <li>▶ Hold burned skin under cool (not cold) running water or immerse in cool water until pain subsides.</li> <li>▶ Use compresses if running water is not available.</li> </ul>   |

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|            |   |
|------------|---|
|            | <ul style="list-style-type: none"> <li>▶ Cover with sterile non-adhesive bandage or clean cloth.</li> <li>▶ Do NOT apply butter or ointments; this may cause infection.</li> <li>▶ Give over-the counter pain relievers if pain increases or swelling, redness, fever occur.</li> </ul> <p>For second-degree burns (affecting top two layers of skin)</p> <ul style="list-style-type: none"> <li>▶ Cool the burn by immerse in cold running water for 10-15 minutes.</li> <li>▶ Use compresses if running water is not available.</li> <li>▶ Do NOT apply ice as this may lower body temperature and cause further damage.</li> <li>▶ Do NOT break blisters or apply butter or ointments; this may cause infection.</li> <li>▶ Protect burn by cover loosely with sterile, nonstick bandage and secure in place with gauze or tape.</li> </ul> <p>To prevent shock: (unless the person has a head, neck, or leg injury, or it would cause discomfort):</p> <ul style="list-style-type: none"> <li>▶ Lay the person flat.</li> <li>▶ Elevate feet about 12 inches.</li> <li>▶ Elevate burn area above heart level, if possible.</li> <li>▶ Cover the person with coat or blanket.</li> <li>▶ Seek medical assistance.</li> </ul> <p>For third-degree burns</p> <p>Seek immediate medical or emergency assistance.</p> <p>In the mean time:</p> <ul style="list-style-type: none"> <li>▶ Protect burn area cover loosely with sterile, nonstick bandage or, for large areas, a sheet or other material that will not leave lint in wound.</li> <li>▶ Separate burned toes and fingers with dry, sterile dressings.</li> <li>▶ Do not soak burn in water or apply ointments or butter; this may cause infection.</li> <li>▶ To prevent shock see above.</li> <li>▶ For an airway burn, do not place pillow under the person's head when the person is lying down. This can close the airway.</li> <li>▶ Have a person with a facial burn sit up.</li> <li>▶ Check pulse and breathing to monitor for shock until emergency help arrives.</li> </ul> <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 <b>calcium gluconate gel</b> 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 <b>calcium gluconate gel</b> 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 <b>calcium gluconate or calcium carbonate</b> tablets in water by mouth.</li> <li>▶ Transport to hospital, or doctor, urgently.</li> </ul> |
| Inhalation | <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><br/>(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 <b>calcium gluconate or calcium carbonate</b> tablets in water by mouth.</li> <li>▶ Transport to hospital, or doctor, urgently.</li> </ul>  |
| Ingestion  | <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

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<br>10mg/gm creatinine | Prior to shift<br>End of shift | B, NS<br>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

- Jets of water.
- Water spray or fog.
- Foam.
- Dry chemical powder.
- BCF (where regulations permit).
- Carbon dioxide.

### Special hazards arising from the substrate or mixture

|                      |             |
|----------------------|-------------|
| Fire Incompatibility | None known. |
|----------------------|-------------|

### Special protective equipment and precautions for fire-fighters

| Fire Fighting         |  |
|-----------------------|--|
| Fire/Explosion Hazard | <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> |

## SECTION 6 ACCIDENTAL RELEASE MEASURES

### Personal precautions, protective equipment and emergency procedures

See section 8

### Environmental precautions

See section 12

### Methods and material for containment and cleaning up

|              |   |
|--------------|---|
| Minor Spills | <ul style="list-style-type: none"> <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> |
| Major Spills | <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> </ul>  |

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- ▶ Neutralise/decontaminate residue (see Section 13 for specific agent).
- ▶ Collect solid residues and seal in labelled drums for disposal.
- ▶ Wash area and prevent runoff into drains.
- ▶ After clean up operations, decontaminate and launder all protective clothing and equipment before storing and re-using.
- ▶ If contamination of drains or waterways occurs, advise emergency services.

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

## SECTION 7 HANDLING AND STORAGE

## Precautions for safe handling

|                   |   |
|-------------------|---|
| Safe handling     | <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>▶ Avoid contact with moisture.</li> <li>▶ Avoid contact with incompatible materials.</li> <li>▶ <b>When handling, 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> |
| Other information | <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>   |

