CUPRIC SULPHATE
SAFETY DATA SHEET

SECTION 1. IDENTIFICATION

Product Identity: Cupric Sulphate.

Trade Names and Synonyms: Cupric Sulphate Pentahydrate, Cupric Sulfate Pentahydrate, Cupric Sulfate, Copper Sulfate, Copper Sulphate, Copper II Sulphate, Bluestone, Blue Vitriol.

Manufacturer:
Teck Metals Ltd.
Trail Operations
Trail, British Columbia
V1R 4L8
Emergency Telephone: 250-364-4214

Supplier:
Univar Canada Ltd.
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Preparer:
Teck Metals Ltd.
Suite 3300 – 550 Burrard Street
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V6C 0B3

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Product Use: Product is used for a range of industrial and agricultural purposes, including as a mine flotation reagent. This product is not to be used as a pesticide or pesticide ingredient. Use in agricultural applications such as hoof bath and animal feed only if product is within specification for that use in the jurisdiction and registered, licensed and labeled correctly.

SECTION 2. HAZARDS IDENTIFICATION

CLASSIFICATION:

Health		Physical	Environmental
Acute Toxicity (Oral)	**– Category 4**	Does not meet criteria for any Physical Hazard	**Aquatic Toxicity – Short Term – Category 1**
Acute Toxicity (Inhalation)	**– Category 4**		
Skin Corrosion/Irritation	– Does not meet criteria		
Eye Damage/Eye Irritation	**– Category 1**		
Respiratory or Skin Sensitization	– Does not meet criteria		
Mutagenicity	– Does not meet criteria		
Carcinogenicity	– Does not meet criteria		
Reproductive Toxicity	**– Category 2**		
Specific Target Organ Toxicity			
Single Exposure	**– Category 1**		
Repeated Exposure	**– Category 1**		

LABEL:

Symbols:

Signal Word: DANGER

Hazard Statements	Precautionary Statements:
DANGER! Harmful if swallowed or inhaled. Causes serious eye damage. Suspected of damaging the unborn child. Causes damage to organs through single ingestion as well as through prolonged or repeated exposure by inhalation of dust. Very toxic to aquatic life.	Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Do not breathe dust. Do not eat, drink or smoke when using this product. Wash hands thoroughly after handling. Use only outdoors or in a well-ventilated area. Use eye protection and other personal protective equipment as required. Avoid release to the environment. Collect spillage. Dispose of container/retained contents in accordance with local regulations. IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses if present and easy to do. Continue rinsing and immediately call a POISON CENTRE or doctor/physician. IF SWALLOWED: Rinse mouth. Immediately call a POISON CENTRE or doctor/physician if you feel unwell. IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. If exposed or concerned or you feel unwell: Get medical advice/attention.

Emergency Overview: A white to blue granular crystal that does not burn or readily decompose in a fire situation. Cupric sulphate particles may cause eye and respiratory irritation but do not pose an acute health threat to emergency response personnel. It is highly soluble in water and toxic to fish and other aquatic organisms.

Potential Health Effects: Inhalation may cause irritation of the respiratory tract. Eye contact will cause irritation and may result in conjunctivitis, ulceration, and corneal opacities if allowed to remain in the eye. Skin contact may cause mild irritation. Ingestion may result in gastritis, nausea, vomiting, diarrhea and ulceration of the gastrointestinal tract. Severe poisoning or death may result from ingesting large doses. Cupric sulphate is not listed as a carcinogen by OSHA, NTP, IARC or ACGIH (see Toxicological Information, Section 11).

Potential Environmental Effects: This product is highly water soluble, and is potentially toxic to fish and other aquatic life. It can also be toxic to plant life and other terrestrial organisms at elevated concentrations in soils. Copper is accumulated by plants and animals; however, biomagnification has not been shown to occur in either aquatic or terrestrial food chains (see Ecological Information, Section 12).

SECTION 3. COMPOSITION / INFORMATION ON INGREDIENTS

HAZARDOUS COMPONENTS	CAS Registry No.	CONCENTRATION (% wt./wt.)
Cupric Sulphate Pentahydrate	7758-99-8	99%

NOTE: See Section 8 for Occupational Exposure Guidelines.

