

Welding, Soldering & Cad welding

- Electrodes
- Lead
- Solder Flux
- Welding Flux
- Welding Rods

Hazard Description:

Welding, soldering and brazing supplies (electrodes, rods, solder) are often overlooked as being potentially hazardous because of their solid form. These materials may become hazardous when they are subjected to a heat source, producing fumes, either from the rod/electrode, from the flux which covers the rod, the components of the solder or from the material being worked.

Precautions should be taken to avoid inhalation of welding and soldering fumes through the use of a local exhaust or ventilation system and by wearing proper respiratory protection.

Eye protection is necessary when performing electric arc welding. Face protection, gloves, and welding jacket are also recommended. If electric arc welding is to be performed in a situation where other workers may directly view the arc, screens must be set up for their protection.

Prolonged exposure to electric arc welding, even if inadvertent in nature, can produce severe eye irritation hours after exposure. In such a case, the eye feels as if sand were in it. Immediate medical attention is recommended.

Leading is commonly used in plumbing work. Usually solders are lead combined with tin and an acid "core" or flux. Solder used for electrical repairs contain a "core" of rosin as well as lead or tin. Fumes created while performing electrical or plumbing work may contain lead, tin, antimony and flux. They should not be inhaled or permitted to enter the eye.

Exposure to fumes from lead solder may cause fatigue, sleep disturbances, headaches, aching bones and muscle and stomach pains.

Some rods used for silver brazing contain cadmium, producing cadmium oxide fumes, a suspect carcinogen. Cadmium fume is highly toxic, and can cause death.

Solder flux contains zinc chloride. Exposure to zinc chloride fumes/dust can cause dermatitis, boils, conjunctivitis (inflammation of the mucous membrane surrounding the eye) and gastrointestinal upsets. The fumes are very toxic, poisonous and corrosive.

Read the SDS and container labels to obtain information on the health hazards posed by these materials and proper precautionary measures to follow in order to protect yourself.

| | | | |
|------------------|--------------------------------------|-----------------|------------|
| Product name: | CADWELD® Electrical Welding Material | Page: | 1/12 |
| Supersedes date: | 2013-09-25 | Revision: | 2015-07-21 |
| SDS-ID: | CADWELD_EWM_US | Version number: | US-EN/3.3 |

SECTION 1: IDENTIFICATION OF THE SUBSTANCE/MIXTURE AND OF THE COMPANY/UNDERTAKING**Product identifier**

Product name: CADWELD® Electrical Welding Material
Inclusive of material types: F20, F80, F33, XF19, F76
Applicable prefixes: CA, SB, PB, XL, XF, ACB, ACC

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

Application: Exothermic Welding material

Details of the supplier of the safety data sheet

Manufacturer ERICO International Corporation
34600 Solon Road
Solon, Ohio 44139
Tel:(440) 248-0100

Emergency telephone number

Emergency telephone: Chemtel
1-800-255-3924 USA
+01-813-248-0585 International

SAFETY DATA SHEET

| | | | |
|------------------|--------------------------------------|-----------------|------------|
| Product name: | CADWELD® Electrical Welding Material | Page: | 2/12 |
| Supersedes date: | 2013-09-25 | Revision: | 2015-07-21 |
| SDS-ID: | CADWELD_EWM_US | Version number: | US-EN/3.3 |

SECTION 2: HAZARDS IDENTIFICATION

Classification of the substance or mixture

OSHA 2012: Acute Toxicity, category 4;H302

Label elements



WARNING

| | |
|--------------------|--|
| H302 | Harmful if swallowed. |
| P260 | Do not breathe dust/fume |
| P301 + P312 | IF SWALLOWED: Call a POISON CENTER/doctor if you feel unwell. |
| P305 + P351 + P338 | IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. |
| P273 | Avoid release to the environment. |
| P501 | Dispose of contents/container in accordance with local regulations. |
| P330 | Rinse mouth. |
| P264 | Wash skin thoroughly after handling. |
| P270 | Do not eat, drink or smoke when using this product. |

Other hazards

Other: Improper use of the product or inadequate preparation of the conductors, molds or surroundings can result in aggressive reactions. Self-propagating high temperature reaction will occur if heated above ignition temperature. Generates molten metal in excess of 2500°F (1370°C), slag and dense, dusty smoke. The molten product can cause serious burns. Inhalation of powder or fumes may cause metal fume fever. Exposure to reaction by-products: See section 8.

SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS

Mixtures

Only classified substances above threshold limits are shown.

SAFETY DATA SHEET

Product name: CADWELD® Electrical Welding Material Page: 3/12
Supersedes date: 2013-09-25 Revision: 2015-07-21
SDS-ID: CADWELD_EWM_US Version number: US-EN/3.3

OSHA 2012:

| <u>%:</u> | <u>CAS-No.:</u> | <u>EC No.:</u> | <u>REACH Reg. No:</u> | <u>Chemical name:</u> | <u>Hazard classification:</u> | <u>Notes:</u> |
|-----------|-----------------|----------------|-----------------------|-------------------------------|---|---------------|
| 25-85 | 1317-39-1 | 215-270-7 | 01-2119513794-36- | Dicopper oxide | Acute Tox. 4;H302 Aquatic Acute 1;H400 Aquatic Chronic 1;H410 | M = 1 |
| 1-30 | 1317-38-0 | 215-269-1 | 01-2119502447-44- | Copper oxide | Acute Tox. 4;H302 Aquatic Acute 1;H400 Aquatic Chronic 3;H412 | M = 1 |
| 1-30 | 7440-50-8 | 231-159-6 | 01-2119480154-42- | Copper | Aquatic Acute 1;H400 Aquatic Chronic 3;H412 | M = 1 |
| 1-20 | 7429-90-5 | 231-072-3 | 01-2119529243-45- | Aluminium powder (stabilised) | Water-react. 2;H261 Flam. Sol. 1;H228 | |

Notes: M: M-Factor

References: The full text for all hazard statements is displayed in section 16.

SECTION 4: FIRST AID MEASURES

Description of first aid measures

Molten product will cause skin burns and if in contact with eyes while in a molten state may cause serious damage.

Inhalation: Inhalation of welding fumes/Dust inhalation: Move into fresh air and keep at rest. In case of persistent throat irritation or coughing: Seek medical attention and bring these instructions.

Skin contact: Remove contaminated clothes and rinse skin thoroughly with water. If material is hot, treat for thermal burns and get immediate medical attention.

Eye contact: Dust in the eyes: Do not rub eye. Immediately flush with plenty of water for up to 15 minutes. Remove any contact lenses and open eyelids widely. If irritation persists: Seek medical attention and bring these instructions.

Ingestion: Immediately rinse mouth and drink plenty of water. Keep person under observation. If person becomes uncomfortable seek hospital and bring these instructions.

Most important symptoms and effects, both acute and delayed

Symptoms/effects: Inhalation of powder or fumes may cause metal fume fever. Symptoms like headache, fatigue and nausea may appear. See section 11 for more detailed information on health effects and symptoms.

