# SAFETY DATA SHEET

## Lead metal (sheet)

Safety Data Sheet according to REACH Regulation (EC 1907/2006), and CLP Regulation (EC1272/2008).

### SECTION 1: Identification of the substance/mixture and of the company/undertaking

**1.1 Product identifier**

**Name of Substance: Lead metal (sheet)**

| | |
|---|---|
| **EC number:** | **231-100-4** |
| **EC name:** | **Lead** |
| **CAS number (EC inventory):** | **7439-92-1** |
| **Registration number** | **N/A** |

**1.2 Relevant identified uses of the substance or mixture and uses advised against**

Uses considered in Exposure Scenarios in an Annex to section 16.

1 Lead sheet production
2 Professional use of lead sheet

No specific uses advised against have been identified, other than legal restrictions on the use of lead.

**1.3 Details of the supplier of the safety data sheet**

BLM British Lead
Peartree Lane
Welwyn Garden City
Hertfordshire AL7 3UB
Tel: 01707 324595
Fax: **01707 328941**
E mail: dward@britishlead.co.uk

**1.4 Emergency telephone number**

**In case of emergency Tel. 01707 324595 (Mon – Fri, 0800hrs – 1700hrs)**

### SECTION 2: Hazards Identification

**2.1 Classification**

The following acute Ecotoxicity Reference Values (ERVs) were used to determine the classification of **lead metal**.

| pH range | Descriptor | ERV |
|---|---|---|
| 6 | ERV (Ecotoxicity Reference Value) | 73.6 µg Pb/L (dissolved) |
| 7 | ERV (Ecotoxicity Reference Value) | 37.8 µg Pb/L (dissolved) |
| 8 | ERV (Ecotoxicity Reference Value) | 20.5 µg Pb/L (dissolved) |

The following chronic Ecotoxicity Reference Values (ERVs) were used to determine the classification of **lead metal**.

| pH range | Descriptor | ERV |
|---|---|---|
| 6 | ERV (Ecotoxicity Reference Value) | 17.8 µg Pb/L (dissolved) |
| 7 | ERV (Ecotoxicity Reference Value) | 9.0 µg Pb/L (dissolved) |
| 8 | ERV (Ecotoxicity Reference Value) | 6.1 µg Pb/L (dissolved) |

**Dangerous Substances Directive 67/548/EEC –** No harmonised classification.

**Classification Labelling and Packaging Regulation EC 1272/2008 –** No harmonised classification.

**2.2 Labelling**

**Classification Labelling and Packaging Regulation EC 1272/2008 -** None required.

**2.3 Other hazards**

Lead in sheet or massive form is not a significant health hazard.
However, melting or operations generating lead dust, fume or vapour can result in sufficient lead entering your body to be hazardous to your health. Oxidation products (including lead compounds) may also form on the surface of metallic lead.
Lead is heavy and care should be taken when lifting and handling.
See section 11 for more information on the health hazards of lead compounds

## SECTION 3: Composition

**3.1 Substances**
Not applicable

**3.2 Mixtures**
Lead Sheet:

| Substance | EC Number | REACH registration number (if applicable) | Concentration (% w/w) | Hazard Classification |
|---|---|---|---|---|
| Lead | 231-100-4 | | >99 | None |
| Copper | 231-159-6 | | 0.03-0.06 | None |
| Non-hazardous impurities | n/a | n/a | remainder | None |

## SECTION 4: First Aid Measures

**The measures below are unlikely to be relevant whilst lead is in its solid metallic state. However, they are relevant in the event of exposure to fumes, vapour or dust or oxidation products that may form on the surface of lead sheet.**

**4.1 Description of first aid measures**
EYE CONTACT: Ensure that contact lenses are removed before rinsing eyes.Separate eyelids, wash the eyes thoroughly with ater (15 min). Seek medical attention if irritation persists
INHALATION: Move person to fresh air. Seek medical attention..
SKIN CONTACT: Remove contaminated clothing. Wash skin immediately with soap and water. Seek medical attention if irritation persists.
INGESTION: Rinse out mouth and give plenty of water to drink. Seek medical attention.

**4.2 Most important symptoms and effects, both acute and delayed**
Clinical manifestations of lead poisoning include weakness, irritability, asthenia, nausea, abdominal pain with constipation, and anaemia.

**4.3 Indication of any immediate medical attention and special treatments needed**
Symptoms of poisoning may occur after several hours; seek medical attention.

## SECTION 5: Firefighting Measures

**5.1 Extinguishing media**
Water spray jet; Dry sand. Extinguishing media that must not be used for safety reasons: Full water jet; Foam.

**5.2 Special hazards arising from the substance or mixture**
In case of fires, hazardous combustion gases are formed: Lead fumes; Lead oxide.

**5.3 Advice for fire fighters**
Appropriate breathing apparatus may be required. Wear protective clothing.

## SECTION 6: Accidental Release Measures

**6.1 Personal precautions, protective equipment and emergency procedures**
Ensure adequate ventilation. Avoid dust formation. Avoid contact with skin, eyes and clothing. See section 8 for further details.

