

**ARSENICAL LEAD
MATERIAL SAFETY DATA SHEET**

SECTION 1. PRODUCT AND COMPANY IDENTIFICATION

Product Identity: Arsenical Lead Alloy

Manufacturer:

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

Supplier:

Teck Metals Ltd.
#1700 – 11 King Street West
Toronto, Ontario
M5H 4C7

MSDS Preparer:

Teck Metals Ltd.
Suite 3300 – 550 Burrard Street
Vancouver, British Columbia
V6C 0B3

Date of Last MSDS Review: August 14, 2012.

Date of Last MSDS Edit: August 14, 2012.

Product Uses: Production of chemicals.

SECTION 2. COMPOSITION / INFORMATION ON INGREDIENTS

| Hazardous Ingredient | Approximate Percent by Weight | CAS Number | Occupational Exposure Limits (OELs) | LD ₅₀ /LC ₅₀ Species and Route |
|----------------------|-------------------------------|------------|--|--|
| Lead | 87 – 93% | 7439-92-1 | OSHA PEL 0.05 mg/m ³ ACGIH TLV 0.05 mg/m ³ NIOSH REL 0.05 mg/m ³ | No Data |
| Arsenic | 7 – 13% | 7440-38-2 | OSHA PEL 0.01 mg/m ³ ACGIH TLV 0.01 mg/m ³ NIOSH REL 0.002 mg/m ³ (Ceiling) | LD ₅₀ , rat, oral 763 mg/kg LD ₅₀ , mouse, oral 145 mg/kg |

NOTE: OELs for individual jurisdictions may differ from OSHA PELs. Check with local authorities for the applicable OELs in your jurisdiction. OSHA - Occupational Safety and Health Administration; ACGIH - American Conference of Governmental Industrial Hygienists; NIOSH - National Institute for Occupational Safety and Health. OEL – Occupational Exposure Limit, PEL – Permissible Exposure Limit, TLV – Threshold Limit Value, REL – Recommended Exposure Limit.

Trade Names and Synonyms: Lead-Arsenic; Pb-As; Lead Arsenic Alloy

SECTION 3. HAZARDS IDENTIFICATION

Emergency Overview: A bluish-white to silvery-grey heavy, soft metal that does not burn in bulk. Clouds of finely-divided dust are a moderate explosion hazard, however. When heated strongly in air highly toxic lead and arsenic fumes can be generated. Inhalation or ingestion of dust or fumes may produce both acute and chronic health effects. Possible cancer and reproductive hazard. Highly toxic ARSINE gas may be generated if this alloy contacts strong acids or bases in the presence of an active metal such as zinc or galvanized steel. **Such circumstances should be regarded as being immediately life threatening.** SCBA and full protective clothing are required for fire emergency response personnel.

Potential Health Effects: Inhalation or ingestion of dust or fumes may result in headache, nausea, vomiting, abdominal spasms, fatigue, sleep disturbances, weight loss, anemia and leg, arm, and joint pain. Prolonged exposure may also cause central nervous system damage, hypertension, gastrointestinal disturbances, anemia, kidney dysfunction and possible reproductive effects. Pregnant women should be protected from excessive exposure in order to prevent absorbed lead crossing the placental barrier and causing infant neurological disorders. Due to the presence of arsenic and lead, which are classified as carcinogens or possible carcinogens by various regulatory and advisory bodies, this product is considered carcinogenic. (See Toxicological Information, Section 11)

Potential Environmental Effects: This product will likely have minimal direct environmental effects, since it is an alloy, and therefore its constituent metals are not highly bioavailable. However, when the product is processed or resides in the environment

for extended periods, some compound forms of lead and arsenic may form which are potentially toxic to aquatic and terrestrial organisms. (See Ecological Information, Section 12)

EU Risk Phrase(s): R61 – May cause harm to the unborn child; R62 – Possible risk of impaired fertility; R23/25 – Toxic by inhalation and if swallowed; R33 – Danger of cumulative effects; R50/53 – Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

SECTION 4. FIRST AID MEASURES

Eye Contact: Do not allow victim to rub eye(s). Let the eye(s) water naturally for a few minutes. If particle/dust does not dislodge, flush with lukewarm, gently flowing water for 5 minutes or until particle/dust is removed, while holding eyelid(s) open. If irritation persists, immediately obtain medical attention. DO NOT attempt to manually remove anything stuck to the eye.