Indication of any immediate medical attention and special treatment needed

Medical attention/treatments: Burns (in contact with molten metal, slag or hot equipment): Flush with water immediately. While flushing, remove clothes which do not adhere to affected area. Call an ambulance. Continue flushing during transport to hospital.

SAFETY DATA SHEET

| | | | |
|------------------|--------------------------------------|-----------------|------------|
| Product name: | CADWELD® Electrical Welding Material | Page: | 4/12 |
| Supersedes date: | 2013-09-25 | Revision: | 2015-07-21 |
| SDS-ID: | CADWELD_EWM_US | Version number: | US-EN/3.3 |

SECTION 5: FIREFIGHTING MEASURES

Extinguishing media

Extinguishing media: Extinguish with dry sand and/or flood with large amounts of water.

Extinguishing media which are not suitable: Hand water buckets or hand storage pumps. Molten metal contact with water can cause small pockets of superheated steam.

Use fire-extinguishing media appropriate for surrounding materials.

Special hazards arising from the substance or mixture

Specific hazards: During fire, health hazardous gases may be formed.
Ignition temperature: >1750°F

In the event that the packaging materials are ignited, the immediate and direct application of large quantities of water will effectively eliminate the spread of fire to the surrounding areas. The ignition of the packaging materials may, in rare cases, lead to ignition. Direct application of a continuous heavy stream of water is recommended.

Ignition of large quantities of exothermic materials may result in large volumes of dense smoke.

Advice for firefighters

Protective equipment for fire-fighters: Selection of respiratory protection for fire fighting: follow the general fire precautions indicated in the workplace.

SECTION 6: ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures

Personal precautions: Avoid inhalation of dust. Do not breathe fumes. Avoid contact with skin and eyes. Follow precautions for safe handling described in this safety data sheet.

Remove sources of ignition. Ventilate well.

Environmental precautions

Environmental precautions: Precaution should be taken to prevent hot material and reaction byproducts from contact with combustible materials in surrounding areas. Avoid spreading dust or contaminated materials. Avoid discharge to the aquatic environment. Contact local authorities in case of spillage to drain/aquatic environment.

Methods and material for containment and cleaning up

Spill Cleanup Methods: Remove sources of ignition. Sweep up spilled substance and remove to safe place.
For large spills use natural fiber brush or broom with a conductive, non-sparking pan.

Reference to other sections

References: For personal protection, see section 8. For waste disposal, see section 13.

SAFETY DATA SHEET

| | | | |
|------------------|--------------------------------------|-----------------|------------|
| Product name: | CADWELD® Electrical Welding Material | Page: | 5/12 |
| Supersedes date: | 2013-09-25 | Revision: | 2015-07-21 |
| SDS-ID: | CADWELD_EWM_US | Version number: | US-EN/3.3 |

SECTION 7: HANDLING AND STORAGE

Precautions for safe handling

Safe handling advice: Avoid inhalation of dust. Do not breathe fumes. Avoid contact with skin and eyes. Observe good chemical hygiene practices. CADWELD Exothermic Welding Materials and Filler Materials are designed for use in CADWELD equipment only. Use of improper or damaged equipment can lead to exposure to molten metal and reaction byproducts.

Technical measures: Do not smoke or use open fire or other sources of ignition. Work practice should minimize risk of contact. All product instructions should be followed to ensure proper welding and safety. For additional information, see American National Standard, Safety In Welding And Cutting, and Z49.1.

Technical precautions: Confined space: Local exhaust is recommended.

Conditions for safe storage, including any incompatibilities

Technical measures for safe storage: CADWELD Electrical Welding Material should be stored in a clean, dry and secure location. Storage should include provisions to minimize rough handling, excessive vibration and physical abuse. All outer packages must be stored in accordance with label markings.

Storage conditions: If evidence is present of damaged or contaminated products, these units should not be used.

If proper storage is maintained, CADWELD Materials do not exhibit any storage or shelf life.

Specific end use(s)

Specific use(s): Welding material

SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

Control parameters

A detailed fume analysis was conducted on CADWELD Electrical Welding Materials. Reactions byproducts were tested for total dust, respirable dust, metals, acids, fluorides, and various elements identified in typical welding fume analysis. All sampling and analysis followed methodologies dictated by the National Institute of Occupational Safety and Health (NIOSH) and by the Occupational Safety and Health Administration (OSHA). A certified Industrial Hygienist did the sample collection and independent labs conducted all analytical work. Data collected was evaluated and compared to limits set by the American Conference of Governmental Industrial Hygienists (ACGIH) and OSHA. As a worst case scenario, calculations were completed based on a sealed 800 ft³ room with no ventilation. These calculations would indicate that the copper fume PEL would be the limiting factor. Under normal outdoor use or in ventilated areas threshold limits are beyond any expected exposure limits.

SAFETY DATA SHEET

| | | | |
|------------------|--------------------------------------|-----------------|------------|
| Product name: | CADWELD® Electrical Welding Material | Page: | 6/12 |
| Supersedes date: | 2013-09-25 | Revision: | 2015-07-21 |
| SDS-ID: | CADWELD_EWM_US | Version number: | US-EN/3.3 |

Occupational exposure limits:

| <u>CAS-No.:</u> | <u>Chemical name:</u> | <u>As:</u> | <u>Exposure limits:</u> | <u>Type:</u> | <u>Notes:</u> | <u>References:</u> |
|-----------------|--------------------------------------|------------|-------------------------|--------------|---------------|--------------------|
| 7429-90-5 | Aluminum, metal, respirable fraction | Al | 5 mg/m3 | TWA | - | OSHA |
| 7429-90-5 | Aluminum, metal, total dust | Al | 15 mg/m3 | TWA | - | OSHA |
| 7429-90-5 | Aluminum metal, respirable fraction | - | 1 mg/m3 | TWA | A4 | ACGIH |
| 7440-21-3 | Silicon, respirable fraction | - | 5 mg/m3 | TWA | - | OSHA |
| 7440-21-3 | Silicon, total dust | - | 15 mg/m3 | TWA | - | OSHA |
| 7440-31-5 | Tin, metal | Sn | 2 mg/m3 | TWA | - | ACGIH |
| 7440-50-8 | Copper, dusts and mists | Cu | 1 mg/m3 | TWA | - | OSHA |
| 7440-50-8 | Copper dusts and mists | Cu | 1 mg/m3 | TWA | - | ACGIH |
| 7440-50-8 | Copper, fume | Cu | 0.1 mg/m3 | TWA | - | OSHA |
| 7440-50-8 | Copper, fume | - | 0.2 mg/m3 | TWA | - | ACGIH |
| - | Fluorides | F | 2.5 mg/m3 | TWA | - | OSHA |
| - | Fluorides | F | 2.5 mg/m3 | TWA | A4; BEI | ACGIH |

Notes: A4: Not Classifiable as a Human Carcinogen.

Exposure controls

Engineering measures:

Provide adequate ventilation. Observe Occupational Exposure Limits and minimise the risk of inhalation of dust and fumes.

Personal protection:

Personal protection equipment should be chosen according to the relevant standards and in discussion with the supplier of the personal protective equipment. Use special welding equipment for protection of eyes, skin and respiratory system.