**6.2 Environmental precautions**
Do not discharge into the drains/surface waters/groundwater. In case of entry into waterways, soil or drains, inform the responsible authorities.

**6.3 Methods and materials for containment and clearing up**
Collect mechanically (preferably in dry condition). Send in suitable containers for recovery or disposal. When picked up, treat material as prescribed under heading "Disposal considerations".

**6.4 References to other sections**
See sections 8 and 13 for further advice.

## SECTION 7: Handling and Storage

**7.1 Precautions for safe handling**
Provide good ventilation of working area (local exhaust ventilation, if necessary). The product is not combustible.

**7.2 Conditions for safe storage, including any incompatibilities**
No special measures required. Do not store together with foodstuffs. Do not store together with animal feedstocks. Do not store with acids or alkalies. Do not store with combustible materials.

**7.3 Specific end uses(s)**
Specific Exposure Scenarios are included in an Annex to Section 16.

## SECTION 8. Exposure Controls/Personal Protection

**8.1 Control parameters**

**8.1.1 Human Toxicity values**

OELs - Lead and inorganic compounds (as Pb):

| | Limit values – 8 hours mg/m³ | Limit values – short term mg/m³ |
|---|---|---|
| EU | 0.15 | |
| United Kingdom | 0.15 | |
| Austria | 0.1 inhalable aerosol | 0.4 inhalable aerosol |
| Belgium | 0.15 | |
| Denmark | 0.05 inhalable aerosol | 0.10 inhalable aerosol |
| France | 0.1 inhalable aerosol | |
| Germany (AGS) | 0.1 inhalable aerosol | |
| Hungary | 0.15 inhalable aerosol<br>0.05 respirable aerosol | 0.60 inhalable aerosol<br>0.2 respirable aerosol |
| Italy | 0.15 inhalable aerosol | |
| Poland | 0.05 | |
| Spain | 0.15 inhalable aerosol | |
| Sweden | 0.1 inhalable aerosol<br>0.15 respirable aerosol | |
| Switzerland | 0.1 inhalable aerosol | 0.8 inhalable aerosol |

Biological action levels, inorganic lead

| | |
|---|---|
| EU | 70 µg/dL |
| UK | 60 µg/dL |
| Germany (suspended) | 40 µg/dL<br>10 µg/dL (for woman of reproductive capacity) |
| France | 40 µg/dL<br>30 µg/dL µg/dL (for woman of reproductive capacity) |
| Spain | 70 µg/dL |
| Italy | 60 µg/dL<br>40 µg/dL (for woman of reproductive capacity) |
| Denmark | 20 µg/dL |

DN(M)ELs for workers:

| Exposure pattern | Route | Descriptors | DNEL/DMEL (appropriate unit) | Most sensitive endpoint |
|---|---|---|---|---|
| Acute - systemic effects | Dermal (mg/kg bw /day) | NA | NA | NA |
| | Inhalation (mg/m$^3$) | NA | NA | NA |
| Acute - local effects | Dermal (mg/cm$^2$) | NA | NA | NA |
| | Inhalation (mg/m$^3$) | NA | NA | NA |
| Long-term - systemic effects | Systemic (µg lead /dL blood) | NOAEL = 40 µg/dL<br><br>NOAEL = 10 µg/dL | 40 µg/dL<br><br>10 µg/dL | Adult neurological function<br>Developmental effect on foetus of pregnant women |
| Long-term – local effects | Dermal (mg/cm$^2$) | NA | NA | NA |
| | Inhalation (mg/m$^3$) | NA | NA | NA |

### 8.1.2 Ecological toxicity values

The following Predicted No Effect Concentrations (PNECs) were used to determine the environmental risk of lead metal (sheet):

| Exposure pattern | Route | Descriptor | PNEC |
|---|---|---|---|
| Long-term – chronic effects | Freshwater | PNEC (Predicted No Effect Concentration) | 3.1 µg Pb/L (dissolved) |
| Long-term- chronic effects | Marine | PNEC (Predicted No Effect Concentration) | 3.5 µg Pb/L (dissolved) |
| Long-term – chronic effects | Freshwater Sediment | PNEC (Predicted No Effect Concentration) | 174.0 mg Pb/kg dw[1]<br>41.0 mg Pb/kg dw[2] |
| Long-term – chronic effects | Marine Sediment | PNEC (Predicted No Effect Concentration) | 164.0 mg Pb/kg dw |
| Long-term – chronic effects | Soil | PNEC (Predicted No Effect Concentration) | 212.0 mg Pb/kg dw |
| Long-term – chronic effects | STP (Sewage Treatment Plant) | PNEC (Predicted No Effect Concentration) | 0.1 mg Pb/L |

[1]: without bioavailability correction; [2]: with bioavailability correction

Guidance on how to comply with these PNECs is given in the attached Exposure Scenarios.