## Conditions for safe storage, including any incompatibilities

|                         |   |
|-------------------------|---|
| Suitable container      | <ul style="list-style-type: none"> <li>▶ <b>DO NOT use aluminium or galvanised containers</b></li> <li>▶ Check regularly for spills and leaks</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 jerricans 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>   |
| Storage incompatibility | <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>Nitric acid:</p> <ul style="list-style-type: none"> <li>▶ is a strong acid and oxidiser</li> <li>▶ reacts with water or steam to form toxic and corrosive nitrous fumes</li> <li>▶ reacts violently with water when added as the concentrated acid with generation of heat (always add acid to water to dilute)</li> <li>▶ reacts violently with reducing agents, bases, combustible materials, finely dispersed or powdered metals and metal alloys, acetic anhydride, acetone, acetylene, acrolein, acrylonitrile, alcohols, aliphatic amines, allyl chloride, ammonia, aniline, anionic exchange resins, 1,4-benzoquinone diimine, 1,2-bis(trimethylsilyl)hydrazine, bromine pentafluoride, cresol, crotonaldehyde, cumene, cyanides, diethyl ether, 1,2-dimethyl-2-trimethylsilylhydrazine, diphenyltin, divinyl ether, N-ethylaniline, ethyl phosphine, 2-ethynylfuran, fluorine, halides of phosphorus or sulfur, hydrazine, hydrogen peroxide, germanium, hydrogen iodide, lithium triethylsilyl amide, metal acetylides, 2-methylthiophene, pentanethiol, phosphorus and phosphorus vapours, polyurethane foam, potassium permanganate, resorcinol, rubber (containing lead), sulfides, sulfur, sulfur dioxide, stibine, thiophene, triethylgallium, polydibromosilane, vinyl ether, zinc ethoxide, zinc phosphide, organic solvents and many other substances and materials</li> <li>▶ is incompatible with many substances including acrylates, aldehydes, alkanolamines, alkylene oxides, aromatic amines, amides, cresols, cyclic ketones, epichlorohydrin, glycols, hydrocarbons, isocyanates, ketones, oleum, organic anhydrides, paraldehyde, phenols, silanes, strong oxidisers, substituted allyls, sulfuric acid, terpenes, vinyl acetate, vinylidene chloride</li> <li>▶ forms heat, impact, friction or shock explosive substances with acetic acid, acetoxyethylene glycol, ammonium nitrate, anilinium nitrate, 1,2-dichloroethane, dichloroethylene, dichloromethane, diethylaminoethanol, 3,6-dihydro-1,2,2H-oxazine, dimethyl ether, dinitrobenzenes, disodium phenyl orthophosphate, 2-hexanal, metal salicylates, 3-methylcyclohexanone, nitroaromatics, nitrobenzenes, nitromethane, beta-propyl acrolein, salicylic acid</li> <li>▶ increases the explosive sensitivity of nitromethane</li> <li>▶ may decompose when heated with the formation of nitrogen dioxide (which also produces discolouration - colourless 100% acid cannot be stored in the</li> </ul> |

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- ▶ presence of light with formation of nitrogen dioxide (which cause discolouration)
  - ▶ attacks most metals and some plastics, rubber and coatings
  - ▶ Inorganic acids are generally soluble in water with the release of hydrogen ions. The resulting solutions have pH's of less than 7.0.
  - ▶ 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.
  - ▶ The dissolution of inorganic acids in water or the dilution of their concentrated solutions with additional water may generate significant heat.
  - ▶ 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.
  - ▶ Inorganic acids react with active metals, including such structural metals as aluminum and iron, to release hydrogen, a flammable gas.
  - ▶ Inorganic acids can initiate the polymerisation of certain classes of organic compounds.
  - ▶ Inorganic acids react with cyanide compounds to release gaseous hydrogen cyanide.
  - ▶ 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 H<sub>2</sub>S and SO<sub>3</sub>), dithionites (SO<sub>2</sub>), and even carbonates.
  - ▶ Acids often catalyse (increase the rate of) chemical reactions.
  - ▶ WARNING: Avoid or control reaction with peroxides. All *transition metal* peroxides should be considered as potentially explosive. For example transition metal complexes of alkyl hydroperoxides may decompose explosively.
  - ▶ The pi-complexes formed between chromium(0), vanadium(0) and other transition metals (haloarene-metal complexes) and mono-or poly-fluorobenzene show extreme sensitivity to heat and are explosive.
  - ▶ Avoid reaction with borohydrides or cyanoborohydrides
- Salts of inorganic fluoride:
- ▶ react with water forming acidic solutions.
  - ▶ are violent reactive with boron, bromine pentafluoride, bromine trifluoride, calcium disilicide, calcium hydride, oxygen difluoride, platinum, potassium.
  - ▶ in aqueous solutions are incompatible with sulfuric acid, alkalis, ammonia, aliphatic amines, alkanolamines, alkylene oxides, amides, epichlorohydrin, isocyanates, nitromethane, organic anhydrides, vinyl acetate.
  - ▶ corrode metals in presence of moisture
  - ▶ may be incompatible with glass and porcelain
  - ▶ Reacts with mild steel, galvanised steel / zinc producing hydrogen gas which may form an explosive mixture with air.
- Hydrogen fluoride:
- ▶ 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
  - ▶ 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
  - ▶ 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.
  - ▶ Segregate from alkalies, oxidising agents and chemicals readily decomposed by acids, i.e. cyanides, sulfides, carbonates.

## 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/m <sup>3</sup> / 5 mg/m <sup>3</sup> | Not Available | Not Available           | Total dust; (as Al) / (as Al)                                      |
| US ACGIH Threshold Limit Values (TLV)                 | aluminium  | Silver, and compounds - Metal, dust and fume                   | 0.1 mg/m <sup>3</sup>                      | Not Available | Not Available           | TLV® Basis: Argyria  |
| US ACGIH Threshold Limit Values (TLV)                 | aluminium  | Aluminum metal and insoluble compounds                         | 1 mg/m <sup>3</sup>                        | 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/m <sup>3</sup>     | Not Available | Not Available           | Not Available  |
| US OSHA Permissible Exposure Levels (PELs) - Table Z1 | antimony   | Antimony and compounds   | 0.5 mg/m <sup>3</sup>                      | Not Available | Not Available           | (as Sb)  |
| US ACGIH Threshold Limit Values (TLV)                 | antimony   | Antimony and compounds, as Sb                                  | 0.5 mg/m <sup>3</sup>                      | Not Available | Not Available           | TLV® Basis: Skin & URT irr   |
| US NIOSH Recommended Exposure Limits (RELs)           | antimony   | Antimony metal, Antimony powder, Stibium                       | 0.5 mg/m <sup>3</sup>                      | 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/m <sup>3</sup>                     | 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/m <sup>3</sup>                     | 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/m <sup>3</sup> | Ca See Appendix A  |
| US OSHA Permissible Exposure Levels (PELs) - Table Z1 | barium     | Barium, soluble compounds                                      | 0.5 mg/m <sup>3</sup>                      | Not Available | Not Available           | (as Ba)  |