Respiratory equipment:

Normal use precludes use of special protection as material is generally used out of doors, in small quantities and is of short duration. In case of inadequate ventilation and work of long duration or on large surface areas in confined rooms. Wear suitable respiratory equipment for dusts and metal fumes.

Hand protection:

Heat insulated protective gloves. Recommended for handling hot equipment.

Eye protection:

Wear goggles/face shield. Avoid direct eye contact with "flash" of light from reaction.

Skin protection:

Use protective clothing, which covers arms and legs.

Hygiene measures:

Wash hands after handling. Change contaminated clothing.

SAFETY DATA SHEET

| | | | |
|------------------|--------------------------------------|-----------------|------------|
| Product name: | CADWELD® Electrical Welding Material | Page: | 7/12 |
| Supersedes date: | 2013-09-25 | Revision: | 2015-07-21 |
| SDS-ID: | CADWELD_EWM_US | Version number: | US-EN/3.3 |

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties

| | |
|---|---------------------------------|
| <u>Form:</u> | Granular. |
| <u>Color:</u> | Gray-black |
| <u>Odor:</u> | Odorless. |
| <u>pH:</u> | Not available. |
| <u>Melting point / freezing point:</u> | 2000°F |
| <u>Boiling point:</u> | Not available. |
| <u>Evaporation rate:</u> | Not relevant. |
| <u>Vapor pressure:</u> | Not relevant. |
| <u>Vapor density:</u> | Not relevant. |
| <u>Solubility:</u> | Insoluble in water |
| <u>Partition coefficient (n-octanol/water):</u> | Not available. |
| <u>Auto-ignition temperature (°C):</u> | > 1750°F |
| <u>Decomposition temperature (°C):</u> | Not available. |
| <u>Viscosity:</u> | Not relevant. |
| <u>Explosive properties:</u> | Not available. |
| <u>Oxidizing properties:</u> | Not available. |
| <u>Other information</u> | |
| <u>Other data:</u> | SPECIFIC GRAVITY (water=1): 5.5 |

SAFETY DATA SHEET

| | | | |
|------------------|--------------------------------------|-----------------|------------|
| Product name: | CADWELD® Electrical Welding Material | Page: | 8/12 |
| Supersedes date: | 2013-09-25 | Revision: | 2015-07-21 |
| SDS-ID: | CADWELD_EWM_US | Version number: | US-EN/3.3 |

SECTION 10: STABILITY AND REACTIVITY

Reactivity

Reactivity: See hazardous reactions.

Chemical stability

Stability: Stable. Not sensitive to vibrations, shock or impact and is not subject to spontaneous ignition.

Possibility of hazardous reactions

Hazardous Reactions: Aggressive reactions are possible if excess moisture is present in the mold or on the conductors to be welded. Care should be taken to ensure proper preparation in accordance with instruction prints.

Conditions to avoid

Conditions/materials to avoid: Temperatures above ignition point. 1750°F

Incompatible materials

Incompatible materials: Typical of problems associated with molten metals.

Hazardous decomposition products

Hazardous decomposition products: None under normal conditions. Polymerization will not occur.

SECTION 11: TOXICOLOGICAL INFORMATION

Information on toxicological effects

Inhalation: Dust may irritate throat and respiratory system and cause coughing. Heating above the melting point releases metallic oxides which may cause metal fume fever by inhalation. The symptoms are shivering, fever, malaise and muscular pain.

Skin contact: Dust has an irritating effect on moist skin. Prolonged and/or repeated contact: May cause eczema-like skin disorders (dermatitis). The molten product can cause serious burns.

Eye contact: Particles/fumes in the eyes may cause discomfort/irritation.

Ingestion: Ingestion may cause nausea, headache, dizziness and intoxication.
Dicopper oxide: LD50 > 500 mg/kg

Specific effects: Frequent inhalation of dust over a long period of time increases the risk of developing lung diseases. Copper oxide may by repeated or prolonged inhalation occasionally cause ulceration and perforation of the nasal septum. Long term exposure to copper containing dusts may cause allergic dermatitis.
This product contains no ingredient listed on the NTP, OSHA or IARC carcinogen lists.

SAFETY DATA SHEET

| | | | |
|------------------|--------------------------------------|-----------------|------------|
| Product name: | CADWELD® Electrical Welding Material | Page: | 9/12 |
| Supersedes date: | 2013-09-25 | Revision: | 2015-07-21 |
| SDS-ID: | CADWELD_EWM_US | Version number: | US-EN/3.3 |

SECTION 12: ECOLOGICAL INFORMATION

Toxicity

Ecotoxicity: Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
Dicopper oxide: EC50 (Daphnia magna, 48 hours): 0.51 mg/l

Persistence and degradability

Degradability: The product solely consists of inorganic compounds which are not biodegradable.

Bioaccumulative potential

Bioaccumulative potential: No data available on bioaccumulation.

Mobility in soil

Mobility: The product is not volatile but may be spread by dust-raising handling.

Results of PBT and vPvB assessment

PBT/vPvB: This product does not contain any PBT or vPvB substances.

Other adverse effects

Other adverse effects: None known.

SECTION 13: DISPOSAL CONSIDERATIONS

Waste treatment methods

Dispose of waste and residues in accordance with local authority requirements.

SAFETY DATA SHEET

| | | | |
|------------------|--------------------------------------|-----------------|------------|
| Product name: | CADWELD® Electrical Welding Material | Page: | 10/12 |
| Supersedes date: | 2013-09-25 | Revision: | 2015-07-21 |
| SDS-ID: | CADWELD_EWM_US | Version number: | US-EN/3.3 |

SECTION 14: TRANSPORT INFORMATION

The product material has been tested by independent facilities in accordance with D.O.T. / U.N. CFR 49 and I.A.T.A. Dangerous Goods Regulations to determine the applicable ratings of this material. Based on the results of this testing, the CADWELD Electrical Welding Material is not classified as a flammable solid.

Due to the minimal quantity present per package, this material and the CADWELD Electrical Welding Material package is shipped under provisions outlined under D.O.T. / U.N. 49 CFR 171.1 "General Regulations for the Transportation of Hazardous Material" and 173.4 "Exceptions for Small Quantities". All materials are packaged and marked at the factory in full compliance with these regulations. The product is covered by international regulation on the transport of dangerous goods (IMDG, IATA).

UN number

UN-No: -

UN proper shipping name

Proper Shipping Name: -

Transport hazard class(es)

Class: -

Packing group

PG: -

Environmental hazards

Marine pollutant: -

Environmentally Hazardous substance: -

Special precautions for user

Special precautions: -

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code

Transport in bulk: -

SAFETY DATA SHEET

| | | | |
|------------------|--------------------------------------|-----------------|------------|
| Product name: | CADWELD® Electrical Welding Material | Page: | 11/12 |
| Supersedes date: | 2013-09-25 | Revision: | 2015-07-21 |
| SDS-ID: | CADWELD_EWM_US | Version number: | US-EN/3.3 |

SECTION 15: REGULATORY INFORMATION

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

Special provisions:

State and local regulation may apply.
TSCA: The ingredients of this product are on the TSCA Inventory.
SARA Section 302: No
SARA Section 313: Yes

NFPA Rating: Health:2 Fire:1 Reactivity:1 Other:-
HMIS Rating: Health:2 Fire:1 Reactivity:1 Personal protection:B

B = Safety Glasses and Gloves.