SECTION 4. FIRST AID MEASURES

Eye Contact: *Symptoms*: Irritation, pain, redness. Rinse eye(s) cautiously with lukewarm, gently flowing water for several minutes, while holding the eyelid(s) open. Remove contact lenses, if present and easy to do. However, do not delay irrigation in order to attempt to remove the lens. Continue rinsing for 15 – 20 minutes. Take care not to rinse contaminated water into the unaffected eye or onto the face. Immediately obtain medical attention.

Skin Contact: *Symptoms*: Mild irritation. Take off contaminated clothing, shoes and leather goods (e.g., watchbands, belts). Wash with plenty of lukewarm, gently flowing water for 5 minutes. If irritation persists, get medical advice/attention. Wash contaminated clothing before reuse or else discard.

Inhalation: *Symptoms*: Nose, throat and lung irritation. Remove source of contamination or move person from exposure area to fresh air and keep comfortable for breathing. Obtain medical advice/attention if you feel unwell.

Ingestion: *Symptoms*: Abdominal pain, nausea, hypersalivation, metallic taste, diarrhea. Have victim rinse mouth thoroughly with water. DO NOT INDUCE VOMITING. However, ingestion of cupric sulphate normally leads to spontaneous vomiting. If vomiting occurs naturally, have victim rinse mouth with water again, then lie the affected person on their side in the recovery position. If breathing has stopped, trained personnel should begin rescue breathing or, if the heart has stopped, immediately start cardiopulmonary resuscitation (CPR) or automated external defibrillation (AED). Immediately call an emergency care facility/poison control centre.

SECTION 5. FIRE FIGHTING MEASURES

Fire and Explosion Hazards: Cupric sulphate is not flammable or combustible.

Extinguishing Media: Use any means of extinction appropriate for surrounding fire conditions such as water spray, carbon dioxide, dry chemical, or foam. Do not release runoff from fire control methods to sewers or waterways.

Fire Fighting: Cupric sulphate pentahydrate begins to lose the water of hydration at temperatures above 88°C. When exposed to heat from a fire, it will rapidly build up pressure inside any tightly sealed containers. Explosive rupture and a sudden release of large amounts of hot steam may occur. Fire fighters must be fully-trained and wear full protective clothing including an approved, self-contained breathing apparatus which supplies a positive air pressure within a full face-piece mask.

SECTION 6. ACCIDENTAL RELEASE MEASURES

Procedures for Cleanup: Control source of spillage if possible to do so safely. Clean up spilled material immediately, observing precautions in Section 8, Personal Protection and using methods which will minimize dust generation (e.g., vacuum solids, dampen material and shovel or sweep up). Do not wash to uncontrolled drains/sewers. Return uncontaminated spilled material to the process if possible. Place contaminated material in suitable labeled containers for later recovery or disposal. Treat or dispose of waste material in accordance with all local, regional, and national requirements.

Personal Precautions: Persons responding to an accidental release should wear protective clothing, gloves, and a respirator. Close-fitting safety goggles may be necessary in some circumstances to prevent eye contact with cupric sulphate dust.

Environmental Precautions: This product can pose a threat to the environment. Contamination of soil and water should be prevented. Keep spillage from entering ground, streams or sewers.

SECTION 7. HANDLING AND STORAGE

Precautions for Safe Handling: Keep containers closed when not in use. Minimize the release of dust into the work environment when handling and clean up any significant spills immediately in order to prevent the dispersion of spilled dust into the air.

Conditions for Safe Storage: Store containers in a dry, cool, well-ventilated area, away from incompatible materials. Keep container tightly closed. Protect from physical damage.

SECTION 8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Occupational Exposure Guidelines: *(Time-Weighted Average (TWA) concentration over 8 hrs. unless otherwise indicated)*

Component	ACGIH TLV	OSHA PEL	NIOSH REL
Cupric Sulphate Pentahydrate	1 mg Cu/m^3	1 mg Cu/m^3	1 mg Cu/m^3

NOTE: OEGs for individual jurisdictions may differ from those given above. Check with local authorities for the applicable OEGs in your jurisdiction.