## CWW-TM-D Certified Waste Water- Trace Metals Solution D

|   |           |   |  |               |                       |  |
|---|-----------|---|--|---------------|-----------------------|--|
| 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 | 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 | 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 | 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 | 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 | 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 NIOSH Recommended Exposure Limits (RELs)           | beryllium | Beryllium metal: Beryllium  | Not Available                            | Not Available | 0.0005 mg/m3          | Ca See Appendix A  |
| US OSHA Permissible Exposure Levels (PELs) - Table Z1 | boron     | 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 | boron     | 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 | boron     | 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 ACGIH Threshold Limit Values (TLV)                 | boron     | 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 compounds   | 0.5 mg/m3                                | Not Available | Not Available         | TLV® Basis: URT & skin irr   |
| 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)  |



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|   |                                    |  |  |               |                       |  |
|---|------------------------------------|--|--|---------------|-----------------------|--|
| 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 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 | mercury (elemental)                | Mercury (vapor)  | Not Available                            | Not Available | Not Available         | See Table Z-2;(as Hg)  |
| US OSHA Permissible Exposure Levels (PELs) - Table Z2 | mercury (elemental)                | Mercury  | Not Available                            | Not Available | 0.1 mg/m3             | (Z37.8-1971)   |
| US ACGIH Threshold Limit Values (TLV)                 | mercury (elemental)                | Silver, and compounds - Metal, dust and fume                           | 0.1 mg/m3                                | Not Available | Not Available         | TLV® Basis: Argyria  |
| US ACGIH Threshold Limit Values (TLV)                 | mercury (elemental)                | Mercury, all forms except alkyl, as Hg - Elemental and inorganic forms | 0.025 mg/m3                              | Not Available | Not Available         | TLV® Basis: CNS impair; kidney dam; BEI  |
| US NIOSH Recommended Exposure Limits (RELs)           | mercury (elemental)                | Mercury metal: Colloidal mercury, Metallic mercury, Quicksilver        | Hg Vapor: 0.05 mg/m3                     | Not Available | Other:0.1 mg/m3       | Not Available  |
| 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  |
| 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                        | 1.5 mg/m3                                | Not Available | Not Available         | TLV® Basis: Dermatitis; pneumoconiosis   |



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|   |                   |   |  |                  |                 |  |
|---|-------------------|---|--|------------------|-----------------|--|
|   |                   | sub sulfide, as Ni - Elemental  |  |                  |                 |  |
| 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 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 Z3 | zinc              | 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)           | zinc              | 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 | 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]  |

## 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 |

Continued...

## CWW-TM-D Certified Waste Water- Trace Metals Solution D

|                                    |   |               |               |               |
|------------------------------------|---|---------------|---------------|---------------|
| beryllium                          | Beryllium   | 0.0023 mg/m3  | Not Available | Not Available |
| boron                              | Boron   | 1.9 mg/m3     | 21 mg/m3      | 130 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     |
| 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      |
| mercury (elemental)                | Mercury vapor   | 0.15 mg/m3    | Not Available | Not Available |
| molybdenum                         | Molybdenum  | 30 mg/m3      | 330 mg/m3     | 2,000 mg/m3   |
| nickel                             | Nickel  | 4.5 mg/m3     | 50 mg/m3      | 99 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     |
| strontium                          | Strontium   | 30 mg/m3      | 330 mg/m3     | 2,000 mg/m3   |
| thallium                           | Thallium  | 0.06 mg/m3    | 13 mg/m3      | 20 mg/m3      |
| ammonium metavanadate              | Ammonium vanadate; (Ammonium vanadium oxide; Ammonium metavanadate) | 0.01 mg/m3    | 0.11 mg/m3    | 80 mg/m3      |
| zinc                               | Zinc  | 6 mg/m3       | 21 mg/m3      | 120 mg/m3     |
| nitric acid                        | Nitric acid   | Not Available | Not Available | Not Available |
| hydrofluoric acid                  | Hydrogen fluoride; (Hydrofluoric acid)                              | Not Available | Not Available | Not Available |

| 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                          | 10 mg/m3                                  | 4 mg/m3                  |
| boron                              | 10 mg/m3                                  | 4 mg/m3                  |
| cadmium                            | 50 mg/m3 / 9 mg/m3                        | 9 mg/m3 / 9 [Unch] mg/m3 |
| 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                |
| manganese(II) acetate tetrahydrate | N.E. / N.E.                               | 500 mg/m3                |
| mercury (elemental)                | 10 mg/m3 / 28 mg/m3                       | 2 mg/m3 / 10 mg/m3       |
| molybdenum                         | N.E. / N.E.                               | 5,000 mg/m3              |
| nickel                             | N.E. / N.E.                               | 10 mg/m3                 |
| 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       |
| strontium                          | Not Available                             | Not Available            |
| thallium                           | Not Available                             | Not Available            |
| ammonium metavanadate              | Not Available                             | Not Available            |
| zinc                               | Not Available                             | Not Available            |
| nitric acid                        | 100 ppm                                   | 25 ppm                   |
| hydrofluoric acid                  | 30 ppm                                    | 30 [Unch] ppm            |
| water                              | Not Available                             | Not Available            |

## Exposure controls

|                                  |   |
|----------------------------------|---|
| Appropriate engineering controls | <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> |
|----------------------------------|---|

## CWW-TM-D Certified Waste Water- Trace Metals Solution D

An approved self contained breathing apparatus (SCBA) may be required in some situations. 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.

| 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.) |

Within each range the appropriate value depends on:

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

Simple theory shows that air velocity falls rapidly with distance away from the opening of a simple extraction pipe. Velocity generally decreases with the square of distance from the extraction point (in simple cases). Therefore the air speed at the extraction point should be adjusted, accordingly, after reference to distance from the contaminating source. The air velocity at the extraction fan, for example, should be a minimum of 1-2 m/s (200-400 f/min) for extraction of solvents generated in a tank 2 meters distant from the extraction point. Other mechanical considerations, producing performance deficits within the extraction apparatus, make it essential that theoretical air velocities are multiplied by factors of 10 or more when extraction systems are installed or used.