National regulation:

The following lists have been checked:
Threshold Limit Values (2014), ACGIH, by the American Conference on Governmental Industrial Hygienists.
The Code of Federal Regulation, Title 29, part 1910. Occupational Safety and Health Standards, Air contaminants (OSHA), with amendments.
NIOSH Pocket Guide to Chemical Hazards.
The Code of Federal Regulation, Title 29, part 1910. Occupational Safety and Health Standards, Hazard Communication, with amendments.
U.S. Department of health and human services: 2014 - Report on Carcinogens - 13th Edition.
International Agency for Research on Cancer (IARC): IARC Monographs on the Evaluation of Carcinogenic Risks to Humans. Lyon: IARC, World Health Organization.
Threshold Limit Values (2015), ACGIH, by the American Conference on Governmental Industrial Hygienists.
The Code of Federal Regulation. Title 40, part 355.50. Emergency Planning and Notification.
The Code of Federal Regulation. Title 40, part 372.65. Toxic Chemical Release Reporting: Community Right to Know.

Chemical Safety Assessment in compliance with Regulation (EC) No 1907/2006 (REACH)

CSA status:

Not relevant.

SAFETY DATA SHEET

| | | | |
|------------------|--------------------------------------|-----------------|------------|
| Product name: | CADWELD® Electrical Welding Material | Page: | 12/12 |
| Supersedes date: | 2013-09-25 | Revision: | 2015-07-21 |
| SDS-ID: | CADWELD_EWM_US | Version number: | US-EN/3.3 |

SECTION 16: OTHER INFORMATION

The user must be instructed in the proper work procedure and be familiar with the contents of these instructions.

The following sections contain revisions or new statements: 1-16

Abbreviations and acronyms used in the safety data sheet: PBT = Persistent, Bioaccumulative and Toxic.
vPvB = very Persistent and very Bioaccumulative.

Wording of H-statements:

| | |
|------|---|
| H228 | Flammable solid. |
| H261 | In contact with water releases flammable gases. |
| H302 | Harmful if swallowed. |
| H400 | Very toxic to aquatic life. |
| H410 | Very toxic to aquatic life with long lasting effects. |
| H412 | Harmful to aquatic life with long lasting effects. |

The information on this data sheet represents our current data and is reliable provided that the product is used under the prescribed conditions and in accordance with the application specified on the packaging and/or in the technical guidance literature. Any other use of the product which involves using the product in combination with any other product or any other process is the responsibility of the user.

SAFETY DATA SHEET

| | | | |
|------------------|----------------------------|-----------------|------------|
| Product name: | CADWELD® Starting Material | Page: | 1/12 |
| Supersedes date: | 2013-02-19 | Revision: | 2015-07-21 |
| SDS-ID: | CADWELD_SM_US | Version number: | US-EN/3.1 |

SECTION 1: IDENTIFICATION OF THE SUBSTANCE/MIXTURE AND OF THE COMPANY/UNDERTAKING

Product identifier

Product name: CADWELD® Starting Material
Inclusive of material types: F20, F80, F33, XF19, F76, RBF, Aluminum.
Applicable prefixes: CA, SB, PB, XF, ACB, ACC, RBF

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

Application: Exothermic Welding material

Details of the supplier of the safety data sheet

Manufacturer ERICO International Corporation
34600 Solon Road
Solon, Ohio 44139
Tel:(440) 248-0100

Emergency telephone number

Emergency telephone: Chemtel
1-800-255-3924 USA
+01-813-248-0585 International

SAFETY DATA SHEET

| | | | |
|------------------|----------------------------|-----------------|------------|
| Product name: | CADWELD® Starting Material | Page: | 2/12 |
| Supersedes date: | 2013-02-19 | Revision: | 2015-07-21 |
| SDS-ID: | CADWELD_SM_US | Version number: | US-EN/3.1 |

SECTION 2: HAZARDS IDENTIFICATION

Classification of the substance or mixture

This product is not sold separately. The following information is provided in regards to the final product making use of Starting Material as its ignition component.

OSHA 2012: Flammable Solid, category 2;H228 - Acute Toxicity, category 4;H302

Label elements



WARNING

| | |
|--------------------|--|
| H228 | Flammable solid. |
| H302 | Harmful if swallowed. |
| P210 | Keep away from heat/sparks/open flames/hot surfaces. - No smoking. |
| P260 | Do not breathe dust/fume |
| P280 | Wear eye protection and gloves. |
| P301 + P312 | IF SWALLOWED: Call a POISON CENTER/doctor if you feel unwell. |
| P305 + P351 + P338 | IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. |
| P273 | Avoid release to the environment. |
| P501 | Dispose of contents/container in accordance with local regulations. |
| P264 | Wash skin thoroughly after handling. |
| P270 | Do not eat, drink or smoke when using this product. |
| P330 | Rinse mouth. |

Other hazards

Other: Improper use of the product or inadequate preparation of the conductors, molds or surroundings can result in aggressive reactions. Self-propagating high temperature reaction will occur if heated above ignition temperature. Generates molten metal in excess of 2500°F (1370°C), slag and dense, dusty smoke. The molten product can cause serious burns. Inhalation of powder or fumes may cause metal fume fever. Exposure to reaction by-products: See section 8.

SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS

Mixtures

Only classified substances above threshold limits are shown.

SAFETY DATA SHEET

| | | | |
|------------------|----------------------------|-----------------|------------|
| Product name: | CADWELD® Starting Material | Page: | 3/12 |
| Supersedes date: | 2013-02-19 | Revision: | 2015-07-21 |
| SDS-ID: | CADWELD_SM_US | Version number: | US-EN/3.1 |

OSHA 2012:

| <u>%:</u> | <u>CAS-No.:</u> | <u>EC No.:</u> | <u>REACH Reg. No.:</u> | <u>Chemical name:</u> | <u>Hazard classification:</u> | <u>Notes:</u> |
|-----------|-----------------|----------------|------------------------|-------------------------------|---|---------------|
| 30-60 | 7429-90-5 | 231-072-3 | 01-2119529243-45- | Aluminium powder (stabilised) | Water-react. 2;H261 Flam. Sol. 1;H228 | |
| 1-30 | 1317-38-0 | 215-269-1 | 01-2119502447-44- | Copper oxide | Acute Tox. 4;H302 Aquatic Acute 1;H400 Aquatic Chronic 3;H412 | M = 1 |
| 1-<25 | 1317-39-1 | 215-270-7 | 01-2119513794-36- | Dicopper oxide | Acute Tox. 4;H302 Aquatic Acute 1;H400 Aquatic Chronic 1;H410 | M = 1 |

Notes: M: M-Factor

References: The full text for all hazard statements is displayed in section 16.

SECTION 4: FIRST AID MEASURES

Description of first aid measures

Molten product will cause skin burns and if in contact with eyes while in a molten state may cause serious damage.