ACGIH - American Conference of Governmental Industrial Hygienists; OSHA - Occupational Safety and Health Administration; NIOSH - National Institute for Occupational Safety and Health. TLV – Threshold Limit Value, PEL – Permissible Exposure Limit, REL – Recommended Exposure Limit.

NOTE: The OSHA PEL, the ACGIH TLV and the NIOSH REL for copper dust and mist are all 1.0 mg/m^3. For copper fume, the OSHA PEL is 0.1 mg/m^3, the NIOSH REL is 0.1 mg/m^3 and the ACGIH TLV is 0.2 mg/m^3.

NOTE: The selection of the necessary level of engineering controls and personal protective equipment will vary depending upon the conditions of use and the potential for exposure. The following are therefore only general guidelines that may not fit all circumstances. Control measures to consider include:

Ventilation: Use adequate local or general ventilation to maintain the concentration of cupric sulphate dust in the working environment well below recommended occupational exposure limits. Supply sufficient replacement air to make up for air removed by the exhaust system.

Protective Clothing: Coveralls or other work clothing and gloves are recommended to prevent prolonged or repeated direct skin contact. Appropriate eye protection should be worn to prevent eye contact if excessive dust is generated or where any possibility exists that eye contact with crystals may occur.

Respirators: Where cupric sulphate dust is generated and cannot be controlled to within acceptable levels by engineering means, use appropriate NIOSH-approved respiratory protection equipment (a 42CFR84 Class N, R or P-95 particulate filter cartridge as a minimum). Consider using a full face piece air purifying respirator in situations where eye contact may be likely.

General Hygiene Considerations: Do not eat, drink or smoke in work areas. Thoroughly wash hands at the end of the workday as well as before eating, drinking, or smoking in appropriate, designated areas. An eyewash and quick drench shower should be provided near the work area. Workers should wash immediately when skin becomes contaminated as well as at the end of each work shift. Work clothing should be removed immediately if it becomes heavily contaminated and should be changed daily if there is reasonable probability that the clothing may be contaminated. Always practice good personal hygiene. Refrain from eating, drinking, or smoking in work areas. Thoroughly wash hands before eating, drinking, or smoking in appropriate, designated areas.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance: White to blue granular or crystal solid	**Odour:** None	**Odour Threshold:** Not Applicable	**pH:** 3.9 (10% solution)
Vapour Pressure: Negligible @ 20ºC	**Vapour Density:** Not Applicable	**Boiling Point/Range:** Not Applicable	**Melting Point/Range:** Not Applicable (Decomposes)
Relative Density (Water = 1)**:** 2.29	**Evaporation Rate:** Not Applicable	**Coefficient of Water/Oil Distribution:** Not Applicable	**Solubility:** 23 g/100 ml @ 25ºC
Flammability: Non-combustible Solid	**Flammable Limits (LEL/UEL):** Not Applicable	**Auto-ignition Temperature:** Not Applicable	**Decomposition Temperature:** Begins to lose water at 88°C Decomposes at @ 560ºC

SECTION 10. STABILITY AND REACTIVITY

Stability & Reactivity: This material is stable and not considered reactive under normal temperatures and pressures. Hazardous polymerization or runaway reactions will not occur.

Incompatibilities: Causes hydroxylamine to ignite. Incompatible with finely-powdered metals, particularly magnesium powder. Incompatible with acetylene gas, sodium hypobromite, hydrazine and nitromethane. Can be highly corrosive to most ferrous-based metals when moist.

Hazardous Decomposition Products: High temperature operations such as oxy-acetylene cutting, electric arc welding or arc-air gouging may generate toxic copper fumes as well as highly irritating and toxic sulphur dioxide gas. The fumes will contain copper oxides, which, on inhalation in sufficient quantity, can produce metal fume fever.

SECTION 11. TOXICOLOGICAL INFORMATION

General: The major routes of exposure are inhalation or ingestion of dust and fumes. Under extreme heating this product can release toxic sulphur dioxide gas. Individuals with “Wilson’s Disease” are predisposed to accumulate copper and should not be occupationally exposed.

Acute:
Skin/Eye: Likely to cause eye irritation. Severe or prolonged eye contact with particles of cupric sulphate may cause conjunctivitis, ulceration and corneal opacities (clouding). Cupric sulphate may occasionally cause skin irritation, particularly in some sensitive individuals.