## Personal protection



## Eye and face protection

- ▶ Chemical goggles.
- ▶ Full face shield may be required for supplementary but never for primary protection of eyes.
- ▶ Contact lenses may pose a special hazard; soft contact lenses may absorb and concentrate irritants. A written policy document, describing the wearing of lenses or restrictions on use, should be created for each workplace or task. This should include a review of lens absorption and adsorption for the class of chemicals in use and an account of injury experience. Medical and first-aid personnel should be trained in their removal and suitable equipment should be readily available. In the event of chemical exposure, begin eye irrigation immediately and remove contact lens as soon as practicable. Lens should be removed at the first signs of eye redness or irritation - lens should be removed in a clean environment only after workers have washed hands thoroughly. [CDC NIOSH Current Intelligence Bulletin 59], [AS/NZS 1336 or national equivalent]

## Skin protection

See Hand protection below

## Hands/feet protection

- ▶ Wear chemical protective gloves, e.g. PVC.
- ▶ Wear safety footwear or safety gumboots, e.g. Rubber
- ▶ When handling corrosive liquids, wear trousers or overalls outside of boots, to avoid spills entering boots.

## Body protection

See Other protection below

## Other protection

- ▶ Overalls.
- ▶ PVC Apron.
- ▶ PVC protective suit may be required if exposure severe.
- ▶ Eyewash unit.
- ▶ Ensure there is ready access to a safety shower.

## Thermal hazards

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

| Appearance                                   | Colourless    |   |               |
|--|---------------|---|---------------|
| Physical state                               | Liquid        | Relative density (Water = 1)            | Not Available |
| Odour  | Not Available | Partition coefficient n-octanol / water | Not Available |
| Odour threshold                              | Not Available | Auto-ignition temperature (°C)          | Not Available |
| pH (as supplied)                             | Not Available | Decomposition temperature               | Not Available |
| Melting point / freezing point (°C)          | Not Available | Viscosity (cSt)                         | Not Available |
| Initial boiling point and boiling range (°C) | Not Available | Molecular weight (g/mol)                | Not Available |
| Flash point (°C)                             | Not Available | Taste                                   | Not Available |
| Evaporation rate                             | Not Available | Explosive properties                    | Not Available |

Continued...

## CWW-TM-D Certified Waste Water- Trace Metals Solution D

|                                  |               |   |               |
|----------------------------------|---------------|---|---------------|
| <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>                 | ► Contact with alkaline material liberates heat |
| <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>Bronchial and alveolar exudate are apparent in animals exposed to molybdenum by inhalation. Molybdenum fume may produce bronchial irritation and moderate fatty changes in liver and kidney.</p> <p>Inhalation of nitric acid mist or fumes may produce respiratory symptoms. Depending on the concentration and duration of exposure, cough, gagging, chest pain, low body oxygen, lung irritation and damage may occur. Deaths have occurred and may be delayed for several days.</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>The material can produce chemical burns within the oral cavity and gastrointestinal tract following ingestion.</p> <p>Molybdenum, an essential trace element, can in large doses hamper growth and cause loss of appetite, listlessness and diarrhoea. Anaemia also occurs, and other symptoms include greying of hair, shrinking of the testicles, reduced fertility and milk production, shortness of breath, incoordination and irritation of the mucous membranes.</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>Exposure to nitric acid causes burning pain, severe corrosion and scarring of the digestive tract with adhesions, narrowing and obstruction and even anaemia.</p> <p>There may be vomiting, aspiration, lung inflammation and shock. Death may be delayed 12 hours to 14 days or several months from these complications.</p> <p>Survivors may have strictures of the stomach lining and subsequent pernicious anaemia.</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.</p> <p>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>The material can produce chemical burns following direct contact with the skin.</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>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>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>Skin contact with nitric acid may cause corrosion, skin thickening, yellow discolouration of the skin, blisters and scars depending on the concentration exposed.</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>  |

## CWW-TM-D Certified Waste Water- Trace Metals Solution D

|                |  |
|----------------|--|
| <b>Eye</b>     | <p>The material can produce chemical burns to the eye following direct contact. Vapours or mists may be extremely irritating. 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>Eye contact with both diluted and concentrated nitric acid may result in burns causing pain, adhesions, corneal damage, blindness or permanent eye damage. Pain may be absent after contact with concentrated nitric acid.</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. 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>High levels of molybdenum can cause joint problems in the hands and feet with pain and lameness. Molybdenum compounds can also cause liver changes with elevated levels of enzymes and cause over-activity of the thyroid gland.</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>Prolonged or repeated overexposure to low concentrations of nitric acid vapour may cause chronic airway inflammation, corrosion of teeth and chemical lung inflammation.</p> <p>Extended exposure to inorganic fluorides causes fluorosis, which includes signs of joint pain and stiffness, tooth discolouration, 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>CWW-TM-D Certified Waste Water- Trace Metals Solution D</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     |
| <b>barium</b>  | <b>TOXICITY</b>   | <b>IRRITATION</b> |
|  | Not Available   | Not Available     |
| <b>beryllium</b>   | <b>TOXICITY</b>   | <b>IRRITATION</b> |
|  | Oral (rat) LD50: >2000 mg/kg <sup>[1]</sup>                 | Not Available     |
| <b>boron</b>   | <b>TOXICITY</b>   | <b>IRRITATION</b> |
|  | Oral (rat) LD50: 650 mg/kg <sup>[2]</sup>                   | Not Available     |
| <b>cadmium</b>   | <b>TOXICITY</b>   | <b>IRRITATION</b> |
|  | 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>        |                   |
| <b>chromium</b>  | <b>TOXICITY</b>   | <b>IRRITATION</b> |
|  | Not Available   | Not Available     |