Inhalation: Inhalation of welding fumes/Dust inhalation: Move into fresh air and keep at rest. In case of persistent throat irritation or coughing: Seek medical attention and bring these instructions.

Skin contact: Remove contaminated clothes and rinse skin thoroughly with water. If material is hot, treat for thermal burns and get immediate medical attention.

Eye contact: Dust in the eyes: Do not rub eye. Immediately flush with plenty of water for up to 15 minutes. Remove any contact lenses and open eyelids widely. If irritation persists: Seek medical attention and bring these instructions.

Ingestion: Immediately rinse mouth and drink plenty of water. Keep person under observation. If person becomes uncomfortable seek hospital and bring these instructions.

Most important symptoms and effects, both acute and delayed

Symptoms/effects: Inhalation of powder or fumes may cause metal fume fever. Symptoms like headache, fatigue and nausea may appear. See section 11 for more detailed information on health effects and symptoms.

Indication of any immediate medical attention and special treatment needed

Medical attention/treatments: Burns (in contact with molten metal, slag or hot equipment): Flush with water immediately. While flushing, remove clothes which do not adhere to affected area. Call an ambulance. Continue flushing during transport to hospital.

SAFETY DATA SHEET

| | | | |
|------------------|----------------------------|-----------------|------------|
| Product name: | CADWELD® Starting Material | Page: | 4/12 |
| Supersedes date: | 2013-02-19 | Revision: | 2015-07-21 |
| SDS-ID: | CADWELD_SM_US | Version number: | US-EN/3.1 |

SECTION 5: FIREFIGHTING MEASURES

Extinguishing media

Extinguishing media: Extinguish with dry sand and/or flood with large amounts of water.

Extinguishing media which are not suitable: Hand water buckets or hand storage pumps. Molten metal contact with water can cause small pockets of superheated steam.

Use fire-extinguishing media appropriate for surrounding materials.

Special hazards arising from the substance or mixture

Specific hazards: During fire, health hazardous gases may be formed.
Ignition temperature: 850°F

The ignition of the packaging materials may, in rare cases, lead to ignition. Direct application of water is not recommended. This product makes use of fine grade aluminums that have the potential to have adverse chemical reactions if exposed to large volumes of water. These reactions can result in evolution of hydrogen gas that can significantly increase fire intensity and potential "explosion" hazards.

Ignition of large quantities of exothermic materials may result in large volumes of dense smoke.

Advice for firefighters

Protective equipment for fire-fighters: Selection of respiratory protection for fire fighting: follow the general fire precautions indicated in the workplace.

SECTION 6: ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures

Personal precautions: Avoid inhalation of dust. Do not breathe fumes. Avoid contact with skin and eyes. Follow precautions for safe handling described in this safety data sheet.

Remove sources of ignition. Ventilate well.

Environmental precautions

Environmental precautions: Precaution should be taken to prevent hot material and reaction byproducts from contact with combustible materials in surrounding areas. Avoid spreading dust or contaminated materials. Avoid discharge to the aquatic environment. Contact local authorities in case of spillage to drain/aquatic environment.

Methods and material for containment and cleaning up

Spill Cleanup Methods: Remove sources of ignition. Sweep up spilled substance and remove to safe place.
For large spills use natural fiber brush or broom with a conductive, non-sparking pan.

Reference to other sections

References: For personal protection, see section 8. For waste disposal, see section 13.

SAFETY DATA SHEET

| | | | |
|------------------|----------------------------|-----------------|------------|
| Product name: | CADWELD® Starting Material | Page: | 5/12 |
| Supersedes date: | 2013-02-19 | Revision: | 2015-07-21 |
| SDS-ID: | CADWELD_SM_US | Version number: | US-EN/3.1 |

SECTION 7: HANDLING AND STORAGE

Precautions for safe handling

Safe handling advice: Avoid inhalation of dust. Do not breathe fumes. Avoid contact with skin and eyes. Observe good chemical hygiene practices. CADWELD Exothermic Welding Materials and Filler Materials are designed for use in CADWELD equipment only. Use of improper or damaged equipment can lead to exposure to molten metal and reaction byproducts.

Technical measures: Do not smoke or use open fire or other sources of ignition. Work practice should minimize risk of contact. All product instructions should be followed to ensure proper welding and safety. For additional information, see American National Standard, Safety In Welding And Cutting, and Z49.1.

Technical precautions: Confined space: Local exhaust is recommended.

Conditions for safe storage, including any incompatibilities

Technical measures for safe storage: CADWELD Electrical Welding Materials and Filler Materials should be stored in a clean, dry and secure location. Storage should include provisions to minimize rough handling, excessive vibration and physical abuse. All outer packages must be stored in accordance with label markings. Follow the rules for storage of flammable products.

Storage conditions: If evidence is present of damaged or contaminated products, these units should not be used.

If proper storage is maintained, CADWELD Materials do not exhibit any storage or shelf life.

Specific end use(s)

Specific use(s): Welding material

SAFETY DATA SHEET

Product name: CADWELD® Starting Material Page: 6/12
Supersedes date: 2013-02-19 Revision: 2015-07-21
SDS-ID: CADWELD_SM_US Version number: US-EN/3.1

SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

Control parameters

A detailed fume analysis was conducted on CADWELD Starting Material. Reaction byproducts were tested for total dust, respirable dust, metals, acids, fluorides, and various elements identified in typical welding fume analysis. All sampling and analysis followed methodologies dictated by the National Institute of Occupational Safety and Health (NIOSH) and by the Occupational Safety and Health Administration (OSHA). A certified Industrial Hygienist did the sample collection and independent labs conducted all analytical work. Data collected was evaluated and compared to limits set by the American Conference of Governmental Industrial Hygienists (ACGIH) and OSHA. No threshold limits are attainable with use of this product as intended.

Occupational exposure limits:

| <u>CAS-No.:</u> | <u>Chemical name:</u> | <u>As:</u> | <u>Exposure limits:</u> | <u>Type:</u> | <u>Notes:</u> | <u>References:</u> |
|-----------------|---|------------|-------------------------|--------------|---------------|--------------------|
| 7429-90-5 | Aluminum, metal, respirable fraction | Al | 5 mg/m ³ | TWA | - | OSHA |
| 7429-90-5 | Aluminum, metal, total dust | Al | 15 mg/m ³ | TWA | - | OSHA |
| 7429-90-5 | Aluminum metal, respirable fraction | - | 1 mg/m ³ | TWA | A4 | ACGIH |
| 7440-50-8 | Copper, dusts and mists | Cu | 1 mg/m ³ | TWA | - | OSHA |
| 7440-50-8 | Copper dusts and mists | Cu | 1 mg/m ³ | TWA | - | ACGIH |
| 7440-50-8 | Copper, fume | - | 0.2 mg/m ³ | TWA | - | ACGIH |
| 7440-50-8 | Copper, fume | Cu | 0.1 mg/m ³ | TWA | - | OSHA |
| 1309-37-1 | Iron oxide fume | - | 10 mg/m ³ | TWA | - | OSHA |
| - | Iron oxide (Fe ₂ O ₃), respirable fraction | - | 5 mg/m ³ | TWA | A4 | ACGIH |

Notes: A4: Not Classifiable as a Human Carcinogen.