Skin Contact: *Dust:* Remove contaminated clothing, shoes and leather goods (e.g. watchbands, belts). Quickly and gently blot or brush away excess chemical. Wash gently and thoroughly with lukewarm gently flowing water and non-abrasive soap for 5 minutes. If irritation persists, repeat flushing. Obtain medical advice. Completely decontaminate clothing, shoes and leather goods before reuse or else discard. *Molten Metal:* Flush contact area to solidify and cool, but do not attempt to remove encrusted material or clothing. Cover burns and seek medical attention immediately.

Inhalation: Remove source of contamination or move victim from exposure area to fresh air immediately. If breathing has stopped, trained personnel should begin artificial respiration. Medical oxygen may be administered by trained personnel, where breathing is difficult. If the heart has stopped, immediately start cardiopulmonary resuscitation (CPR), or automated external defibrillation (AED). If either of the above adverse circumstances occurs, quickly transport victim to an emergency care facility.

Ingestion: Never give anything by mouth if victim is rapidly losing consciousness, or is unconscious or convulsing. Have victim rinse mouth thoroughly with water. DO NOT INDUCE VOMITING. Have victim drink 2 – 8 oz. (60 – 240 ml) of water. If vomiting occurs naturally, have victim rinse mouth with water again. Obtain medical advice and bring a copy of this MSDS.

SECTION 5. FIRE FIGHTING MEASURES

Fire and Explosion Hazards: Massive metal is not flammable or combustible. However, finely-divided alloy dust or powder is a moderate explosion hazard when dispersed in the air at high concentrations and exposed to heat, flame or other ignition sources. Explosions may also occur upon contact with certain incompatible materials. (see Stability and Reactivity, Section 10)

Extinguishing Media: Use any means of extinction appropriate for surrounding fire conditions such as water spray, carbon dioxide, dry chemical, or foam.

Fire Fighting: If possible, move material from fire area and cool material exposed to flame. Highly toxic fumes of lead and arsenic oxides may evolve in fires. 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 facepiece mask.

Flashpoint and Method: Not Applicable.

Upper and Lower Flammable Limit: Not Applicable.

Autoignition Temperature: Not Applicable.

SECTION 6. ACCIDENTAL RELEASE MEASURES

Procedures for Cleanup: Control source of spillage if possible to do so safely. Restrict access to the area and deny entry to unauthorized personnel until completion of clean-up. Clean up spilled material immediately, observing precautions in Section 8, Personal Protection. Molten metal should be allowed to solidify before cleanup. Once solidified, wear gloves, pick up and return to process. If present as dust, wear recommended personal protective equipment (see Section 8) and use methods that will minimize dust generation (e.g. vacuum solids). Return uncontaminated spilled material to the process if possible. Place contaminated material in suitable labelled 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 (see also Section 8). Close-fitting safety goggles may be necessary in some circumstances to prevent eye contact with dust and fume. Where molten metal is involved, wear heat-resistant gloves and suitable clothing for protection from radiant heat and hot-metal splash as well as a respirator to protect against inhalation of lead and arsenic oxide fumes. Workers should wash and also consider the need to change clothing following cleanup of a spill to prevent personal contamination with lead and arsenic dust.

Environmental Precautions: Although this product is not an immediate threat to the environment, care in handling, storage, transport and use is required to prevent environmental contamination. Material in aquatic and terrestrial environments may be chemically altered to release toxic compounds.

SECTION 7. HANDLING AND STORAGE

Store arsenical lead pigs in DRY, covered area, separate from strong acids, other incompatible materials, active metals and foods or feedstuffs. Ingots suspected of containing moisture should be THOROUGHLY DRIED before being added to a molten bath. Otherwise, entrained moisture could expand explosively and spatter molten metal out of the bath. No special packaging materials are required. NOTE: Special care should be taken in processing arsenical lead alloy to minimize the risk of generating arsine gas. Installation of devices for detection of this gas is recommended in areas where there is a recognized potential for generation. 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 and also at the end of the workday.

