Teck

LEAD CONCENTRATE
MATERIAL SAFETY DATA SHEET

SECTION 1. PRODUCT AND COMPANY IDENTIFICATION

Product Identity: Pend Oreille Lead Concentrate

Manufacturer:
Teck American Incorporated
Pend Oreille Mine
1382 Pend Oreille Mine Road
P.O. Box 7
Metaline Falls, WA 99153
Emergency Telephone: (250) 364-4214

Supplier:
Teck American Incorporated
Pend Oreille Mine
1382 Pend Oreille Mine Road
P.O. Box 7
Metaline Falls, WA 99153

MSDS Preparer:
Teck Metals Ltd.
3300 - 550 Burrard Street
Vancouver, British Columbia
V6C 0B3

Date of Last MSDS Review/Edit: July 6, 2010.

Product Use: Lead concentrate is used in the production of lead metal and lead alloys.

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 Sulphide	66 to 73%	1314-87-0	OSHA PEL ACGIH TLV NIOSH REL	0.05 mg/m^3 (as Pb) 0.05 mg/m^3 (as Pb) 0.05 mg/m^3 (as Pb)	No Data	
Zinc Sulphide	7 to 10%	1314-98-3	OSHA PEL ACGIH TLV NIOSH REL	None Established None Established None Established	LD_{50}, rat, oral LC_{50}, rat, inhal LD_{50}, rat, skin	>2000 mg/kg >5040 mg/m^3/4H >2000mg/kg
Iron Sulphide	12 to 18%	1317-37-9	OSHA PEL ACGIH TLV NIOSH REL	None Established None Established None Established	No Data	
Silica	0.1 to 0.2%	14808-60-7	OSHA PEL ACGIH TLV NIOSH REL	4.5 mg/m^3 (resp dust)** 13 mg/m^3 (total dust)** 0.025 mg/m^3 (resp SiO_2) 0.050 mg/m^3 (resp SiO_2)	No Data	

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.

While there are no established OELs for zinc sulphide and iron sulphide as such, there are OELs for their respective oxides, which may be formed during burning, welding or other fuming processes. The OSHA PEL for zinc oxide dust is 15 mg/m^3 (total) and 5 mg/m^3 (respirable); the OSHA PEL for zinc oxide fume is 5 mg/m^3. The ACGIH TLV for zinc oxide is 2 mg/m^3 (respirable fraction) with a Short Term Exposure Limit (STEL) of 10 mg/ m^3 (respirable fraction). The NIOSH REL for zinc oxide (dust or fume) is 5 mg/m^3 10 hr TWA with a 15 mg/m^{3}ceiling for zinc oxide dust and a 10 mg/m^3 STEL for zinc oxide fume (15 min. sample).
The OSHA PEL for iron oxide fume is 10 mg/m^3. The NIOSH REL for iron oxide dust and fume is 5 mg/m^3 (as Fe) and the ACGIH TLV is 5 mg/m^3 of iron oxide dust/fume (respirable fraction).
** – The OSHA PEL for silica applies to the total airborne lead concentrate dust concentration and has been calculated based on the maximum percent SiO2 in the sample using the formulas: Respirable Dust PEL = 10 mg/m3/(%SiO2 + 2): Total Dust PEL = 30 mg/m3/(%SiO2 + 2)

Trade Names and Synonyms: Lead Concentrate

SECTION 3. HAZARDS IDENTIFICATION

Emergency Overview: A dark black-grey, heavy, soil-like material that is not flammable or combustible under normal conditions of transport and storage. However, when heated strongly in air it will burn, releasing toxic and irritating sulphur dioxide gas as well as possible lead and zinc oxide fumes. Contact with strong acids will generate flammable and highly toxic hydrogen sulphide gas (H_2S). Inhalation or ingestion of concentrate dust may produce both acute and chronic health effects. Possible cancer hazard due to lead and silica content. Possible reproductive hazard due to lead content. SCBA and full protective clothing required for fire emergency response personnel.