Inhalation: Inhalation of dust and mists of copper salts can result in irritation of nasal mucous membranes. If copper salts from inhalation reach the GI tract in sufficient quantity they act as irritants, producing a metallic taste, salivation, nausea, vomiting, gastric pain and diarrhea. Sudden and excessive exposure to copper fume can lead to nausea and metal fume fever. This can result in flu-like symptoms of fever, chills, nausea, muscle pain, vomiting and dryness in the mouth and throat.

Ingestion: Will cause metallic taste, salivation, nausea, burning in the GI tract, repeated vomiting and in more severe cases, diarrhea and ulceration of the gastrointestinal tract. Severe cases may cause renal injury and death.

Chronic: A few individuals apparently become sensitized to cupric sulphate and develop allergic contact dermatitis. Inhalation of dust and mists of copper salts can result in irritation of nasal mucous membranes and, on occasion, ulceration with perforation of the nasal septum. Repeated inhalation of a copper sulphate mist has resulted in a condition known as "vineyard sprayer's lung". The condition is asymptomatic until later stages, when symptoms include weakness, malaise, loss of appetite and weight, cough and greenish-brown sputum. Greenish tumours may occur in the liver and lungs of affected persons. Cupric sulphate is not listed as a carcinogen by OSHA, the National Toxicology Program (NTP), the International Agency for Research on Cancer (IARC), or the American Conference of Governmental Industrial Hygienists (ACGIH). Although copper is an essential element, mutagenicity and genotoxicity assays have produced both positive and negative results.

Animal Toxicity:

Hazardous Ingredient:	Acute Oral Toxicity:	Acute Dermal Toxicity:	Acute Inhalation Toxicity:
Copper (II) Sulphate Pentahydrate	LD_{50}† = 790 mg/kg (male rats) LD_{50}† = 450 mg/kg (female rats)	LD_{50}* = >2,000 mg/kg	LC_{50}‡ = 1.29 mg/L

† LD_{50}, Rat,Oral, * LD_{50}, Rat, Skin ‡ LC_{50}, Rat, Inhalation, 4 hour

SECTION 12. ECOLOGICAL INFORMATION

Dissolved copper can be highly toxic to aquatic life at relatively low concentrations; pH, hardness and dissolved organic matter are factors that regulate the degree of resultant toxicity. In soil, copper can be particularly toxic to invertebrates and plants at elevated concentrations, with physicochemical soil properties being regulating factors. Copper is accumulated by plants and animals; however, biomagnification has not been shown to occur in either aquatic or terrestrial food chains.

SECTION 13. DISPOSAL CONSIDERATIONS

If material cannot be returned to process or salvage, dispose of in accordance with applicable regulations. Do not wash down drain or allow to reach natural watercourses.

SECTION 14. TRANSPORT INFORMATION

PROPER SHIPPING NAME (CANADA and U.S.) ..... Environmentally Hazardous Substance, Solid, n.o.s. (Cupric Sulphate)
HAZARD CLASSIFICATION (CANADA and U.S.)..... Class 9, Packing Group III
PRODUCT IDENTIFICATION NUMBER UN3077
MARINE POLLUTANT (U.S.)..... Yes, Severe
MARINE POLLUTANT (IMO)..... Yes, Severe

SECTION 15. REGULATORY INFORMATION

U.S.
INGREDIENTS LISTED ON TSCA INVENTORY ..... Yes

HAZARDOUS UNDER HAZARD COMMUNICATION STANDARD..... Yes

CERCLA SECTION 103 HAZARDOUS SUBSTANCES ..... Cupric Sulfate ... Yes.... Reportable Quantity: 10 pounds (4.54 kg.)

