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

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.

13. Disposal Considerations:

13.1 Waste treatment methods

Should be recycled or disposed as hazardous waste. Do not allow product to reach sewage system. Different Pb-bearing wastes resulting from the processes described above are generated in the form of dross, flue dust and slag. These waste products are mainly recycled in the production process or landfilled.

European waste catalogue:
06 03 13* solid salts and solutions containing heavy metals or
06 04 05* wastes containing other heavy metals

14. Transport Information

Not classified as dangerous for transport.

14.1	UN Number	Not applicable
14.2	UN Proper shipping name	Not applicable
14.3	Transport hazard class(es)	Not applicable
14.4	Packing group	Not applicable
14.5	Environmental hazards	Not applicable
14.6	Special precautions for user	None
14.7	Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code	Not transported in bulk

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

National regulations (Germany):
Notes on employment restriction:
Observe employment restriction for young people.
Observe employment restriction for expectant and nursing mothers.
Observe employment restriction for women of childbearing age.

Other regulations, restrictions and prohibition ordinances:
Chemicals prohibition ordinances and prohibitions on use are to be observed

Please observe the domestic regulations.

15.2 Chemical Safety Assessment

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

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.

Grosell M, Gerdes R, Brix KV (2006). Influence of Ca, humic acid and pH on lead accumulation and toxicity in the fathead minnow during prolonged water-borne lead exposure. Comparative Biochemistry and Physiology, Part C 143 (2006) 473-483.

Grosell M (2010b) The effects of pH on waterborne lead toxicity in the fathead minnow, Pimephales promelas - 24 February 2010. Testing laboratory: University of Miami, USA.

Davies PH, JP Goettl, JR Sinley and NF Smith (1976). Acute and chronic toxicity of lead to rainbow trout Salmo Gairdneri, in hard and soft water. Water Research, Vol 10, pp 199-206.

Roger JT, Richards JG, Wood CM (2003). Ionoregulatory disruption as the acute toxic mechanism for lead in the rainbow trout (Oncorhynchus mykiss). Aquatic Toxicology 64 (2003) 215-234.

Schubauer-Berigan MK et al. (1993b). pH-dependent toxicity of Cd, Cu, Ni, Pb and Zn to Ceriodaphnia dubia, Pimephales promelas, Hyalella azteca and Lumbriculus variegatus. Environmental Toxicology and Chemistry, Vol 12, pp. 1261-1266, 1993.

Spehar RL, Fiandt JT. (1986). Acute and chronic effects of water quality criteria-based metal mixtures on three aquatic species. Environ Toxicol Chem 5:917-931.

Chronic Toxicity Data:

Aery N C and Jasetiya B L (1997). Relative toxicity of Cadmium, Lead and Zinc on Barley. Commun. Soil Sci. Plant Anal., 28(11&12), 949-960. Testing laboratory: Dept. of Botany, University College of Science, M. L. Sukhaida University, Udaipur, India.

Bengtsson G., Gunnarsson T. and Rundgren S. (1986). Effects of metal pollution on the earthworm Dendrobaena Rubida (Sav.) in Acified soils. Water, Air and Soil Pollution 28 (1986) 361-383. Testing laboratory: University of Lund. Ecology Building, Helgonavagen, Sweden.

Besser JM, Brumbaugh WG, Brunson EL and Ingersoll CG (2005). Acute and chronic toxicity of lead in water and diet to the amphipod Hyalella azteca. Environmental Toxicology and Chemistry, Vol. 24, No. 7, pp. 1807-1815, 2005.

Chang F-H and Broadbent F E (1981). Influence of trace metals on carbon dioxide evolution from a yolo soil. Soil Science, vol 132 No 6, december 1981.

Farrar JD, Bridges TS. (2003). Effects of lead on Leptocheirus plumulosus, Neanthes arenaceodentata, Chironomus tentans and Hyalella azteca following long-term sediment exposures. Report for the International Lead Zinc Research Organization. US Army Engineer Research and Development Center, Vicksburg, Mississippi.

Madoni P, Davoli D, Gorbi G, Vescovi L (1996). Toxic effect of heavy metals on the activated sludge protozoan community. Water Research, 30 (1), 135-141. Testing laboratory: Istituto di Ecologica, Universita di Parma, Italy.

Madoni P, Davoli D, Guglielmi L (1999). Response to SOUR and AUR to heavy metal contamination in activated sludge. Water Research, 33 (10), 2459-2464. Testing laboratory: Dipartimento di Scienze Ambientali, Universita di Parma, Italy.

Nguyen LTH, Roman Y, Zoetardt H, Janssen CR. (2003). Ecotoxicity of lead to the tubificid oligochaete Tubifex tubifex tested in natural freshwater sediments. Draft final report to the International Lead Zinc Research Organization. Laboratory of Environmental Toxicology and Aquatic Ecology, Ghent University, Belgium.

Wood C. M. & Nadella S. (2010). Effects of salinity and DOC on Pb Toxicity to Marine Organisms. Testing laboratory: Dept. of Biology, McMaster University, Hamilton, Canada L8S 4K1. Report date: 2010-01-01.

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 worke	Controls give 78% minimum worker exposure reduction. 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 managemen	Dilution rate (Freshwater): 10 Dilution rate (Marine): 100		
Technical onsite conditions an 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. *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.* ***Fraction of daily/annual use** expected in waste:* *- primary producers = 0.22 %* *- secondary producers = 0.73 %* *- compound producers = 0.02 %* *- battery manufacturers = 1.25E-8 %* *- lead sheet manufacturers = 0.19 %* ***Appropriate waste codes:*** *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** ***Suitable disposal:** Keep separate and dispose of to either* *- 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.* *- Hazardous landfill operated under Directive 1999/31/EC.* *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).				