

HIGH LEAD INGOT SAFETY DATA SHEET

SECTION 1. IDENTIFICATION

Product Identity: This SDS applies to the following grades of High Lead Ingot & Low Alpha High Lead Ingot:

- High Lead Ingot 90 (90% Pb/Balance Tin)
- High Lead Ingot 95 (95% Pb/Balance Tin)
- High Lead Ingot 97 (97% Pb/Balance Tin)

Trade Names and Synonyms: None.

Manufacturer:

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

Supplier:

Teck Advanced Materials Inc.
13670 Danielson Street
Suite H & I
Poway, CA 92064

Preparer:

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

Date of Last Review: May 29, 2015.

Date of Last Edit: July 30, 2015.


Product Use: Production of high lead metal powders, manufacture of electronic devices.

SECTION 2. HAZARDS IDENTIFICATION

CLASSIFICATION:

Health	Physical	Environmental
Acute Toxicity (Oral, Inhalation) – Does not meet criteria Skin Corrosion/Irritation – Does not meet criteria Eye Damage/Eye Irritation – Does not meet criteria Respiratory or Skin Sensitization – Does not meet criteria Mutagenicity – Does not meet criteria Carcinogenicity – Category 2 Reproductive Toxicity – Category 1A Specific Target Organ Toxicity Acute Exposure – Does not meet criteria Chronic Exposure – Category 1	Does not meet criteria for any Physical Hazard	Aquatic Toxicity – Short Term (Acute) – Category 3

LABEL:

<p>Symbols:</p> <div style="text-align: center;">  </div>	<p>Signal Word: DANGER</p>
<p style="text-align: center;"><u>Hazard Statements</u></p> <p>DANGER May damage fertility or the unborn child. Causes damage to organs through prolonged or repeated exposure by inhalation. Suspected of causing cancer Harmful to aquatic life.</p>	<p style="text-align: center;"><u>Precautionary Statements:</u></p> <p>Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Do not breathe dust Wear protective gloves, protective clothing and eye protection. Wash hands thoroughly after handling. Do not eat, drink or smoke when using this product. Avoid release to the environment. If exposed or concerned or you feel unwell: Get medical advice/attention.</p>

Emergency Overview: A bluish-white to silvery-grey heavy, soft metal that does not burn in bulk but will melt readily at temperatures above 216°C to form a molten metal pool. Finely-divided lead dust clouds are a moderate explosion hazard,

however, when exposed to heat, flames or powerful oxidizers. The alloy contains 90 - 97% lead and fumes generated in a fire situation present the risk of lead inhalation and absorption. SCBA and full protective clothing required for fire emergency response personnel.

Potential Health Effects: While this product is not considered hazardous in the form in which it is sold, this Safety Data Sheet contains valuable information critical to the safe handling and proper use of the product. Inhalation or ingestion of lead dust or fumes from this product 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 to dust/fume in order to prevent lead crossing the placental barrier and causing infant neurological disorders. Airborne lead dust or fume is considered a potential human carcinogen by IARC, ACGIH and NTP (see Toxicological Information, Section 11).

Potential Environmental Effects: Lead compounds are not particularly mobile in the aquatic environment but can be toxic to organisms, especially fish, at low concentrations. Water hardness, pH and dissolved organic carbon content are factors which regulate the degree of toxicity. In soil, lead is generally not very mobile or bioavailable as it can become strongly sorbed on soil particles, increasingly so over time, to a degree dependent on soil properties. Lead bioaccumulates in plants and animals in both the terrestrial and aquatic environments (see Ecological Information, Section 12).

SECTION 3. COMPOSITION / INFORMATION ON INGREDIENTS

HAZARDOUS COMPONENTS	CAS Registry No.	CONCENTRATION (% wgt/wgt)
Lead	7439-92-1	90 – 97%
Tin	7440-31-5	3 – 10%

Note: See Section 8 for Occupational Exposure Guidelines.

SECTION 4. FIRST AID MEASURES

Eye Contact: *Symptoms:* Eye irritation, redness. Gently brush product off face if necessary. Do not rub eye(s). Let the eye(s) water naturally for a few minutes. Look right and left, then up and down. If particle/dust does not dislodge, cautiously rinse eye(s) with lukewarm, gently flowing water for 5 minutes or until particle/dust is removed, while holding eyelid(s) open. If irritation persists, get medical advice/attention. DO NOT attempt to manually remove anything stuck to the eye.

Skin Contact: *Symptoms:* Skin soiling, mild irritation. Wash gently and thoroughly with lukewarm, gently flowing water and non-abrasive soap for 5 minutes, or until product is removed. If skin irritation occurs or you feel unwell, get medical advice/attention.
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: *Symptoms:* Respiratory irritation. Remove source of exposure or move person to fresh air and keep comfortable for breathing. Seek medical attention if you feel unwell.

Ingestion: *Symptoms:* Stomach upset. If you feel unwell or are concerned, get medical advice/attention.