EU Safety Phrase(s): S20/21 – When using, do not eat, drink or smoke; S28B – After contact with skin, wash immediately with plenty of water and soap; S45 – In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible); S53 – Avoid exposure – obtain special instructions before use.

SECTION 8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Protective Clothing: Gloves and coveralls or other work clothing are recommended to prevent prolonged or repeated direct skin contact when this product is processed. Appropriate eye protection should be worn where fume or dust is generated. Where hot or molten metal is handled, heat resistant gloves, goggles or face shield, and clothing to protect from radiant heat and hot metal splash should be worn. Safety type boots are recommended.

Do not eat, drink or smoke in work areas. Thoroughly wash hands before eating, drinking, or smoking in appropriate, designated areas and also at the end of the workday. Contaminated clothing should be changed frequently and laundered before each reuse. If using a commercial or industrial laundry service, inform laundry personnel of contaminants' hazards. Workers should not take dirty work clothes home and launder them with other personal clothing. A double locker-shower system with separate clean and dirty sides is usually required for lead and arsenic handling operations to avoid cross-contamination of street clothes.

Ventilation: Use adequate local or general ventilation to maintain the concentration of lead and arsenic fumes in the working environment well below their respective occupational exposure limits. Supply sufficient replacement air to make up for air removed by the exhaust system. Local exhaust is recommended for melting, casting, grinding, and welding or flame cutting / burning.

Respirators: Where arsenical lead dust or fume is generated and cannot be controlled to within acceptable levels by engineering means, use appropriate NIOSH-approved respiratory protection equipment (a 42 CFR 84 Class N, R or P-100 particulate filter cartridge). When exposure levels are obviously high but the actual concentration is unknown, a self-contained breathing apparatus which supplies a positive air pressure within a full face piece mask should be worn.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

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|--|--|--|--|
| Appearance: Bluish-white to silvery-grey metal | Odour: None | Physical State: Solid | pH: Not Applicable |
| Vapour Pressure: Negligible at 20°C | Vapour Density: Not Applicable | Boiling Point/Range: 1740°C for lead; arsenic sublimates at 1135°C | Melting Point/Range: 252° to 420°C |
| Specific Gravity: 10.0 | Evaporation Rate: Not Applicable | Coefficient of Water/Oil Distribution: Not Applicable | Odour Threshold: Not Applicable |
| Solubility: Insoluble in water | | | |

SECTION 10. STABILITY AND REACTIVITY

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

Incompatibilities: Arsenical lead alloys react vigorously with strong acids or bases, strong oxidizing agents, such as peroxides, chlorates, nitrates, and halogens or interhalogen compounds such as chlorine trifluoride. Powdered alloy metal in contact with disodium acetylide, chlorine trifluoride, sodium carbide or fused ammonium nitrate poses a risk of explosion. Solutions of sodium azide in contact with this metal can form lead azide, which is a detonating compound. Strong reactions can also occur between the molten alloy and active metals, such as sodium, potassium, lithium and calcium.

Hazardous Decomposition Products: High temperature operations such as oxy-acetylene cutting or burning, electric arc welding or overheating a molten bath will generate highly toxic lead and arsenic oxide fumes. Both are highly soluble in body fluids and the particle size of the metal fumes is largely within the respirable size range, which increases the likelihood of inhalation and deposition of the fume within the body. Under reducing conditions (i.e. any strong acid or base plus an active metal such as zinc or aluminum) or in the presence of freshly formed hydrogen, highly toxic ARSINE gas may be evolved.

SECTION 11. TOXICOLOGICAL INFORMATION

General: The lead and arsenic components of this alloy, when used in a process, may produce both acute and chronic health hazards. The primary routes of exposure to arsenical lead are by inhalation or ingestion of dust and fumes.

NOTE: Highly toxic Arsine gas may be generated when this alloy comes into contact with acid solutions under certain conditions. This situation should be regarded as being immediately life threatening. Exposure to arsine gas can cause a rapid destruction of red blood cells, tea-coloured or bloody urine, cessation of urine production, and kidney failure. The subjective signs of exposure are headache, nausea, back and upper abdominal pains, and jaundice. Severe kidney damage is common in victims who survive acute poisoning.