## CWW-TM-D Certified Waste Water- Trace Metals Solution D

|                                    |   |               |
|------------------------------------|---|---------------|
| 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>           |               |
| manganese(II) acetate tetrahydrate | TOXICITY  | IRRITATION    |
|                                    | Oral (rat) LD50: 3730 mg/kg <sup>[2]</sup>            | Not Available |
| mercury (elemental)                | TOXICITY  | IRRITATION    |
|                                    | Oral (rat) LD50: >9.2 mg/kg <sup>[1]</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 |
| 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 |
| strontium                          | TOXICITY  | IRRITATION    |
|                                    | Not Available   | Not Available |
| thallium                           | TOXICITY  | IRRITATION    |
|                                    | Not Available   | 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>            |               |

## CWW-TM-D Certified Waste Water- Trace Metals Solution D

|                   |   |                             |
|-------------------|---|-----------------------------|
| zinc              | TOXICITY  | IRRITATION                  |
|                   | Dermal (rabbit) LD50: 1130 mg/kg <sup>[2]</sup>     | Not Available               |
|                   | Oral (rat) LD50: >2000 mg/kg <sup>[1]</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             | TOXICITY  | IRRITATION                  |
|                   | Oral (rat) LD50: >90000 mg/kg <sup>[2]</sup>        | Not Available               |
|                   |   |                             |

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

|   |   |
|---|---|
| ARSENIC   | 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.  |
| BERYLLIUM   | 33nix&11b<br><b>WARNING:</b> Beryllium and compounds are classified by IARC as Group 1- <b>CARCINOGENIC TO HUMANS</b><br>Beryllium oxide fume is very toxic to the respiratory tract, lungs and skin and is quick acting.<br>Mutation DNA damage Human Tumorigenic - neoplastic by RTECS criteria.  |
| BORON   | Elemental boron produces lower foetal body weight in rats.  |
| CHROMIUM  | On skin and inhalation exposure, chromium and its compounds (except hexavalent) can be a potent sensitiser, as particulates.<br>Gastrointestinal tumours, lymphoma, musculoskeletal tumours and tumours at site of application recorded.  |
| COBALT  | Allergic reactions involving the respiratory tract are usually due to interactions between IgE antibodies and allergens and occur rapidly.<br>Attention should be paid to atopic diathesis, characterised by increased susceptibility to nasal inflammation, asthma and eczema.<br>Exogenous allergic alveolitis is induced essentially by allergen specific immune-complexes of the IgG type; cell-mediated reactions (T lymphocytes) may be involved. |
| COPPER  | for copper and its compounds (typically copper chloride):<br><b>Acute toxicity:</b> There are no reliable acute oral toxicity results available.<br><b>WARNING:</b> 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.  |
| LEAD  | <b>WARNING:</b> Lead is a cumulative poison and has the potential to cause abortion and intellectual impairment to unborn children of pregnant workers.   |
| MERCURY (ELEMENTAL)   | Animal studies have shown that mercury may be a reproductive effector.  |
| NICKEL  | Tenth Annual Report on Carcinogens: Substance anticipated to be Carcinogen<br>[National Toxicology Program: U.S. Dep.<br>Oral (rat) TDL0: 500 mg/kg/5D-I Inhalation (rat) TCL0: 0.1 mg/m3/24H/17W-C   |
| THALLIUM  | Structural changes in nerves and sheath, changes in extraocular muscles, hair loss recorded   |
| ZINC  | 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.  |
| NITRIC ACID   | for acid mists, aerosols, vapours<br>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.<br>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.<br>Oral (?) LD50: 50-500 mg/kg * [Various Manufacturers] |
| HYDROFLUORIC ACID   | (liver and kidney damage) [Manufacturer] for hydrogen fluoride (as vapour)  |
| ALUMINIUM & BARIUM & CHROMIUM & MOLYBDENUM & STRONTIUM & HYDROFLUORIC ACID & WATER  | No significant acute toxicological data identified in literature search.  |
| ARSENIC & BERYLLIUM   | <b>WARNING:</b> This substance has been classified by the IARC as Group 1: <b>CARCINOGENIC TO HUMANS</b> .  |
| BARIUM & BORON & MANGANESE(II) ACETATE TETRAHYDRATE & MERCURY (ELEMENTAL) & AMMONIUM METAVANADATE & NITRIC ACID & HYDROFLUORIC ACID | Asthma-like symptoms may continue for months or even years after exposure to the material ceases.   |