Exposure controls

Engineering measures:

Provide adequate ventilation. Observe Occupational Exposure Limits and minimise the risk of inhalation of dust and fumes.

Personal protection:

Personal protection equipment should be chosen according to the relevant standards and in discussion with the supplier of the personal protective equipment. Use special welding equipment for protection of eyes, skin and respiratory system.

Respiratory equipment:

Normal use precludes use of special protection as material is generally used out of doors, in small quantities and is of short duration. In case of inadequate ventilation and work of long duration or on large surface areas in confined rooms. Wear suitable respiratory equipment for dusts and metal fumes.

Hand protection:

Heat insulated protective gloves. Recommended for handling hot equipment.

Eye protection:

Wear goggles/face shield. Avoid direct eye contact with "flash" of light from reaction.

Skin protection:

Use protective clothing, which covers arms and legs.

Hygiene measures:

Wash hands after handling. Change contaminated clothing.

SAFETY DATA SHEET

Product name: CADWELD® Starting Material
Supersedes date: 2013-02-19
SDS-ID: CADWELD_SM_US

Page: 7/12
Revision: 2015-07-21
Version number: US-EN/3.1

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties

Form: Powder
Color: Gray-black
Odor: Odorless.
pH: Not available.
Melting point / freezing point: 1220°F
Boiling point: Not available.
Evaporation rate: Not relevant.
Vapor pressure: Not relevant.
Vapor density: Not relevant.
Solubility: Insoluble in water
Partition coefficient (n-octanol/water): Not available.
Auto-ignition temperature (°C): >850°F
Decomposition temperature (°C): Not available.
Viscosity: Not relevant.
Explosive properties: Not available.
Oxidizing properties: Not available.
Other information
Other data: SPECIFIC GRAVITY (water=1): 4.0

SAFETY DATA SHEET

| | | | |
|------------------|----------------------------|-----------------|------------|
| Product name: | CADWELD® Starting Material | Page: | 8/12 |
| Supersedes date: | 2013-02-19 | Revision: | 2015-07-21 |
| SDS-ID: | CADWELD_SM_US | Version number: | US-EN/3.1 |

SECTION 10: STABILITY AND REACTIVITY

Reactivity

Reactivity: See hazardous reactions.

Chemical stability

Stability: Stable. Not sensitive to vibrations, shock or impact and is not subject to spontaneous ignition.

Possibility of hazardous reactions

Hazardous Reactions: Aggressive reactions are possible if excess moisture is present in the mold or on the conductors to be welded. Care should be taken to ensure proper preparation in accordance with instruction prints.

Conditions to avoid

Conditions/materials to avoid: Temperatures above ignition point. 850°F

Incompatible materials

Incompatible materials: Typical of problems associated with molten metals.

Hazardous decomposition products

Hazardous decomposition products: None under normal conditions. Polymerization will not occur.

SECTION 11: TOXICOLOGICAL INFORMATION

Information on toxicological effects

Inhalation: Dust may irritate throat and respiratory system and cause coughing. Heating above the melting point releases metallic oxides which may cause metal fume fever by inhalation. The symptoms are shivering, fever, malaise and muscular pain.

Skin contact: Dust has an irritating effect on moist skin. Prolonged and/or repeated contact: May cause eczema-like skin disorders (dermatitis). The molten product can cause serious burns.

Eye contact: Particles/fumes in the eyes may cause discomfort/irritation.

Ingestion: Ingestion may cause nausea, headache, dizziness and intoxication.
Dicopper oxide: LD50 > 500 mg/kg

Specific effects: Frequent inhalation of dust over a long period of time increases the risk of developing lung diseases. Copper oxide may by repeated or prolonged inhalation occasionally cause ulceration and perforation of the nasal septum. Long term exposure to copper containing dusts may cause allergic dermatitis.
This product contains no ingredient listed on the NTP, OSHA or IARC carcinogen lists.

SAFETY DATA SHEET

| | | | |
|------------------|----------------------------|-----------------|------------|
| Product name: | CADWELD® Starting Material | Page: | 9/12 |
| Supersedes date: | 2013-02-19 | Revision: | 2015-07-21 |
| SDS-ID: | CADWELD_SM_US | Version number: | US-EN/3.1 |

SECTION 12: ECOLOGICAL INFORMATION

Toxicity

Ecotoxicity: Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
Dicopper oxide: EC50 (Daphnia magna, 48 hours): 0.51 mg/l

Persistence and degradability

Degradability: The product solely consists of inorganic compounds which are not biodegradable.

Bioaccumulative potential

Bioaccumulative potential: No data available on bioaccumulation.

Mobility in soil

Mobility: The product is not volatile but may be spread by dust-raising handling.

Results of PBT and vPvB assessment

PBT/vPvB: This product does not contain any PBT or vPvB substances.

Other adverse effects

Other adverse effects: None known.

SECTION 13: DISPOSAL CONSIDERATIONS

Waste treatment methods

Dispose of waste and residues in accordance with local authority requirements.

SAFETY DATA SHEET

| | | | |
|------------------|----------------------------|-----------------|------------|
| Product name: | CADWELD® Starting Material | Page: | 10/12 |
| Supersedes date: | 2013-02-19 | Revision: | 2015-07-21 |
| SDS-ID: | CADWELD_SM_US | Version number: | US-EN/3.1 |

SECTION 14: TRANSPORT INFORMATION

Not shipped or sold separately

Due to the minimal quantity present per package, this material and the CADWELD Welding Materials and Filler Materials package is shipped under provisions outlined under D.O.T. / U.N. 49 CFR 171.1 "General Regulations for the Transportation of Hazardous Material" and 173.4 "Exceptions for Small Quantities". All materials are packaged and marked at the factory in full compliance with these regulations.

UN number

UN-No: 3089

UN proper shipping name

Proper Shipping Name: METAL POWDER, FLAMMABLE, N.O.S. (Aluminum powder (stabilized))

Transport hazard class(es)

Class: 4.1

Packing group

PG: II

Environmental hazards

Marine pollutant: -

Environmentally Hazardous -

substance:

Special precautions for user

Special precautions: -

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code

Transport in bulk: -

SAFETY DATA SHEET

| | | | |
|------------------|----------------------------|-----------------|------------|
| Product name: | CADWELD® Starting Material | Page: | 11/12 |
| Supersedes date: | 2013-02-19 | Revision: | 2015-07-21 |
| SDS-ID: | CADWELD_SM_US | Version number: | US-EN/3.1 |

SECTION 15: REGULATORY INFORMATION

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

Special provisions: State and local regulation may apply.

TSCA: The ingredients of this product are on the TSCA Inventory.
SARA Section 302: No
SARA Section 313: Yes

NFPA Rating: Health:2 Fire:1 Reactivity:1 Other:-
HMIS Rating: Health:2 Fire:1 Reactivity:1 Personal protection:B

B = Safety Glasses and Gloves.