### 8.2 Exposure controls

**8.2.1 Organisational measures**

Personal Hygiene: Ensure workers follow simple hygiene rules (e.g. do not bite nails and keep them cut short, avoid touching or scratching face with dirty hands or gloves); Ensure workers do not wipe away sweat with hands or arms; Ensure workers use disposable tissues rather than a handkerchief; Prohibit drinking, eating and smoking in production areas, or access to eating and non-production areas in working clothes; Ensure workers wash hands, arms, faces and mouths (but preferably shower) and change into clean clothing before entering eating areas; For high exposure workplaces, separate rooms for cleaning hands, removal of clothes, showers and clean clothes may be necessary; Ensure workers handle dirty working clothes with care; Allow no personal belongings to be taken into production areas, or items that have been used in production areas to be taken home. Ensure general shop cleanliness is maintained by frequent washing/vacuuming. Clean every workplace at the end of every shift.

Blood lead monitoring: Set in place a certified monitoring regime which covers all site activities; Define a policy for submitting workers to regular blood lead monitoring, including increased frequency for workers undertaking high-risk jobs and workers with elevated blood lead levels; Ensure all workers have a blood test prior to working on site. Set an "action level" that is typically 5 µg/dL below the exposure limit deemed to be safe. If the action level is exceeded, appropriate measures are to be taken, to prevent further increases in blood lead. If the safe threshold is exceeded, continue or begin ban on overtime, ensure strict hygiene procedures are followed, undertake detailed inspections to ensure correct use of personal protective equipment, undertake detailed inspections to ensure recommended workplace procedures are followed, move employee to workplace where exposure is expected to be lower or remove from lead environment altogether, further increase blood lead sampling frequency, and continue frequent sampling until results are below the first action level.

**8.2.2 Personal Protection Equipment**

Respiratory protection: Suitable respiratory protective device recommended if work activity is likely to result in formation of lead fumes, vapours or dust. In case of brief or low level exposure use dust mask or half mask with particle filter P2. Assess the need to wear respiratory protective equipment in production areas. Consider use effective masks accompanied by a compliance policy (ensure proper shaving; ensure workers do not remove RPE in production areas in order to communicate). Where masks are used, employ formal mask cleaning and filter changing strategies.

Hand Protection: Protective gloves. Material of gloves: Neoprene or Leather.

Eye protection: Safety glasses.

Skin protection: Wear protective work clothing. For workers in areas of significant exposure, provide sufficient working clothes to enable daily change into clean clothes. In such cases all work clothing should be cleaned by the employer on a daily basis and is not permitted to leave the work site.

**8.2.3 Environmental Protection**

One or more of the following measures may if necessary be taken to reduce emissions to water:
- Chemical precipitation: used primarily to remove the metal ions
- Sedimentation
- Filtration: used as final clarification step
- Electrolysis: for low metal concentration
- Reverse osmosis: extensively used for the removal of dissolved metals
- Ion exchange: final cleaning step in the removal of heavy metal from process wastewater

One or more of the following measures may if necessary be taken to reduce emissions to air:
- Electrostatic precipitators using wide electrode spacing: Wet electrostatic precipitators:
- Cyclones, but as primary collector Fabric or bag filters: high efficiency in controlling fine particulate (melting): achieve emission values Membrane filtration techniques can achieve
- Ceramic and metal mesh filters. PM10 particles are removed
- Wet scrubbers

Lead removal from treatment works should be at least the minimum default 84% removal used in the CSR. Solid material collected from on-site treatment must be sent for metal recovery or treated as hazardous waste. Waste water treatment sludge must be recycled, incinerated or landfilled and not used as agricultural fertiliser.

## SECTION 9: Physical and Chemical Properties

**9.1 Information on basic physical and chemical properties**

| | |
|---|---|
| **Appearance:** | Grey-blue solid |
| **Odour:** | None |
| **Odour threshold:** | Not applicable |
| **pH:** | Not applicable |
| **Melting point:** | 326°C |
| **Boiling point:** | >600°C |
| **Flashpoint:** | Not applicable |
| **Evaporation rate:** | Not applicable |
| **Flammability:** | Not flammable |
| **Upper/lower flammability limits:** | Not applicable |
| **Vapour pressure:** | Not applicable |
| **Vapour density** | Not applicable |
| **Relative density** | 11.45 |
| **Solubility in water:** | 185 mg/L at 20°C |
| **Solubility in other solvents:** | Not applicable |
| **Partition coefficient (log Kow)** | Not applicable |

| | |
|---|---|
| **Autoignition temperature** | Not applicable |
| **Decomposition temperature** | Not applicable |
| **Viscosity** | Not applicable |
| **Explosive properties** | Not explosive |
| **Oxidising properties** | Not oxidising |

**9.2 Other information**
None.

## SECTION 10: Stability and Reactivity

**10.1 Reactivity**
Lead is not a reactive substance and no reactive hazards are expected.

**10.2 Chemical stability**
Expected to be stable under normal conditions of use.

**10.3 Possibility of hazardous reactions**
No hazardous reactions expected under normal conditions of use.

**10.4 Conditions to avoid**
Not applicable.

**10.5 Incompatible materials**
Strong oxidizing agents.

**10.6 Hazardous decomposition products**
No decomposition if used as directed.

## SECTION 11: Toxicological Information

**11.1 Information on toxicological effects**

Lead in massive or sheet form is not a significant health hazard. However the following information is relevant if you swallow any lead or breathe in lead dust, fume or vapour.