Potential Health Effects: *Caution: The toxicological properties of this material have not been fully investigated. The information contained in this MSDS is therefore based on information in the technical and scientific literature about the material's constituent compounds.*
Inhalation or ingestion of concentrate dust may result in lead absorption and possible lead intoxication. Symptoms include 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 (e.g., fatigue, headaches, tremors, hypertension), gastrointestinal disturbances, anemia, kidney dysfunction and possible reproductive effects. Pregnant women should be protected from excessive exposure to prevent lead crossing the placental barrier and causing infant neurological disorders. 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 recently listed lead and lead compounds as *Reasonably Anticipated to be a Human Carcinogen*. OSHA does not currently list lead as a human carcinogen. Silica is classified as an *A2 Carcinogen* by the ACGIH and as a *Group 1 Carcinogen* by IARC. (see Toxicological Information, Section 11)

Potential Environmental Effects: Lead concentrate is relatively insoluble in water and its constituent metals have low direct bioavailability. However, extended exposure in aquatic and terrestrial environments can lead to the release of constituent metals in bioavailable forms, which may result in toxicity to organisms in these environments.

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: 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.

Inhalation: Remove 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). 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: Product is not considered a fire or explosion hazard. However, concentrate will burn if heated strongly in a fire situation, releasing toxic and irritating sulphur dioxide gas (SO_2). Contact with strong acids will generate flammable and highly toxic hydrogen sulphide gas (H_2S). The ignition temperature of lead concentrate is approximately 500 – 600ºC.

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

Fire Fighting: Toxic fumes of sulphur dioxide will result from combustion. 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 until completion of clean-up. Clean up spilled material immediately, observing precautions in Section 8, Personal Protection and using methods that will minimize dust generation (e.g., vacuum solids, dampen material and shovel or wet sweep). Return uncontaminated spilled material to the process if possible. Place contaminated material in suitable labeled containers for 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 coveralls or other 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. Workers should wash and change clothing following cleanup of a spill to prevent personal contamination with lead-containing dust.

Environmental Precautions: The handling, shipment, storage and processing of this material requires appropriate controls and care to prevent spillage or gradual accumulation in terrestrial and aquatic environments. Spilled material should be promptly cleaned up.

SECTION 7. HANDLING AND STORAGE

Health Precautions: Avoid breathing dust. Always practice good personal hygiene. Refrain from eating, drinking, or smoking in work areas. Thoroughly wash hands after handling and before eating, drinking, or smoking in appropriate designated areas only. Some sulphide concentrates may slowly oxidize in storage and generate sulphur dioxide as well as deplete the oxygen content of a confined space. The atmosphere within confined spaces containing concentrate must be tested before entry and the area thoroughly ventilated or self-contained breathing apparatus used, if conditions warrant.

Handling (Physical Aspects): Avoid excessive heat. Avoid contact with acids, oxidizers and combustible materials. Minimize dust generation and accumulation.

Storage Precautions: Store in a cool, dry area.

Autoignition: Some sulphide concentrates may oxidize and generate heat which accumulates in storage piles. If material is to be stored for an extended period, the temperature of piles should be monitored.

Means of Control: If heating of the concentrate is detected, the material should be sealed from air or oxygen in one of the following ways:

1. Leave the piles totally intact, do not open them up or try to spread them around.
2. Tamp or compact the surface of the piles.
3. Spray the pile with water. Resort to an organic binder only if needed because it can cause formation of hard lumps and subsequent problems for processing. Suggestions for organic binders include Aerospray 70A Binder, Coherex, Igepal CA-720 and lignin sulphonate, a pulp mill by-product.
4. For smaller piles, cover them with a tarp that will prevent exposure of the material to air.
5. If inside a building or ship's hold, keep all doors closed as much as possible.

SECTION 8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Protective Clothing: Coveralls or other work clothing, glasses or goggles, and gloves are recommended to prevent prolonged or repeated direct skin contact. Close-fitting safety goggles should be worn to prevent eye contact if excessive dust is generated or where any possibility exists that eye contact may occur. Workers should wash immediately when skin becomes contaminated and at the end of each work shift. Work clothing should be removed immediately if it becomes heavily contaminated and should be changed daily and laundered before reuse if there is reasonable probability that the clothing may be contaminated.