|  |  |                                 |   |
|--|--|---------------------------------|---|
| <b>BERYLLIUM &amp; COBALT &amp; NICKEL</b> | The following information refers to contact allergens as a group and may not be specific to this product.                |                                 |   |
| <b>BERYLLIUM &amp; CHROMIUM</b>            | Tenth Annual Report on Carcinogens: Substance known to be Carcinogenic<br>[National Toxicology Program: U.S. Dep.        |                                 |   |
| <b>CHROMIUM &amp; SELENIUM</b>             | The substance is classified by IARC as Group 3:<br><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>Carcinogenicity</b>          | ⊘ |
| <b>Skin Irritation/Corrosion</b>           | ✓  | <b>Reproductivity</b>           | ⊘ |
| <b>Serious Eye Damage/Irritation</b>       | ✓  | <b>STOT - Single Exposure</b>   | ⊘ |
| <b>Respiratory or Skin sensitisation</b>   | ⊘  | <b>STOT - Repeated Exposure</b> | ⊘ |
| <b>Mutagenicity</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      |
| beryllium  | EC50     | 96                 | Fish                          | 0.19mg/L        | 5      |
| beryllium  | NOEC     | 48                 | Crustacea                     | 0.25mg/L        | 4      |
| boron      | LC50     | 96                 | Fish                          | 74mg/L          | 2      |
| boron      | EC50     | 48                 | Crustacea                     | 230mg/L         | 5      |
| boron      | EC50     | 72                 | Algae or other aquatic plants | 54mg/L          | 2      |
| boron      | BCF      | 336                | Algae or other aquatic plants | 8.5mg/L         | 4      |
| boron      | EC50     | 336                | Algae or other aquatic plants | 8.5mg/L         | 4      |
| boron      | NOEC     | 576                | Fish                          | 0.001mg/L       | 5      |
| 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      |
| chromium   | LC50     | 96                 | Fish                          | 13.9mg/L        | 4      |
| chromium   | EC50     | 48                 | Crustacea                     | 0.0225mg/L      | 5      |

Continued...

## CWW-TM-D Certified Waste Water- Trace Metals Solution D

|                     |      |      |                               |                 |   |
|---------------------|------|------|-------------------------------|-----------------|---|
| 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 |
| 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                     | 0.0000002mg/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 |
| mercury (elemental) | LC50 | 96   | Fish                          | 0.004mg/L       | 4 |
| mercury (elemental) | EC50 | 48   | Crustacea                     | 0.0035mg/L      | 5 |
| mercury (elemental) | EC50 | 72   | Algae or other aquatic plants | 0.0025mg/L      | 4 |
| mercury (elemental) | BCF  | 720  | Fish                          | 0.001mg/L       | 4 |
| mercury (elemental) | EC50 | 240  | Fish                          | 0.0003mg/L      | 5 |
| mercury (elemental) | NOEC | 2688 | Crustacea                     | 0.00025mg/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 |
| 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 |
| 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 |

Continued...

## CWW-TM-D Certified Waste Water- Trace Metals Solution D

|                       |      |     |                               |             |   |
|-----------------------|------|-----|-------------------------------|-------------|---|
| thallium              | NOEC | 720 | Fish                          | 0.04mg/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 |
| 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 |
| 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 |

**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

**For Molybdenum:**

**Environmental Fate:** Molybdenum is an essential micronutrient in plants and animals. It is commonly used in the manufacture of steel alloys. Based on the high concentration of molybdenum in all analyzed waste types, the exposure of the environment to molybdenum is regarded as significant. The limited amount of data regarding its toxicity makes it impossible to evaluate the potential for adverse environmental and health effects from molybdenum exposure. Molybdenum is generally found in two oxidation states in nature, Mo(IV) and Mo(VI). In oxidizing environments, Mo(VI) dominates and it is commonly present as molybdate. Natural molybdenum contains seven isotopes. Molybdenum oxidizes at elevated temperatures.

**Atmospheric Fate:** Molybdenum can be deposited via dry/wet deposition; however, atmospheric exposure has been identified as a minor source to terrestrial and aquatic habitats.

**Terrestrial Fate:** Molybdenum is a naturally occurring substance in soil. Soil molybdenum is a potentially toxic element, but no cases have been reported of molybdenum toxicity to animals from consumption of forage grown on sludge-amended soils. Microbes are expected to transform the substance.

**Aquatic Fate:** Molybdenum disulfide is sparingly soluble in water but oxidizes to more soluble molybdates, which are stable in water. At pH 3-5, molybdate frequently shifts to hydrogen molybdate. Low pH molybdenum is usually adsorbed to sediment composed of clay, or other minerals that are prone to weathering. Molybdenum in the water is expected to be taken up by aquatic organisms. Concentrations of the substance in sediments are by site-specific factors like flow rate, and other factors, (e.g. organic content, pH)

**Ecotoxicology:** Molybdenum cause adverse effects in ruminant animals. Livestock have been injured by forage grown on soils containing the element. The substance's toxicological properties in mammals are governed, to a large extent, by its interaction with copper and sulfur; residues of molybdenum alone are not sufficient to diagnose poisoning by the substance. Domestic ruminants, especially cattle, are especially sensitive to molybdenum poisoning, when copper and inorganic sulfate are deficient. The resistance of small laboratory animals, and wildlife, is at least 10X that of cattle. Mule deer are not adversely affected by the substance. The substance may have a negative impact on reproduction in domestic birds and there is inadequate data on its effects on waterfowl and most mammals.

**For Vanadium Compounds:**

**Environmental Fate:** Vanadium is travels through the environment via long-range transportation in the atmosphere, water, and land by natural and man-made sources, wet and dry deposition, adsorption and complexing. From natural sources, vanadium is probably in the form of less soluble trivalent mineral particles.

**Atmospheric Fate:** Vanadium generally enters the atmosphere as an aerosol. Natural and man-made sources of vanadium tend to release large particles that are more likely to settle near the source. Smaller particles, such as those emitted from oil-fueled power plants, have a longer residence time in the atmosphere and are more likely to be transported farther away from the site of release.