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| | |
|---|---|
| **Toxicokinetic assessment** | Lead is slowly absorbed by ingestion and inhalation and poorly absorbed through the skin. If absorbed, it will accumulate in the body with low rates of excretion, leading to long-term build up. Part of risk management is to take worker blood samples for analysis to ensure that exposure levels are acceptable. |
| **(a) acute toxicity** | Lead massive metal is not considered to be acutely toxic. It is not easily inhaled or ingested, and if it is accidentally ingested normally passes through the gastrointestinal system without significant absorption into the body. Lead is not easily absorbed through the skin. |
| **(b) skin corrosion/irritation** | Studies have shown that sparingly soluble inorganic lead compounds are not corrosive or irritating to skin, and this lack of effect is expected also for metallic lead. This conclusion is supported by the lack of reports of irritant effects from occupational settings. |
| **(c) serious eye damage/irritation** | Studies have shown that sparingly soluble inorganic lead compounds are not corrosive or irritating to eyes, and this lack of effect is expected also for metallic lead. This conclusion is supported by the lack of reports of irritant effects from occupational settings. |
| **(d) respiratory/skin sensitisation** | There is no evidence that lead causes respiratory or skin sensitisation. |
| **(e) germ cell mutagenicity** | The evidence for genotoxic effects of highly soluble inorganic lead compounds is contradictory, with numerous studies reporting both positive and negative effects. Responses appear to be induced by indirect mechanisms, mostly at very high concentrations that lack physiological relevance. |
| **(f) carcinogenicity** | There is some evidence that inorganic lead compounds may have a carcinogenic effect, and they have been classified by IARC as probably carcinogenic to humans (Group 2A). However, it is considered that this classification does not apply to lead in articles, given the very low bioavailability of metallic lead. Carcinogenicity studies of lead metal powder have been negative. Epidemiology studies of workers exposed to inorganic lead compounds have found a limited association with stomach cancer. IARC has concluded that lead metal is possibly carcinogenic to humans (Group aB). |
| **(g) reproductive toxicity** | Exposure to high levels of inorganic lead compounds may cause adverse effects on male and female fertility, including adverse effects on sperm quality. Prenatal exposure to inorganic lead compounds is also associated with adverse effects on the development of the unborn child. There is evidence that neurobehavioural development in children is affected by exposure to lead. |

**(h) STOT-single exposure** Inorganic lead compounds have generally been found to be of relatively low acute toxicity by ingestion, in contact with skin, and by inhalation, with no evidence of any local or systemic toxicity from such exposures. The bioavailability of lead metal is low and acute lead exposure is not expected to result in acute toxicity effects.

**(i) STOT-repeated exposure** Lead is a cumulative poison and may be absorbed into the body through ingestion or inhalation. Although inhalation and ingestion of lead in massive form are unlikely, poor hygiene practises may result in hand to mouth transfer which maybe significant over a prolonged period of time. Inorganic lead compounds have been documented in observational human studies to produce toxicity in multiple organ systems and body function including the haemotopoetic (blood) system, kidney function, reproductive function and the central nervous system.

**(j) aspiration hazard** Lead metal is a solid and aspiration hazards are not expected to occur.

## SECTION 12: Ecological Information

### 12.1 Toxicity

**Reliable acute freshwater aquatic toxicity data** (tests conducted with soluble lead salts; all toxicity data reported as dissolved lead)***:***

| Test Organisms: | Endpoint | Range of values |
|---|---|---|
| Fish: *Pimephales promelas, Oncorhynchus mykiss* | 96h-$LC_{50}$ | pH 5.5 – 6.5: 40.8 – 810.0 µg Pb/L<br>pH >6.5 – 7.5: 52.0 – 3,598.0 µg Pb/L<br>pH > 7.5 – 8.5: 113.8 – 3,249.0 µg Pb/L |
| Invertebrates: *Daphnia magna, Ceriodaphnia dubia* | 48h-$LC_{50}$ | pH 5.5 – 6.5: 73.6 – 655.6 µg Pb/L<br>pH >6.5 – 7.5: 28.8 – 1,179.6 µg Pb/L<br>pH > 7.5 – 8.5: 26.4 – 3,115.8 µg Pb/L |
| Algae: *Pseudokirchneriella subcapitata, Chlorella kesslerii* | 72h-$ErC_{50}$ (growth rate) | pH 5.5 – 6.5: 72.0 – 388.0 µg Pb/L<br>pH >6.5 – 7.5: 26.6 – 79.5 µg Pb/L<br>pH > 7.5 – 8.5: 20.5 – 49.6 µg Pb/L |

Tests were conducted according to international accepted test guidelines or scientifically acceptable methods.