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

Respirators: Where lead concentrate 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-100 particulate filter cartridge).

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance: Dark black-grey, fine powder	**Odour:** Weak organic odour from entrained flotation reagents	**Physical State:** Solid	**pH:** 7.5 to 8.5
Vapour Pressure: Negligible @ 20°C	**Vapour Density:** Not Applicable	**Boiling Point/Range:** Not Applicable	**Melting Point/Range:** Will burn first unless in an inert atmosphere
Specific Gravity: 3.5 (Bulk Sp. Gr.)	**Evaporation Rate:** Not Applicable	**Coefficient of Water/Oil Distribution:** Not Applicable	**Odour Threshold:** No Data
Solubility: Essentially insoluble	**Percent Volatiles:** 9 – 12% (moisture)		

SECTION 10. STABILITY AND REACTIVITY

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

Incompatibilities: Reacts violently with iodine pentachloride. Incompatible with iodine monochloride, hydrogen peroxide, strong oxidizers, and strong acids.

Hazardous Decomposition Products: May release highly toxic and flammable hydrogen sulphide gas on contact with strong acids. This material can decompose at high temperatures forming toxic and irritating sulphur dioxide gas as well as lead and zinc oxides.

SECTION 11. TOXICOLOGICAL INFORMATION

General: In the powder form in which this product is sold, the metals are present as sulphides that are relatively insoluble and poorly absorbed within the body. However, high temperature operations such as oxy-acetylene cutting, electric arc welding or arc-air gouging on dust–contaminated surfaces will generate highly toxic lead oxide fume that also contains some zinc oxide. These oxides 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. The primary route of exposure would be through inhalation of metal oxide fumes, composed principally of lead oxide and including some zinc oxide as well.

NOTE: The toxicological properties of this material have not been fully investigated. The information contained in this MSDS is therefore based on information in the technical and scientific literature about the material's constituent compounds.

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

Inhalation: Exposure to dust or fume is irritating to the nose, throat and respiratory tract with dryness and irritation of the nose and throat, tightness of the chest, coughing and metallic taste. It may cause headache, as well as gastrointestinal disturbances with nausea, vomiting, abdominal spasms, fatigue, sleep disturbances, weight loss, anemia, and pain in legs, arms, and joints. An intense, short-term exposure to welding/burning fumes could cause congestion and pulmonary edema as well as acute encephalopathy with seizures, coma, and death. However, short-term exposures of this magnitude are unlikely in industry today. Less intense short-term exposure to such fumes could produce metal fume fever with flu-like symptoms of fever, malaise, perspiration, frontal headache and muscle cramps from the zinc oxide fume. 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 lead concentrate dust may produce many of the symptoms of short-term exposure and may also cause central nervous system damage, gastrointestinal disturbances, kidney dysfunction, 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. 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 recently listed lead and lead compounds as *Reasonably Anticipated to be a Human Carcinogen*. OSHA does not currently list lead as a human carcinogen. IARC has classified crystalline silica of respirable particle size as a *Group 1 Carcinogen (Carcinogenic to Humans)* while ACGIH classifies it as a *Suspected Human Carcinogen (A2)*. The NTP recently reclassified silica as a *Known Human Carcinogen*. OSHA does not list silica as a carcinogen.

SECTION 12. ECOLOGICAL INFORMATION

Lead concentrate is relatively insoluble in water and its constituent metals have low direct bioavailability. However, extended exposure in aquatic and terrestrial environments can lead to the release of constituent metals in bioavailable forms, which can potentially result in toxicity to organisms in these environments. The mobility of lead and zinc is media-dependent. They can bind with inorganic and organic ligands, reducing their mobility and bioavailability in soil and water. Bioavailability is also regulated by other factors, such as pH and hardness.