Acute:

Skin/Eye: Contact with dust or fume may cause local irritation but would not cause tissue damage. In the most severe cases, redness and burning or itching of the skin may be experienced on the face, neck, forearms, wrists and hands, particularly from contact with the collected fumes.

Inhalation: Exposure to dust or fume may cause headache, nausea, vomiting, abdominal spasms, dryness and irritation of the nose and throat, coughing, fatigue, sleep disturbances, weight loss, anemia, and pain in legs, arms, and joints. An intense, short-term exposure could cause pulmonary congestion and edema as well as acute encephalopathy with seizures, coma, and death. However, short-term exposures of this magnitude are unlikely in industry today. Kidney damage, as well as anemia, can occur from acute exposure.

Ingestion: Symptoms due to ingestion of dust or fume would be similar to those from inhalation. Other health effects such as constipation or bloody diarrhea might also occur.

Chronic:

Prolonged exposure to dust and fumes from this alloy may produce many of the symptoms of short-term exposure and may also cause central nervous system damage, gastrointestinal disturbances, anemia, skin rashes or dermatitis and, rarely, wrist drop. Reduced hemoglobin production has been associated with low lead exposures. Symptoms of central nervous system damage due to moderate exposure include fatigue, headaches, tremors and hypertension. Very high exposure can result in lead encephalopathy with symptoms of hallucinations, convulsions, and delirium. Kidney dysfunction and possible injury has also been associated with chronic lead poisoning. Chronic over-exposure to lead has been implicated as a causative agent for the impairment of male and female reproductive capacity. Pregnant women should be protected from excessive exposure as lead can cross the placental barrier and unborn children may suffer neurological damage or developmental problems due to excessive lead exposure. Teratogenic and mutagenic effects from exposure to lead have been reported in some studies but not in others. The literature is inconsistent and no firm conclusions can be drawn at this time. Lead and lead compounds are listed as an *A3 Carcinogen (Confirmed Animal Carcinogen with Unknown Relevance to Humans)* by the ACGIH. IARC has listed lead compounds as *Group 2A Carcinogens (Probably Carcinogenic to Humans)* while lead metal is listed as *Group 2B (Possibly Carcinogenic to Humans)*. The NTP has listed lead and lead compounds as *Reasonably Anticipated to be a Human Carcinogen*. OSHA and the EU do not currently list lead as a human carcinogen. Arsenic and inorganic arsenic compounds are listed as an *A1 Carcinogen (Confirmed Human Carcinogen)* by the ACGIH and as a *Group 1 Carcinogen (Carcinogenic to Humans)* by IARC. The NTP and OSHA also identify arsenic and inorganic arsenic compounds as *Known Human Carcinogens*. The EU does consider some compounds of arsenic, including arsenic oxides, to be carcinogenic, but does not include arsenic in the metallic form.

SECTION 12. ECOLOGICAL INFORMATION

This product will have minimal direct environmental effects, since it is an alloy, and therefore its constituent metals are not highly bioavailable. However, when the product is processed or resides in the environment for extended periods, compound forms of lead and arsenic may form which are potentially toxic to aquatic and terrestrial organisms. Depending on physico-chemical factors (such as pH and hardness) in water or soil which influence bioavailability, these metal compounds may have toxic effects on organisms. The typical "weathering" compounds of both constituents generally have low solubility in water, and very low mobility in soil. While lead readily bioaccumulates in aquatic and terrestrial organisms, this occurs to a much lesser extent with arsenic.

SECTION 13. DISPOSAL CONSIDERATIONS

If material cannot be returned to process or salvage, dispose of in accordance with applicable regulations. Special care should be taken in the disposal of arsenical lead alloy waste to minimize the risk of generating arsine gas.

SECTION 14. TRANSPORT INFORMATION

PROPER SHIPPING NAME Not a regulated product in ingot form
TRANSPORT CANADA CLASSIFICATION Not applicable
U.S. DOT HAZARD CLASSIFICATION Not applicable
TRANSPORT CANADA PRODUCT IDENTIFICATION NUMBER Not applicable
U.S. DOT PRODUCT IDENTIFICATION NUMBER Not applicable
MARINE POLLUTANT No
IMO CLASSIFICATION Not regulated

SECTION 15. REGULATORY INFORMATION

U.S.