National regulation:

The following lists have been checked:
Threshold Limit Values (2014), ACGIH, by the American Conference on Governmental Industrial Hygienists.
The Code of Federal Regulation, Title 29, part 1910. Occupational Safety and Health Standards, Air contaminants (OSHA), with amendments.
NIOSH Pocket Guide to Chemical Hazards.
The Code of Federal Regulation, Title 29, part 1910. Occupational Safety and Health Standards, Hazard Communication, with amendments.
U.S. Department of health and human services: 2014 - Report on Carcinogens - 13th Edition.
International Agency for Research on Cancer (IARC): IARC Monographs on the Evaluation of Carcinogenic Risks to Humans. Lyon: IARC, World Health Organization.
Threshold Limit Values (2015), ACGIH, by the American Conference on Governmental Industrial Hygienists.
The Code of Federal Regulation. Title 40, part 355.50. Emergency Planning and Notification.
The Code of Federal Regulation. Title 40, part 372.65. Toxic Chemical Release Reporting: Community Right to Know.

Chemical Safety Assessment in compliance with Regulation (EC) No 1907/2006 (REACH)

CSA status: Not relevant.

SAFETY DATA SHEET

| | | | |
|------------------|----------------------------|-----------------|------------|
| Product name: | CADWELD® Starting Material | Page: | 12/12 |
| Supersedes date: | 2013-02-19 | Revision: | 2015-07-21 |
| SDS-ID: | CADWELD_SM_US | Version number: | US-EN/3.1 |

SECTION 16: OTHER INFORMATION

The user must be instructed in the proper work procedure and be familiar with the contents of these instructions.

The following sections contain revisions or new statements: 2, 3, 4, 7, 13, 14, 15, 16.

Abbreviations and acronyms PBT = Persistent, Bioaccumulative and Toxic.
used in the safety data sheet: vPvB = very Persistent and very Bioaccumulative.

Wording of H-statements:

| | |
|------|---|
| H228 | Flammable solid. |
| H261 | In contact with water releases flammable gases. |
| H302 | Harmful if swallowed. |
| H400 | Very toxic to aquatic life. |
| H410 | Very toxic to aquatic life with long lasting effects. |
| H412 | Harmful to aquatic life with long lasting effects. |

The information on this data sheet represents our current data and is reliable provided that the product is used under the prescribed conditions and in accordance with the application specified on the packaging and/or in the technical guidance literature. Any other use of the product which involves using the product in combination with any other product or any other process is the responsibility of the user.

SAFETY DATA SHEET

| | | | |
|------------------|--------------------------------|-----------------|------------|
| Product name: | CADWELD® Plus Welding Material | Page: | 1/12 |
| Supersedes date: | 2013-09-25 | Revision: | 2015-07-21 |
| SDS-ID: | CADWELD_PLUS_US | Version number: | US-EN/4.0 |

SECTION 1: IDENTIFICATION OF THE SUBSTANCE/MIXTURE AND OF THE COMPANY/UNDERTAKING

Product identifier

Product name: CADWELD® Plus Welding Material
Inclusive of material types: F20, F80, F33, XF19
Applicable prefixes: SB, PB, CA

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

Application: Exothermic Welding material

Details of the supplier of the safety data sheet

Manufacturer ERICO International Corporation
34600 Solon Road
Solon, Ohio 44139
Tel:(440) 248-0100

Emergency telephone number

Emergency telephone: Chemtel
1-800-255-3924 USA
+01-813-248-0585 International

SAFETY DATA SHEET

| | | | |
|------------------|--------------------------------|-----------------|------------|
| Product name: | CADWELD® Plus Welding Material | Page: | 2/12 |
| Supersedes date: | 2013-09-25 | Revision: | 2015-07-21 |
| SDS-ID: | CADWELD_PLUS_US | Version number: | US-EN/4.0 |

SECTION 2: HAZARDS IDENTIFICATION

Classification of the substance or mixture

OSHA 2012: Acute Toxicity, category 4;H302

Label elements



WARNING

| | |
|--------------------|--|
| H302 | Harmful if swallowed. |
| P260 | Do not breathe dust/fume |
| P301 + P312 | IF SWALLOWED: Call a POISON CENTER/doctor if you feel unwell. |
| P305 + P351 + P338 | IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. |
| P273 | Avoid release to the environment. |
| P501 | Dispose of contents/container in accordance with local regulations. |
| P264 | Wash skin thoroughly after handling. |
| P270 | Do not eat, drink or smoke when using this product. |
| P330 | Rinse mouth. |

Other hazards

Other: Improper use of the product or inadequate preparation of the conductors, molds or surroundings can result in aggressive reactions. Self-propagating high temperature reaction will occur if heated above ignition temperature. Generates molten metal in excess of 2500°F (1370°C), slag and dense, dusty smoke. The molten product can cause serious burns. Inhalation of powder or fumes may cause metal fume fever. Exposure to reaction by-products: See section 8.

SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS

Mixtures

Only classified substances above threshold limits are shown.

SAFETY DATA SHEET

| | | | |
|------------------|--------------------------------|-----------------|------------|
| Product name: | CADWELD® Plus Welding Material | Page: | 3/12 |
| Supersedes date: | 2013-09-25 | Revision: | 2015-07-21 |
| SDS-ID: | CADWELD_PLUS_US | Version number: | US-EN/4.0 |

OSHA 2012:

| %: | CAS-No.: | EC No.: | REACH Reg. No: | Chemical name: | Hazard classification: | Notes: |
|-------|-----------|-----------|-------------------|-------------------------------|---|--------|
| 25-85 | 1317-39-1 | 215-270-7 | 01-2119513794-36- | Dicopper oxide | Acute Tox. 4;H302 Aquatic Acute 1;H400 Aquatic Chronic 1;H410 | M = 1 |
| 1-30 | 1317-38-0 | 215-269-1 | 01-2119502447-44- | Copper oxide | Acute Tox. 4;H302 Aquatic Acute 1;H400 Aquatic Chronic 3;H412 | M = 1 |
| 1-30 | 7440-50-8 | 231-159-6 | 01-2119480154-42- | Copper | Aquatic Acute 1;H400 Aquatic Chronic 3;H412 | M = 1 |
| 1-20 | 7429-90-5 | 231-072-3 | 01-2119529243-45- | Aluminium powder (stabilised) | Water-react. 2;H261 Flam. Sol. 1;H228 | |

Notes: M: M-Factor

References: The full text for all hazard statements is displayed in section 16.

SECTION 4: FIRST AID MEASURES

Description of first aid measures

Molten product will cause skin burns and if in contact with eyes while in a molten state may cause serious damage.

Inhalation: Inhalation of welding fumes/Dust inhalation: Move into fresh air and keep at rest. In case of persistent throat irritation or coughing: Seek medical attention and bring these instructions.

Skin contact: Remove contaminated clothes and rinse skin thoroughly with water. If material is hot, treat for thermal burns and get immediate medical attention.

Eye contact: Dust in the eyes: Do not rub eye. Immediately flush with plenty of water for up to 15 minutes. Remove any contact lenses and open eyelids widely. If irritation persists: Seek medical attention and bring these instructions.