**Terrestrial Fate:** Soil - Transport and partitioning of vanadium in soil is influenced by pH and reduction potential. Ferric hydroxides and solid bitumens (organic) are the main carriers of vanadium in the sedimentation process. Iron acts as a carrier for trivalent vanadium and is responsible for its diffusion through molten rocks where it becomes trapped during crystallization. Vanadium is fairly mobile in neutral or alkaline soils, but its mobility decreases in acidic soils. Under oxidizing, unsaturated conditions, some mobility is observed, but under reducing, saturated conditions, vanadium is immobile. Plants - Vanadium levels in terrestrial plants are dependent upon the amount of water-soluble vanadium available in the soil as well as pH and growing conditions. The uptake of vanadium into the above-ground parts of many plants is low, although root concentrations have shown some correlation with levels in the soil. Certain legumes have been shown to be vanadium accumulators and the root nodules of these plants may contain vanadium levels three times greater than those of the surrounding soil. Fly agaric (*Amanita muscaria*) mushrooms are known to actively accumulate vanadium.

**Aquatic Fate:** Vanadium is eventually adsorbed to hydroxides or associated with organic compounds and is deposited on the sea bed. Vanadium is transported in water by solution (13%) or suspension (87%). Upon entering the ocean, vanadium is deposited to the sea bed. Only about 0.001% of vanadium entering the oceans is estimated to persist in soluble form. Sorption and biochemical processes are thought to contribute to the extraction of vanadium from sea water. Adsorption to organic matter as well as to manganese oxide and ferric hydroxide results in the precipitation of dissolved vanadium. Biochemical processes are also of importance in the partitioning from sea water to sediment.

**Ecotoxicity:** Some marine organisms, in particular the sea squirts, bioconcentrate vanadium very efficiently, attaining body concentrations approximately 10,000 times greater than the ambient sea water. Upon the death of the organism, the body burden adds to the accumulation of vanadium in silt. In general, marine plants and invertebrates contain higher levels of vanadium than terrestrial plants and animals. In the terrestrial environment, bioconcentration is more commonly observed amongst the lower plant phyla than in the higher, seed-producing phyla. Vanadium appears to be present in all terrestrial animals; however tissue concentrations in vertebrates are often so low that detection is difficult. The highest levels of vanadium in terrestrial mammals are generally found in the liver and skeletal tissues. No data are available regarding biomagnification of vanadium within the food chain, but human studies suggest that it is unlikely. Bioaccumulation appears to be unlikely.

**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 |
|-----------------------|-------------------------|------------------|
| ammonium metavanadate | HIGH                    | HIGH             |
| water                 | LOW                     | LOW              |

#### Bioaccumulative potential

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

#### Mobility in soil

| Ingredient            | Mobility          |
|-----------------------|-------------------|
| ammonium metavanadate | LOW (KOC = 35.04) |
| water                 | LOW (KOC = 14.3)  |


### SECTION 13 DISPOSAL CONSIDERATIONS

#### Waste treatment methods

|                              |   |
|------------------------------|---|
| Product / Packaging disposal | <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> |

### SECTION 14 TRANSPORT INFORMATION

#### Labels Required

|                  |   |
|------------------|---|
|                  |  |
| Marine Pollutant | NO  |

#### Land transport (DOT)

|                              |  |              |   |                    |                              |
|------------------------------|--|--------------|---|--------------------|------------------------------|
| UN number                    | 3264   |              |   |                    |                              |
| UN proper shipping name      | Corrosive liquid, acidic, inorganic, n.o.s.  |              |   |                    |                              |
| Transport hazard class(es)   | <table border="1"> <tr> <td>Class</td><td>8</td></tr> <tr> <td>Subrisk</td><td>Not Applicable</td></tr> </table>                                 | Class        | 8 | Subrisk            | Not Applicable               |
| Class                        | 8  |              |   |                    |                              |
| Subrisk                      | Not Applicable   |              |   |                    |                              |
| Packing group                | II   |              |   |                    |                              |
| Environmental hazard         | Not Applicable   |              |   |                    |                              |
| Special precautions for user | <table border="1"> <tr> <td>Hazard Label</td><td>8</td></tr> <tr> <td>Special provisions</td><td>386, B2, IB2, T11, TP2, TP27</td></tr> </table> | Hazard Label | 8 | Special provisions | 386, B2, IB2, T11, TP2, TP27 |
| Hazard Label                 | 8  |              |   |                    |                              |
| Special provisions           | 386, B2, IB2, T11, TP2, TP27   |              |   |                    |                              |

**Air transport (ICAO-IATA / DGR)**

|                              |   |                |        |
|------------------------------|---|----------------|--------|
| UN number                    | 3264  |                |        |
| UN proper shipping name      | Corrosive liquid, acidic, inorganic, n.o.s. *             |                |        |
| Transport hazard class(es)   |   |                |        |
|                              | ICAO/IATA Class   | 8              |        |
|                              | ICAO / IATA Subrisk                                       | Not Applicable |        |
|                              | ERG Code  | 8L             |        |
| Packing group                | II  |                |        |
| Environmental hazard         | Not Applicable  |                |        |
| Special precautions for user | 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)**

|                              |   |                |  |
|------------------------------|---|----------------|--|
| UN number                    | 3264  |                |  |
| UN proper shipping name      | CORROSIVE LIQUID, ACIDIC, INORGANIC, N.O.S. |                |  |
| Transport hazard class(es)   | IMDG Class                                  | 8              |  |
|                              | IMDG Subrisk                                | Not Applicable |  |
| Packing group                | II  |                |  |
| Environmental hazard         | Not Applicable                              |                |  |
| Special precautions for user | 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 - 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 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 NIOSH Recommended Exposure Limits (RELs)  
US OSHA Permissible Exposure Levels (PELs) - Table Z1  
US Toxic Substances Control Act (TSCA) - Chemical Substance Inventory