SECTION 5. FIRE FIGHTING MEASURES

Fire and Explosion Hazards: Massive metal is not flammable or combustible but will melt readily at temperatures above 216°C to form a molten metal pool. Finely-divided lead dust or powder that may be generated during processing 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 under certain circumstances 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. Do not use direct water streams on fires where molten metal is present.

Fire Fighting: If possible, move material from fire area and cool material exposed to flame. Highly toxic lead oxide fumes may evolve in a fire. 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. Do not use direct water streams on fires where molten metal is present, due to the risk of a steam explosion that could potentially eject molten metal uncontrollably. Use a fine water mist on the front-running edge of the spill and on the top of the molten metal to cool and solidify it.

SECTION 6. ACCIDENTAL RELEASE MEASURES

Procedures for Cleanup: Material is recyclable. Control source of spillage if possible to do so safely. Restrict access to the area until completion of cleanup. 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 and use methods which 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. Where molten metal is involved, wear heat-resistant gloves and suitable clothing for protection from radiant energy and hot-metal splash as well as a respirator to protect against inhalation of lead fume. Workers should wash and change clothing following cleanup of a spill to prevent personal contamination with lead-containing dust.

Environmental Precautions: In the form in which it is sold, this product does not pose an immediate ecological hazard. However, its processing or extended exposure in the aquatic and terrestrial environments may lead to the release of its contained metals in bioavailable forms. Contamination of water, soil and air should be prevented.

SECTION 7. HANDLING AND STORAGE

Store in a dry, covered area away from strong acids, other incompatible materials and food or feedstuffs. Use with adequate ventilation. 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.

SECTION 8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Occupational Exposure Guidelines:

<u>Component</u>	<u>ACGIH TLV</u>	<u>OSHA PEL</u>	<u>NIOSH REL</u>
Lead	0.05 mg/m ³	0.05 mg/m ³	0.05 mg/m ³
Tin	2.0 mg/m ³	2.0 mg/m ³	2.0 mg/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 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 lead fumes in the work environment well below recommended 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, welding and flame cutting.

Protective Clothing: Gloves and shop coat or other work clothing with long sleeves are recommended to prevent prolonged or repeated direct skin contact with lead dust 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 energy and hot metal splash should be worn. Safety type boots are recommended.

A double locker-shower system with separate clean and dirty sides is usually required for lead-handling operations to avoid cross-contamination of street clothes. Remove contaminated clothing promptly and discard or launder before reuse. Inform laundry personnel of contaminants' hazards, especially if using a commercial or industrial laundry service. Workers should never take dirty work clothes home and launder them with other personal clothing.

Respirators: Where lead dust or fumes 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-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.

General Hygiene Considerations: Always follow good industrial hygiene and housekeeping practices. Do not eat, drink or smoke while working with this material. Thoroughly wash hands after handling and before eating, drinking or smoking in appropriate, designated areas only. Remove contaminated clothing and launder before reuse.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance: Malleable, bluish-white or silvery-grey metal	Odour: None	Odour Threshold: Not Applicable	pH: Not applicable
Vapour Pressure: Negligible at ambient temp.	Vapour Density: Not applicable	Melting Point/Range: 216 – 232°C	Boiling Point/Range: 1740°C (Lead)
Relative Density (Water = 1): Approx. 11	Evaporation Rate: Not applicable	Coefficient of Water/Oil Distribution: Not applicable	Solubility: Insoluble in water
Flash Point: None	Flammable Limits (LEL/UEL): Not flammable	Auto-ignition Temperature: None	Decomposition Temperature: None

SECTION 10. STABILITY AND REACTIVITY

Stability & Reactivity: Massive metal is stable and not considered reactive under normal temperatures and pressures. Hazardous polymerization or runaway reactions will not occur. Fresh cut or cast lead surfaces tarnish rapidly due to the formation of an insoluble protective layer of basic lead carbonate.

Incompatibilities: Lead metal reacts vigorously with strong acids, particularly nitric acid and with strong oxidizers, such as hydrogen peroxide or chlorine trifluoride, and active metals such as sodium, potassium, lithium and calcium. Powdered lead 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 lead can form lead azide, which is a detonating compound. Avoid spark, open flames or other potential sources of ignition in dusty conditions.

Hazardous Decomposition Products: High temperature operations such as oxy-acetylene cutting and electric arc welding or overheating a molten metal bath will generate highly toxic lead oxide fumes. Lead oxide is 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.

SECTION 11. TOXICOLOGICAL INFORMATION

General: It should be noted that simple handling and non-thermal processing of this alloy does not present any significant health hazard to workers. The major route of exposure would be through inhalation of fumes generated from high temperature processing. Dust generated by handling and processing also creates an inhalation and/or ingestion risk. Tin is present at low concentrations and is much less toxic than lead. Hence the health effects of this alloy are due principally to the lead content. Initial and periodic medical examinations are advised for persons repeatedly exposed to levels above the exposure limits of lead.

Acute:

Skin/Eye: Contact with dust or fume may cause local irritation but would not cause tissue damage.