INGREDIENTS LISTED ON TSCA INVENTORY Yes
HAZARDOUS UNDER HAZARD COMMUNICATION STANDARD Arsenic Yes
Lead Yes

CERCLA SECTION 103 HAZARDOUS SUBSTANCES Arsenic Yes RQ: 1lb. (0.454 kg)*
Lead Yes RQ: 10lb. (4.54 kg)*

* reporting not required when diameter of the pieces of solid metal released is equal to or exceeds 100 micrometers.

EPCRA SECTION 302 EXTREMELY HAZARDOUS SUBSTANCE No ingredients qualify.

EPCRA SECTION 311/312 HAZARD CATEGORIES Delayed (chronic) health hazard – Carcinogen
Delayed (chronic) health hazard – Reproductive Toxin

EPCRA SECTION 313 TOXIC RELEASE INVENTORY Arsenic CAS NO. 7440-38-2 Percent by Weight: 7% to 13%
Lead CAS NO. 7439-92-1 Percent by Weight: 87% to 93%

CANADIAN:

INGREDIENTS LISTED ON THE DOMESTIC SUBSTANCES LIST Yes

WHMIS CLASSIFICATION: D2A, Materials Causing Other Toxic Effects – Very Toxic

EUROPEAN UNION:

Ingredients Listed on the European Inventory
of Existing Commercial Chemical Substances (EINECS) Yes

EU Classification Toxic, Category 1 and Category 3 Reproductive Toxin,
Dangerous for the Environment

SECTION 16. OTHER INFORMATION

The information in this Material 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, 2012, Guide to Occupational Exposure Values.
- American Conference of Governmental Industrial Hygienists, 2012, Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices.
- Bretherick's Handbook of Reactive Chemical Hazards, 20th Anniversary Edition. (P.G. Urban, Ed.), 1995.
- Canadian Centre for Occupational Health and Safety (CCOHS), Hamilton, ON., CHEMINFO Record No. 608 Lead (Rev. 2009-05).
- Canadian Centre for Occupational Health and Safety (CCOHS), Hamilton, ON., CHEMINFO Record No. 3465 Arsenic (Rev. 2009-05).
- European Economic Community, Commission Directives 91/155/EEC, 93/21/EEC, and 67/548/EEC.
- Industry Canada, Controlled Products Regulations SOR/88-66, as amended.
- International Agency for Research on Cancer (IARC), Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Man, 1972 –present (multi-volume work), World Health Organization, Geneva.
- International Chemical Safety Cards (WHO/IPCS/ILO), ICSC:0052 – Lead; ICSC:0013 – Arsenic.

- Merck & Co., Inc., 2001, The Merck Index, An Encyclopedia of Chemicals, Drugs, and Biologicals, Thirteenth Edition.
- National Library of Medicine, National Toxicology Information Program, Hazardous Substance Data Bank (HSDB) on-line.
- Patty's Toxicology, 5th Edition, (E Bingham, B Cohrssen & C H Powell, Ed.) 2001.
- U.S. Department of Health and Human Services, National Institute of Environmental Health Sciences, National Toxicology Program (NTP), 12th Report on Carcinogens, June 2011.
- U.S. Department of Health and Human Services, National Institute for Occupational Safety and Health, NIOSH Pocket Guide to Chemical Hazards. CD-ROM Edition September 2005.
- U.S. Department of Health and Human Services, Public Health Service, Agency for Toxic Substances and Disease Registry, Toxicological Profile for Arsenic.
- U.S. Department of Health and Human Services, Public Health Service, Agency for Toxic Substances and Disease Registry, Toxicological Profile for Lead.
- U.S. Occupational Safety and Health Administration, 1989, Code of Federal Regulations, Title 29, Part 1910.

Notice to Reader

Although reasonable precautions have been taken in the preparation of the data contained herein, it is offered solely for your information, consideration and investigation. Teck Metals Ltd. extends no warranty and assumes no responsibility for the accuracy of the content and expressly disclaims all liability for reliance thereon. This material safety data sheet provides guidelines for the safe handling and processing of this product; it does not and cannot advise on all possible situations. Therefore, your specific use of this product should be evaluated to determine if additional precautions are required. Individuals exposed to this product should read and understand this information and be provided pertinent training prior to working with this product.