EPCRA SECTION 302 EXTREMELY HAZARDOUS SUBSTANCE..... No

EPCRA SECTION 311/312 HAZARD CATEGORIES..... Immediate (Acute) Health Hazard - Toxic
Immediate (Acute) Health Hazard – Irritant
Delayed (Chronic) Health Hazard – Teratogen, Embryotoxin

EPCRA SECTION 313 TOXIC RELEASE INVENTORY:..... This product contains reportable levels of the following toxic chemicals subject to the Toxic Release Reporting Requirements:
Copper Compounds (Cupric Sulphate)
CAS No. 7758-99-8
Percent by Weight: 99%

SECTION 16. OTHER INFORMATION

Date of Original Issue: January 9, 1998 **Version:** 01 *(first edition)*

Date of Latest Revision: August 14, 2018 **Version:** 15

The information in this Safety Data Sheet is based on the following references:

- American Conference of Governmental Industrial Hygienists, 2004, Documentation of the Threshold Limit Values and Biological Exposure Indices, 7th Edition plus updates.
- American Conference of Governmental Industrial Hygienists, 2018, Guide to Occupational Exposure Values.
- American Conference of Governmental Industrial Hygienists, 2018, Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices.
- Bretherick's Handbook of Reactive Chemical Hazards, 20th Anniversary Edition. (PG Urben, Ed.) 1995.
- Canadian Centre for Occupational Health and Safety (CCOHS) CHEMINFO Record No: 4122, Copper Sulfate *(Last Revised 2018-08)*.
- Commission de la santé et la sécurité du travail, Service du répertoire toxicologique, Sulfate de cuivre (II) pentahydraté, 2003-08.
- European Regulation (EC) No. 1272/2008 on classification, labelling and packaging of substances and mixtures, amending and repealing directives 67/548/EEC and 1999/45/EC, and amending Regulation (EC) No 1907/2006 (REACH).
- Health Canada, SOR/2015-17, Hazardous Products Regulations, 11 February 2015.
- Health Council of the Netherlands, Copper Sulphate - evaluation of the effects on reproduction. Report No 1999-01OSH.
- International Program for Chemical Safety (IPCS) INCHEM - UK PID Monograph - Copper Sulphate (28/1/98).
- International Chemical Safety Cards (WHO/IPCS/ILO) ICSC:1416 – Copper (II) Sulfate, Pentahydrate (Revised Apr 2005).
- International Labour Office (WHO/ILO) Encyclopedia of Occupational Health & Safety 4th Ed. CD-ROM Version (1998).
- Merck & Co., Inc., 2001, The Merck Index, An Encyclopedia of Chemicals, Drugs, and Biologicals, Thirteenth Edition.
- National Institute of Technology and Evaluation (NITE) - GHS Classification Guidance by the Japanese Government - Copper (II) Sulphate. Pentahydrate (2006).
- National Library of Medicine, National Toxicology Information Program, Hazardous Substance Data Bank *(last accessed 9 Feb 2015).*
- National Oceanic and Atmospheric Administration, Office of Response and Restoration, CAMEO Chemicals – Database of Hazardous Materials [http://www.cameochemicals.noaa.gov/] (*last accessed 9 Feb 2015).*
- National Pesticide Information Center, Oregon State University Extension Services. Copper Sulfate Technical Fact Sheet; 2012. http://npic.orst.edu/factsheets/cuso4tech.pdf.
- Patty's Toxicology, 5th Edition, (E Bingham, B Cohrssen & CH Powell, Ed.) 2001.
- Toxicology of the Eye, 2nd Ed. W. Morton Grant, MD, Charles C. Thomas, Publishers; Springfield IL (1974).
- U.S. Dept. of Health and Human Services, Public Health Service, Agency for Toxic Substances and Disease Registry, Toxicological Profile for Copper (Sept 2004).
- U.S. Dept. of Health and Human Services, National Institute for Occupational Safety and Health, NIOSH Pocket Guide to Chemical Hazards *(last accessed 9 Feb 2015)*.
- U.S. Environmental Protection Agency, Registration Eligibility Decision (RED) for Coppers, Revised May 2009.
- U.S. Occupational Safety and Health Administration, 1989, Code of Federal Regulations, Title 29, Part 1910.1000 & 1910.1200.

Acronyms not spelled out elsewhere in the SDS:
CAS: Chemical Abstracts Service
CERCLA: Comprehensive Environmental Response, Compensation, and Liability Act
DOT: Department of Transportation
EPCRA: Emergency Planning and Community Right- to-Know Act
IMO: International Maritime Organization
LD50, LC50: Lethal Dose 50%, Lethal Concentration 50%
OEGs: Occupational Exposure Guidelines
TSCA: Toxic Substances Control Act
Wt.: Weight

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