**Reliable chronic toxicity test results** *(*tests conducted with soluble lead salts; all toxicity data reported as dissolved lead*):*

| Test organisms | Range of values ($EC_{10}$, NOEC) |
|---|---|
| ***Aquatic freshwater toxicity data*** | |
| Fish: *Oncorhynchus mykiss, Salmo salar, Pimephales promelas, Salvelinus fontinalis, Ictalurus punctatus, Lepomis macrochirus, Salvelinus namaycush, Cyprinus carpio, Acipenser sinensis* | 17.8 – 1,558.6 µg Pb/L |
| Invertebrates: *Hyalella azteca, Lymnaea palustris, Ceriodaphnia dubia, Lymnaea stagnalis, Philodina rapida, Daphnia magna, Alona rectangular, Diaphanosoma birgei, Chironomus tentans, Brachionus calyciflorus, Chironomus riparius, Baetis tricaudatus.* | 1.7 – 963.0 µg Pb/L |
| Algae: *Pseudokirchneriella subcapitata, Chlorella kesslerii, Chlamydomonas reinhardtii.* | 6.1 – 190.0 µg Pb/L |
| Higher plants: *Lemna minor* | 85.0 – 1,025.0 µg Pb/L |
| The most sensitive toxicity endpoint was 1.7 µg Pb/L for *C. dubia* (reproduction) and *L. stagnalis* (growth). Symptoms of toxicity were effects on survival, growth, reproduction, hatching, (population) growth rate and malformation during development. Toxicity of dissolved lead in freshwater is dependent on the physico-chemistry of the freshwater (mainly dissolved organic carbon, pH, hardness). | |
| **Aquatic marine toxicity data** | |
| Fish: *Cyprinodon variegatus* | 229.6 – 437.0 µg Pb/L |
| Invertebrates: *Mytilus trossolus, Americamysis bahia, Mytilus galloprovincialis, Neanthes arenaceodentata, Strongylocentrotus purpuratus, Paracentrotus lividus, Dendraster excentricus, Tisbe battagliai, Crassotrea gigas* | 9.2 – 1,409.6 µg Pb/L |
| Algae: *Skeletonema costatum, Phaeodactylum tricornutum, Dunaliella tertiolecta.* | 52.9 – 1,234.0 µg Pb/L |
| Higher plants*: Champia parvula* | 11.9 µg Pb/L |
| The most sensitive toxicity endpoint was 9.2 µg Pb/L for *M. trossulus* (malformation). Symptoms of toxicity include effects on survival, growth, growth rate, reproduction and malformation during development | |
| **Sediment freshwater toxicity data** | |
| Invertebrates: *Tubifex tubifex, Ephoron virgo, Hyalella azteca, Gammarus pulex, Lumbriculus variegatus, Hexagenia limbata, Chironomus tentans* | 573.0 – 3,390.0 mg Pb/kg dw |
| The most sensitive toxicity endpoint was 573.0 mg Pb/kg dw for *T. tubifex* (reproduction). Symptoms of toxicity include effects on survival, growth, and reproduction. Toxicity of lead in freshwater sediment is dependent on the acid volatile sulphide content (AVS) of the freshwater sediment. | |
| **Sediment marine toxicity data** | |
| Invertebrates: *Neanthes arenaceodentata, Leptocheirus plumulosus* | 680.0 – 1,291.0 mg Pb/kg dw |
| The most sensitive toxicity endpoint was 680.0 mg Pb/kg dw for *N. arenaceodentata* (growth). Symptoms of toxicity | |

| | |
|---|---|
| include effects on survival, growth, and reproduction | |
| **Terrestrial toxicity data** (values were determined in different topsoils with contrasting properties and spiked with soluble lead salts): | |
| Invertebrates: *Folsomia candida*, *Proisotoma minuta, Sinella curviseta, Eisenia fetida, Eisenia andrei, Dendrobaena rubida, Lumbricus rubellus, Aporrectodea caliginosa* | 34.0 – 2,445.0 mg Pb/kg dw |
| Plants: *Hordeum vulgare*, *Zea mays*, *Echinochloa crus-galli*, *Lolium perenne*, *Sorgum bicolor*, *Triticum aestivum*, *Oryza sativa* and *Avena sativa, Raphanus sativus, Lycopersicon esculentum, Lactuca sativa, Cucumis sativus, Picea rubens, Pinus taeda* | 57.0 – 6,774.0 mg Pb/kg dw |
| Micro-organisms: denitrification, N-mineralization, nitrification, basal respiration, substrate-induced respiration | 97.0 – 7,880.0 mg Pb/kg dw |
| The most sensitive toxicity endpoint was 34.0 mg Pb/kg for *F. candida* (reproduction). Symptoms of toxicity include effects on survival, growth, hatching, yield, reproduction, and microbe mediated processes. Toxicity of lead in soils is dependent on 1) the ageing processes and 2) the Cation Exchange Capacity (eCEC) of the soil. | |

Tests were conducted according to international accepted test guidelines or scientifically acceptable methods.