**ARSENIC(7440-38-2) 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 - 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 - Minnesota Permissible Exposure Limits (PELs)  
US - New Jersey Right to Know - Special Health Hazard Substance List (SHHSL): Carcinogens  
US - Pennsylvania - 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 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 A Known to be Human Carcinogens  
US NIOSH Recommended Exposure Limits (RELs)  
US OSHA Permissible Exposure Levels (PELs) - Table Z1  
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(7440-41-7) 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 - 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 Permissible Exposure Levels (PELs) - Table Z1  
US OSHA Permissible Exposure Levels (PELs) - Table Z2  
US OSHA Permissible Exposure Levels (PELs) - Table Z3  
US Toxic Substances Control Act (TSCA) - Chemical Substance Inventory

**BORON(7440-42-8) 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 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 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

## 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 (SHSL): 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

**CHROMIUM(7440-47-3) 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 - 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 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 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 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 - 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 - 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 ACGIH Threshold Limit Values (TLV) - Carcinogens  
US ATSDR Minimal Risk Levels for Hazardous Substances (MRLs)  
US Clean Air Act - Hazardous Air 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

**COPPER(7440-50-8) 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 - 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 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 B.  
US NIOSH Recommended Exposure Limits (RELs)  
US OSHA Permissible Exposure Levels (PELs) - Table Z1  
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 - 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 - 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 - 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 Clean Air Act - Hazardous Air Pollutants  
US OSHA Permissible Exposure Levels (PELs) - Table Z1  
US OSHA Permissible Exposure Levels (PELs) - Table Z3  
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 - 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 - Minnesota Permissible Exposure Limits (PELs)  
US - New Jersey Right to Know - Special Health Hazard Substance List (SHHSL): Carcinogens  
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 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 National Toxicology Program (NTP) 14th Report Part B.  
US NIOSH Recommended Exposure Limits (RELs)  
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

**MANGANESE(II) ACETATE TETRAHYDRATE(6156-78-1) 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 - 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 - 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 Clean Air Act - Hazardous Air Pollutants

US EPCRA Section 313 Chemical List

US OSHA Permissible Exposure Levels (PELs) - Table Z1

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

**MERCURY (ELEMENTAL)(7439-97-6) 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 - 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 - 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 NIOSH Recommended Exposure Limits (RELs)

US OSHA Permissible Exposure Levels (PELs) - Table Z1

US OSHA Permissible Exposure Levels (PELs) - Table Z2

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 Spacecraft Maximum Allowable Concentrations (SMACs) for Airborne 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 - 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 NIOSH Recommended Exposure Limits (RELs)

US OSHA Permissible Exposure Levels (PELs) - Table Z1

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

**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

**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

**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

**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

**ZINC(7440-66-6) IS FOUND ON THE FOLLOWING REGULATORY LISTS**

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 - Massachusetts - Right To Know Listed Chemicals  
US - Michigan Exposure Limits for Air Contaminants  
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 - Washington Permissible exposure limits of air contaminants

US - Wyoming Toxic and Hazardous Substances Table Z1 Limits for Air Contaminants  
US ATSDR Minimal Risk Levels for Hazardous Substances (MRLs)  
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 Z3  
US Toxic Substances Control Act (TSCA) - Chemical Substance Inventory

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

## CWW-TM-D Certified Waste Water- Trace Metals Solution D

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 - 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 - 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 - 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) - List of Hazardous Substances  
 US EPCRA Section 313 Chemical List  
 US NIOSH Recommended Exposure Limits (RELs)  
 US OSHA Permissible Exposure Levels (PELs) - Table Z1  
 US OSHA Permissible Exposure Levels (PELs) - Table Z2  
 US SARA Section 302 Extremely Hazardous Substances  
 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

## 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                     |
| Beryllium         | 10                                 | 4.54                      |
| Cadmium           | 10                                 | 4.54                      |
| Chromium          | 5000                               | 2270                      |
| Copper            | 5000                               | 2270                      |
| Lead              | 10                                 | 4.54                      |
| Mercury           | 1                                  | 0.454                     |
| Nickel            | 100                                | 45.4                      |
| Selenium          | 100                                | 45.4                      |
| Silver            | 1000                               | 454                       |
| Thallium          | 1000                               | 454                       |
| Ammonium vanadate | 1000                               | 454                       |
| Zinc              | 1000                               | 454                       |
| Nitric acid       | 1000                               | 454                       |
| Hydrofluoric acid | 100                                | 45.4                      |

Continued...

## 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, Beryllium and beryllium compounds: Beryllium, Cadmium and cadmium compounds: Cadmium, Cobalt metal powder, Lead and lead compounds: Lead, Mercury and mercury compounds, Nickel (Metallic) Listed

| National Inventory            | Status  |
|-------------------------------|---|
| Australia - AICS              | Y   |
| Canada - DSL                  | Y   |
| Canada - NDSL                 | N (strontium; thallium; lead; zinc; ammonium metavanadate; copper; boron; water; antimony; barium; selenium; aluminium; mercury (elemental); molybdenum; arsenic; cobalt; nickel; manganese(II) acetate tetrahydrate; iron; beryllium; chromium; silver; hydrofluoric acid; cadmium; nitric acid) |
| China - IECSC                 | Y   |
| Europe - EINEC / ELINCS / NLP | Y   |
| Japan - ENCS                  | N (strontium; thallium; lead; zinc; copper; boron; water; antimony; barium; selenium; aluminium; mercury (elemental); molybdenum; arsenic; cobalt; nickel; iron; beryllium; chromium; silver; cadmium)  |
| Korea - KECI                  | Y   |
| New Zealand - NZIoC           | Y   |
| Philippines - PICCS           | Y   |
| USA - TSCA                    | Y   |
| <b>Legend:</b>                | Y = All ingredients are on the inventory<br>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  |
| copper            | 7440-50-8, 133353-46-5, 133353-47-6, 195161-80-9, 65555-90-0, 72514-83-1 |
| 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 — TWA: 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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