Lead: Lead compounds are highly persistent in water. Dissolved lead compounds bioaccumulate in aquatic and terrestrial plants and animals. Lead may occur as sorbed ions or surface coatings on sediment particles, or may be carried in colloidal particles in surface water. Most lead is strongly retained in soil, resulting in relatively little mobility.

Zinc: Zinc can be toxic to aquatic organisms. In aquatic systems, zinc bioaccumulates in both plants and animals. Zinc also bioaccumulates in terrestrial plants, vertebrates, and mammals, with plant uptake from soil dependent on species, soil pH, and soil composition. In general, zinc does not biomagnify through food chains.

SECTION 13. DISPOSAL CONSIDERATIONS

If material cannot be returned to process or salvage, dispose of only in accordance with applicable regulations.

SECTION 14. TRANSPORT INFORMATION

TRANSPORT CANADA CLASSIFICATION	Not regulated
U.S. DOT HAZARD CLASSIFICATION	Class 9, Packing Group III
U.S. PROPER SHIPPING NAME	Environmentally Hazardous Substance, Solid, n.o.s. (contains lead sulfide)
U.S. DOT RQ	Lead sulfide 10 lbs.
U.S. DOT PRODUCT IDENTIFICATION NUMBER	UN3077
MARINE POLLUTANT	No
IMO CLASSIFICATION	MHB - Materials Hazardous Only in Bulk

SECTION 15. REGULATORY INFORMATION

U.S.

INGREDIENTS LISTED ON TSCA INVENTORY	Yes
HAZARDOUS UNDER HAZARD COMMUNICATION STANDARD:	Lead Sulphide.....Yes Silica .....Yes
CERCLA SECTION 103 HAZARDOUS SUBSTANCES	Lead Sulphide.....Yes ... RQ: 10 lbs. (4.54 kg.) Zinc Compounds.....Yes ... RQ: None assigned
EPCRA SECTION 302 EXTREMELY HAZARDOUS SUBSTANCE	None of the 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 Compounds (Lead Sulphide) CAS No 1314-87-0 Percent by Weight:..... 66 to 73% Zinc Compounds (Zinc Sulphide)

CAS No 1314-98-3
Percent by Weight:..... 7 to 10%

CANADIAN:
INGREDIENTS LISTED ON DOMESTIC SUBSTANCES LIST..... Yes
WHMIS CLASSIFICATION: ..... D2A, Material Causing Other Toxic Effects – Very Toxic

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, Seventh Edition plus updates.
- American Conference of Governmental Industrial Hygienists, 2009, Guide to Occupational Exposure Values.
- American Conference of Governmental Industrial Hygienists, Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices - 2010.
- Bretherick's Handbook of Reactive Chemical Hazards, 20th Anniversary Edition. (P. G. Urben, 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. 548 – Zinc (Rev 2009-05).
- European Economic Community, Commission Directives 91/155/EEC and 67/548/EEC.
- Industry Canada, SOR/88-66, as amended, Controlled Products Regulations.
- International Agency for Research on Cancer (IARC), Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Man, 1972 – 2009, (multi-volume work), World Health Organization, Geneva.
- International Chemical Safety Cards (WHO/IPCS/ILO), ICSC:0052 – Lead, ICSC 0208 – Zinc Oxide.
- Merck & Co., Inc., 2001, The Merck Index, An Encyclopedia of Chemicals, Drugs, and Biologicals, 13th Edition.
- National Library of Medicine, National Toxicology Information Program, Hazardous Substance Data Bank (HSDB) online.
- Patty's Toxicology; 5th Edition, 2001, Bingham, Cohrssen & Powell, Editors.
- U.S. Department of Health and Human Services, National Institute of Environmental Health Sciences, National Toxicology Program (NTP), 11th Report on Carcinogens, January 2005.
- U.S. Department of Health and Human Services, Public Health Service, Agency for Toxic Substances and Disease Registry, Update Toxicological Profile for Lead.
- U.S. Department of Health and Human Services, Public Health Service, Agency for Toxic Substances and Disease Registry, Update Toxicological Profile for Zinc.
- 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. Occupational Safety and Health Administration, 1989, Code of Federal Regulations, Title 29, Part 1910.

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