**Toxicity data for micro-organisms (for STP)** (tests conducted with soluble lead salts)***:***

| **Test Organisms:** | **Effect** | **Range of values ($EC_{10}$, NOEC)** |
|---|---|---|
| Bacterial populations | Respiration | 1.06 - 2.92 mg Pb/L |
| | Ammonia uptake rate | 2.79 - 9.59 mg Pb/L |
| Protozoan community | Mortality | 1.0 – 7.0 mg Pb/L |

Tests were conducted according to international accepted test guidelines or scientifically acceptable methods.

For an overview of PNECs for the different compartments check section 8.1.2.

**12.2 Persistence and degradability**

Lead is naturally occurring and ubiquitous in the environment. Lead is obviously persistent in the sense that they do not degrade to $CO_2$, water, and other elements of less environmental concern. In the water compartment, lead is rapidly and strongly bound to the suspended solids of the water column. This binding and subsequent settling to the sediment allows for rapid metal removal of lead from the water column. Insignificant remobilization of lead from sediment is expected.

**12.3 Bioaccumulative potential**

Available BCF/BAF data for the aquatic environment show a distinct inverse relationship with the exposure concentration demonstrating that lead is homeostatically regulated by aquatic organisms. A median BAF within environmentally relevant concentrations of 1,552 $L/kg_{ww}$ is observed in aquatic organisms. In the soil compartment no bioaccumulation is expected. The BAF's are not significantly affected by the Pb concentration in the soil. A median BAF value for soil dwelling organisms is 0.10 $kg_{dw}/kg_{ww}$. Available information on transfer of Pb through the food chain indicates that lead does not biomagnify in aquatic or terrestrial food chains.

**12.4 Mobility in sediment and soil**

Lead metal (sheet) is sparingly soluble in water and with its relatively high Kd value, is expected to be absorbed onto soils and sediments. Typical log Kd-values of 5.2, 5.7 and 3.8 have been determined for freshwater sediment, marine sediment and soil, respectively.

**12.5 Results of PBT and vPvB assessment**

The PBT and vPvB criteria of Annex XIII to the Regulation do not apply to inorganic substances, such as lead metal (sheet).. The criterion for persistence is not applicable for inorganic Pb. Under conditions of a standard EUSES lake Pb meets the criteria for rapid removal from the water column (> 70% in 28 days). Bioaccumulation criterion is not applicable to inorganic substances such as Pb. However, Pb is considered to be toxic, since the most sensitive NOECs, HC5-50 and PNEC values are lower than 10 µg Pb/L.

**12.6 Other adverse effects**

Lead metal (sheet) is not expected to contribute to ozone depletion, ozone formation, global warming or acidification.

## SECTION 13: Disposal Considerations

**13.1 Waste treatment methods**

Dispose of in accordance with local regulations.

## SECTION 14: Transport Information

| | ADR/RID/AND | IMDG Code | IATA DGRs |
|---|---|---|---|
| **14.1 UN Number** | - | - | - |
| **14.2 UN Proper Shipping Name** | - | - | - |
| **14.3 Transport Hazard Class(es)** | - | - | - |
| **14.4 Packing Group** | - | - | - |
| **14.5 Environmental hazards** | No | No | - |
| | | | |
| **14.6 Special precautions for user** | No specific transport precautions | | |
| **14.7 Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code** | Not transported by sea in bulk | | |
| **14.8 Other Information** | ***IMDG Code Segregation Group (if none applicable insert "Not Applicable"):***<br>**Segregation Groups 7 and 9 (Voluntary application)** | | |

## SECTION 15: Regulatory Information

**15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture**
Control of Lead at Work Regulations Act 2002

**15.2 Chemical Safety Assessment**
A Chemical Safety Assessment has been carried out for this product.

## SECTION 16: Other Information

**R Phrases and H Statements used in Section 3**
None

**Revision information:**
This is the second SDS to the format required by Commission Regulation (EU) No 453/2010

**Legal Statement:**
The information contained within this Safety Data Sheet is the property of the members of the Lead REACH Consortium. Only legal entities with legitimate access may use this data.

**List of Abbreviations**
Acute Tox.: Acute Toxicity
CAS No: CAS Registry Numbers
Carc.: Carcinogenic
CLP: Classification, Labeling and Packaging of chemicals
DN(M)EL: Derived No-Effect Level or Derived Minimal Effect Level
DW: Dry weight
EC No: European Commission number
EC Name: European Commission Name
EHS: Environmentally hazardous substance
IARC: International Agency for Research on Cancer
IBC: International Code for the Construction and Equipment of Ships carrying Dangerous Chemicals in Bulk
$LC_{50}$: Lethal Dose, 50%
$LD_{50}$: Lethal Dose, 50%
MARPOL 73/78: International Convention for the Prevention of Pollution From Ships, 1973 as modified by the Protocol of 1978
NOAEL: No observed adverse effect level.
NOEC: No Observed Effect Concentration
OELs: Occupational Exposure Limits
P Statement: Precautionary statement
PNEC: Predicted No-Effect Level
PBT: Persistent, bio-accumulative, toxic
REACH: Registration, Evaluation, Authorisation and Restriction of Chemicals
Repr.: Reprotoxic
STOT: Single Target Organ Toxicity
SDS: Safety Data Sheet
vPvB: Very Toxic Very Bio-accumulative
WW: Wet weight

**References from Section 8.1.2**

Acute Toxicity data:

Diamond JM, Koplish DE, McMahon III J and Rost R. (1997). Evaluation of the water-effect ratio procedure for metals in a riverine system. Environmental Toxicology and Chemistry, Vol 16, No 3, pp. 509-520, 1997.