Inhalation: Exposure to dust or fume may cause respiratory irritation and headache, nausea, vomiting, abdominal pain, fatigue, sleep disturbances, weight loss, anemia and pain in legs, arms, and joints. An acute, short-term dose of lead could cause acute encephalopathy with seizures, coma, and death. However, short-term exposure of this magnitude is unlikely in industry today. Kidney damage, as well as anemia, can occur from extreme acute exposures.

Ingestion: May cause headache, nausea, vomiting, dizziness and/or gastrointestinal irritation. Other health effects such as metallic taste in the mouth and constipation or bloody diarrhea might also be expected to occur. Kidney damage, as well as anemia, can occur from extremely high acute doses of lead.

Chronic:

Lead can be harmful when ingested or inhaled. Overexposure to lead can cause lead poisoning, which is characterized by fatigue, sleep disturbance, headache, aching bones and muscles, constipation, abdominal pains, decreased appetite, tremors and hypertension. These symptoms are reversible and complete recovery is possible. However, continued over-exposure to lead can lead to increased symptoms and chronic systemic disorders. The kidneys, blood, gastrointestinal tract, and central nervous systems can be adversely affected by concentrations of lead in the body. Chronic over-exposure to lead has been implicated as a causative agency for the impairment of male and female reproductive capacity. Pregnant women should be protected from excessive exposure in order to prevent lead crossing the placental barrier and causing infant neurological disorders. 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 metal as *Group 2B (Possibly Carcinogenic to Humans)*. The NTP has recently 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.

Animal Toxicity:

<u>Hazardous Ingredient:</u>	<u>Acute Oral Toxicity:</u>	<u>Acute Dermal Toxicity:</u>	<u>Acute Inhalation Toxicity:</u>
Lead	No data	No data	No data
Tin	No data	No data	No data

SECTION 12. ECOLOGICAL INFORMATION

This alloy does not pose an immediate ecological hazard but its processing or extended exposure in the aquatic and terrestrial environments may lead to the release of its contained metals in bioavailable forms. Lead compounds are not particularly mobile in the aquatic environment but can be toxic to organisms, especially fish, at low concentrations. Water hardness, pH and dissolved organic carbon content are factors which regulate the degree of toxicity. In soil, lead is generally not very mobile or bioavailable as it can become strongly sorbed on soil particles, increasingly so over time, to a degree dependent on soil properties. Lead bioaccumulates in plants and animals in both the terrestrial and aquatic environments.

Tin compounds have similar geochemical and ecological properties to those of lead but are considerably less toxic to aquatic and terrestrial organisms.

SECTION 13. DISPOSAL CONSIDERATIONS

If material cannot be returned to process or salvage, dispose of only in accordance with applicable local, regional and national regulations. Waste material meets the requirements of a hazardous waste in most jurisdictions. It is the responsibility of the waste generator to determine the toxicity and physical properties of the material generated in order to determine the proper waste classification and disposal methods.

SECTION 14. TRANSPORT INFORMATION

TRANSPORT CANADA CLASSIFICATION	Not a regulated product in ingot form.
U.S. DOT CLASSIFICATION	Not a regulated product in ingot form.
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	Yes
CERCLA SECTION 103 HAZARDOUS SUBSTANCES	Lead.....RQ: 10lb. (4.54kg.)*
* 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:	Lead CAS No. 7439-92-1 Percent by Weight: At least 90%

SECTION 16. OTHER INFORMATION

Date of Original Issue:	Sept. 30, 2002	Version: 01 (<i>First edition</i>)
Date of Latest Revision:	July 30, 2015	Version: 09

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, Seventh Edition plus updates.
- American Conference of Governmental Industrial Hygienists, 2015, Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices.

- American Conference of Governmental Industrial Hygienists, 2015. Guide to Occupational Exposure Values.
- Bretherick's Handbook of Reactive Chemical Hazards, 20th Anniversary Edition. (P. G. Urban, Ed), 1995.
- Commission de la santé et la sécurité du travail, Service du répertoire toxicologique, Plomb.
- Canadian Centre for Occupational Health and Safety (CCOHS), Hamilton, Ontario, CHEMINFO Record No. 0608 – Lead.
- 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).
- Industry Canada, SOR/2015-17, 30 January 2015 - Hazardous Products Regulations.
- 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.
- 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.
- Patty's Toxicology, Fifth Edition, 2001: E. Bingham, B. Cohnsen & C.H. Powell, Ed.
- U.S. Department of Health and Human Services, National Institute of Environmental Health Sciences, National Toxicology Program (NTP), 13th Report on Carcinogens, October 2014.
- U.S. Department of Health and Human Services, National Institute for Occupational Safety and Health, NIOSH Pocket Guide to Chemical Hazards. On-line edition.
- U.S. Department of Health and Human Services, Public Health Service, Agency for Toxic Substances and Disease Registry, Toxicological Profile for Lead (August 2007).
- U.S. Department of Health and Human Services, National Institute of Occupational Safety and Health, Registry of Toxic Effects of Chemical Substances (RTECS).
- 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 Advanced Materials Inc. extends no warranty and assumes no responsibility for the accuracy of the content and expressly disclaims all liability for reliance thereon. This 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.