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# Annex: Exposure Scenarios

## ES 1 Lead sheet production – Industrial

| 1. Title | | |
|---|---|---|
| Use of secondary lead materials in lead sheet production | | |
| **2. Operational conditions and risk management measures** | | |
| Descriptors | Involved PROCs | Summary of tasks |
| SU10, SU14, SU15, SU19; ERC1, ERC10a; PC7, PC0 | PROC 26, 4, 23 | Raw material handling: scrap delivery, loading/unloading, and furnace feed mixing |
| | PROC 22, 23 | Melting, drossing and refining |
| | PROC 24 | Milling operations |
| | PROC 21 | sawing and slitting operations |
| | PROC 21 | Internal logistics: storage and shipment of finished goods, intra-facility transport |
| | PROC 0 | Others: repair, cleaning, and maintenance, quality control, and engineering |

| 2.1 Control of workers exposure | |
|---|---|
| Product characteristic | Raw materials are principally metallic scrap. Fine lead particles are generated during the process steps. Finished product solid, dry (>90% lead purity). |
| Amounts used | Not restricted |
| Frequency and duration of use/exposure | Full shift (8 hours) exposure for all workplaces other than raw material handling and melting, drossing and refining (3 hours). |
| Other operational conditions affecting workers exposure | Indoor handling, room volume >1000 $m^3$ |
| Technical conditions and measures at process level (source) to prevent release | Enclosed space (furnace) for melting, drossing and refining |
| Technical conditions and measures to control dispersion from source towards the worker | Controls give 78% minimum worker exposure reduction.<br>Risk Management Measures include enclosure of process equipment, dilution ventilation and/or local exhaust ventilation. Pass waste air through cleaning equipment. |
| Organisational measures to prevent /limit releases, dispersion and exposure | See section 8 of the SDS, above. |
| Conditions and measures related to personal protection, hygiene and health evaluation | Minimum Respiratory Protective Equipment (RPE) is FFP 2 mask, except in cases where adequate ventilation/emission control in place (see also section 8). |

| 2.2 Control of environmental exposure | | |
|---|---|---|
| Amounts used | Amount used (tonnes/annum): | 14,700 |
| | Assumed timeframe (days): | 296 |
| Environment factors not influenced by risk management | Dilution rate (Freshwater): 10<br>Dilution rate (Marine): 100 | |
| Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil | See section 8 of the SDS, above. | |
| | Estimated fraction released to water (g/tonne): | 0.008 |
| | Estimated fraction released to air (g/tonne): | 43.44 |
| Organisational measures to prevent/limit release from site | See section 8 of the SDS, above. | |
| Conditions and measures related to external treatment of waste for disposal | Different Pb-bearing wastes resulting from the processes described above are generated in the form of solids (dross, slag). The waste products should be treated by a licensed waste treatment operated according to relevent waste regulation.<br><br>*Hazardous wastes from onsite risk management measures and solid or liquid wastes from production, use and cleaning processes should be disposed of separately to hazardous waste incineration plants or hazardous waste landfills as hazardous waste. Releases to the floor, water and soil are to be prevented. If the lead content of the waste is elevated enough, internal or external recovery/recycling might be considered.*<br><br>***Fraction of daily/annual use** expected in waste:* | |

| | |
|---|---|
| | - *primary producers = 0.22 %*<br>- *secondary producers = 0.73 %*<br>- *compound producers = 0.02 %*<br>- *battery manufacturers = 1.25E-8 %*<br>- *lead sheet manufacturers = 0.19 %*<br><br>***Appropriate waste codes:***<br>*02 01 10*, 06 03 15*, 06 04 05*, 06 05 02*, 10 04 01*, 10 04 02*, 10 04 04*, 10 04 05*, 10 04 06*, 10 04 07*, 10 04 99, 10 05 99, 10 10 10, 10 10 11*, 12 01 03*, 15 01 04*, 15 01 10*, 15 02 02*, 16 01 04*, 16 01 06*, 16 01 19, 16 06 01*, 16 06 02*, 16 08 02*, 16 08 03*, 16 11 03*, 17 04 03, 17 04 07*, 17 04 09*, 17 09 04*, 19 01 11*, 19 02 05*, 19 08 11*, 19 08 13*, 19 08 14, 19 10 02*, 19 12 03*, 19 12 11**<br><br>***Suitable disposal:*** *Keep separate and dispose of to either*<br>- *Hazardous waste incineration operated according to Council Directive 2008/98/EC on waste, Directive 2000/76/EC on the incineration of waste and the Reference Document on the Best Available Techniques for Waste Incineration of August 2006.*<br>- *Hazardous landfill operated under Directive 1999/31/EC.*<br><br>*A detailed assessment has been performed and is reported in the Waste report (ARCHE, 2013)* |

3 Exposure estimation

| | | | | |
|---|---|---|---|---|
| Health Exposure Estimations (based on measures outlined in section 2.1) | | Predicted Blood Lead Levels (Maximum) | Derived No-Effect Level | Risk Characterisation Ratio |
| | Blood lead concentrations for male workers (maximum): | 34µg/dL | 40µg/dL | 0.85 |
| Environmental Exposure Estimations (based on measures outlined in section 2.2) | | Predicted Exposure Concentrations (Maximum) | Predicted No Effect Concentrations | |
| | Freshwater: | 0.84µg/l | 3.1µg/l | 0.27 |
| | Marine: | 0.051µg/l | 3.5µg/l | 0.015 |
| | Freshwater sediment: | 144.1mg/kg dw | 174mg/kg dw | 0.97 |
| | Marine water sediment: | 61.2 mg/kg dw | 164.2mg/kg dw | 0.37 |
| | Terrestrial: | 28.51mg/kg dw | 212mg/kg dw | 0.13 |
| | Sewerage treatment plant: | 0.013 mg/l | 0.1mg/l | 0.13 |

4 Guidance to DU to evaluate whether they work inside the boundaries set by the ES

The DU works inside the boundaries set by the ES if either the proposed risk management measures as described above are met or the downstream user can demonstrate on his own that his implemented risk management measures are adequate. Detailed guidance for evaluation of ES can be acquired via your supplier or from the ECHA website (guidance R14, R16). For environmental exposure, a DU-Scaling tool (free download: http://www.arche-consulting.be/Metal-CSA-toolbox/du-scaling-tool) is available. For human health, exposure (as measured blood lead levels) must be below the DNEL. For female workers these DNEL are 30µg/dL or 10µg/dL (for female workers of reproductive capacity).

# ES 2 Professional Use of Lead Sheet

Title

Installation and maintenance of Lead sheet by professional users.

2 Operational conditions and risk management measures

| Descriptors | Involved PROCs | Summary of tasks |
|---|---|---|
| SU 15, 17, 19; AC7; ERC 10a, 11a; PC7 | PROC 21 | Installation and maintenance of lead sheet |
| | PROC 24 | Welding of lead sheets |

2.1 Control of workers Exposure

| | |
|---|---|
| Product characteristic | Lead sheets (typically >99% purity). |
| Amounts used | Weight of articles used varies from 1kg to several kg. |

| | |
|---|---|
| Frequency and duration of us/exposure | Full shift (8 hours) exposure apart from welding (1 hour non-continuous/day) five days a week. |
| Operational conditions affecting workers exposure | No limitations assessed. |
| Technical conditions and measures at process level (source) to prevent release | Surface varnish to reduce exposure. Specialty welding equipment to reduce inhalation exposure. |
| Technical conditions and measures to control dispersion from source towards the worker | Ensure good ventilation where possible. For indoor use fume extraction where possible. |
| Organisational measures to present /limit releases, dispersion and exposure | General precautions for handling lead products outlined in section 8 of the SDS above may not apply to professional users. Specialised training for lead sheet handling is appropriate as well as blood lead monitoring programs. |
| Conditions and measures related to personal protection, hygiene and health evaluation | For operations covered by this scenario, gloves should be worn thereby effectively eliminating the dermal lead exposure. Respiratory protection (local exhaust and/or full face respiration) are required during indoor welding activity and may be worn during outdoor activity as a function of local wind conditions and the duration of welding activity. |
| 2.2 Control of environmental exposure | |
| Overview | No risk management measures related to the environment are taken, as this ES does not include intended release to the environment. |
| Conditions and measures related to recovery of articles at the end of service life | Lead sheet articles are expected to be recovered and recycled at the end of building life service by those with expertise in building demolition. |
| 3 Exposure estimation | |

| Health Exposure estimations (based on measures outlined in section 2.1) | | Predicted Blood Lead Levels (Maximum) | Derived No-Effect Level | Risk Characterisation Ratio |
|---|---|---|---|---|
| | Blood lead concentrations for male professionals: | 28 µg/dL | 40µg/dL | 0.7 |
| Environmental Exposure estimations (based on measures outlined in section 2.2) | Not applicable. | | | |

| 4 Guidance to DU to evaluate whether they work inside the boundaries set by the ES |
|---|
| The DU works inside the boundaries set by the ES if either the proposed risk management measures as described above are met or the downstream user can demonstrate on his own that his implemented risk management measures are adequate. Detailed guidance for evaluation of ES can be acquired via your supplier or from the ECHA website (guidance R14, R16). For environmental exposure, a DU-Scaling tool (free download: http://www.arche-consulting.be/Metal-CSA-toolbox/du-scaling-tool) is available. For human health, exposure (as measured blood lead levels) must be below the DNEL. For female workers these DNEL are 30µg/dL or 10µg/dL (for female workers of reproductive capacity). |