Ingestion: Immediately rinse mouth and drink plenty of water. Keep person under observation. If person becomes uncomfortable seek hospital and bring these instructions.

Most important symptoms and effects, both acute and delayed

Symptoms/effects: Inhalation of powder or fumes may cause metal fume fever. Symptoms like headache, fatigue and nausea may appear. See section 11 for more detailed information on health effects and symptoms.

Indication of any immediate medical attention and special treatment needed

Medical attention/treatments: Burns (in contact with molten metal, slag or hot equipment): Flush with water immediately. While flushing, remove clothes which do not adhere to affected area. Call an ambulance. Continue flushing during transport to hospital.

SAFETY DATA SHEET

| | | | |
|------------------|--------------------------------|-----------------|------------|
| Product name: | CADWELD® Plus Welding Material | Page: | 4/12 |
| Supersedes date: | 2013-09-25 | Revision: | 2015-07-21 |
| SDS-ID: | CADWELD_PLUS_US | Version number: | US-EN/4.0 |

SECTION 5: FIREFIGHTING MEASURES

Extinguishing media

Extinguishing media: Extinguish with dry sand and/or flood with large amounts of water.

Extinguishing media which are not suitable: Hand water buckets or hand storage pumps. Molten metal contact with water can cause small pockets of superheated steam.

Use fire-extinguishing media appropriate for surrounding materials.

Special hazards arising from the substance or mixture

Specific hazards: During fire, health hazardous gases may be formed.
Ignition temperature: >1750°F

In the event that the packaging materials are ignited, the immediate and direct application of large quantities of water will effectively eliminate the spread of fire to the surrounding areas. The ignition of the packaging materials may, in rare cases, lead to ignition. Direct application of a continuous heavy stream of water is recommended.

Ignition of large quantities of exothermic materials may result in large volumes of dense smoke.

Advice for firefighters

Protective equipment for fire-fighters: Selection of respiratory protection for fire fighting: follow the general fire precautions indicated in the workplace.

SECTION 6: ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures

Personal precautions: Avoid inhalation of dust. Do not breathe fumes. Avoid contact with skin and eyes. Follow precautions for safe handling described in this safety data sheet.

Remove sources of ignition. Ventilate well.

Environmental precautions

Environmental precautions: Precaution should be taken to prevent hot material and reaction byproducts from contact with combustible materials in surrounding areas. Avoid spreading dust or contaminated materials. Avoid discharge to the aquatic environment. Contact local authorities in case of spillage to drain/aquatic environment.

Methods and material for containment and cleaning up

Spill Cleanup Methods: Remove sources of ignition. Sweep up spilled substance and remove to safe place.
For large spills use natural fiber brush or broom with a conductive, non-sparking pan.

Reference to other sections

References: For personal protection, see section 8. For waste disposal, see section 13.

SAFETY DATA SHEET

| | | | |
|------------------|--------------------------------|-----------------|------------|
| Product name: | CADWELD® Plus Welding Material | Page: | 5/12 |
| Supersedes date: | 2013-09-25 | Revision: | 2015-07-21 |
| SDS-ID: | CADWELD_PLUS_US | Version number: | US-EN/4.0 |

SECTION 7: HANDLING AND STORAGE

Precautions for safe handling

Safe handling advice: Avoid inhalation of dust. Do not breathe fumes. Avoid contact with skin and eyes. Observe good chemical hygiene practices. CADWELD PLUS integrated packages are designed for use in CADWELD equipment only. Use of improper or damaged equipment can lead to exposure to molten metal and reaction byproducts.

Technical measures: Do not smoke or use open fire or other sources of ignition. Work practice should minimize risk of contact. All product instructions should be followed to ensure proper welding and safety. For additional information, see American National Standard, Safety In Welding And Cutting, and Z49.1.

Technical precautions: Confined space: Local exhaust is recommended.

Conditions for safe storage, including any incompatibilities

Technical measures for safe storage: CADWELD PLUS material should be stored in a clean, dry and secure location. Storage should include provisions to minimize rough handling, excessive vibration and physical abuse. All outer packages must be stored in accordance with label markings.

Storage conditions: If evidence is present of damaged or contaminated products, these units should not be used.

If proper storage is maintained, the CADWELD PLUS unit and CADWELD Welding Materials do not exhibit any storage or shelf life.

Specific end use(s)

Specific use(s): Welding material

SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

Control parameters

A detailed fume analysis was conducted on CADWELD PLUS. Reaction byproducts were tested for total dust, respirable dust, metals, acids, fluorides, various elements, and volatile organic compounds (VOC's). All sampling and analysis followed methodologies dictated by the National Institute of Occupational Safety and Health (NIOSH) and by the Occupational Safety and Health Administration (OSHA). A certified Industrial Hygienist did the sample collection and independent labs conducted all analytical work.

Data collected was evaluated and compared to limits set by the American Conference of Governmental Industrial Hygienists (ACGIH) and OSHA. As a worst case scenario, calculations were completed based on a sealed 800 ft³ room with no ventilation. These calculations would indicate that the copper fume PEL would be the limiting factor. Under normal outdoor use or in ventilated areas threshold limits are beyond any expected exposure limits.

SAFETY DATA SHEET

| | | | |
|------------------|--------------------------------|-----------------|------------|
| Product name: | CADWELD® Plus Welding Material | Page: | 6/12 |
| Supersedes date: | 2013-09-25 | Revision: | 2015-07-21 |
| SDS-ID: | CADWELD_PLUS_US | Version number: | US-EN/4.0 |

Occupational exposure limits:

| <u>CAS-No.:</u> | <u>Chemical name:</u> | <u>As:</u> | <u>Exposure limits:</u> | <u>Type:</u> | <u>Notes:</u> | <u>References:</u> |
|-----------------|--------------------------------------|------------|-------------------------|--------------|---------------|--------------------|
| 7429-90-5 | Aluminum, metal, respirable fraction | Al | 5 mg/m3 | TWA | - | OSHA |
| 7429-90-5 | Aluminum, metal, total dust | Al | 15 mg/m3 | TWA | - | OSHA |
| 7429-90-5 | Aluminum metal, respirable fraction | - | 1 mg/m3 | TWA | A4 | ACGIH |
| 7440-21-3 | Silicon, respirable fraction | - | 5 mg/m3 | TWA | - | OSHA |
| 7440-21-3 | Silicon, total dust | - | 15 mg/m3 | TWA | - | OSHA |
| 7440-31-5 | Tin, metal | Sn | 2 mg/m3 | TWA | - | ACGIH |
| 7440-50-8 | Copper, dusts and mists | Cu | 1 mg/m3 | TWA | - | OSHA |
| 7440-50-8 | Copper, fume | Cu | 0.1 mg/m3 | TWA | - | OSHA |
| 7440-50-8 | Copper dusts and mists | Cu | 1 mg/m3 | TWA | - | ACGIH |
| 7440-50-8 | Copper, fume | - | 0.2 mg/m3 | TWA | - | ACGIH |
| - | Fluorides | F | 2.5 mg/m3 | TWA | - | OSHA |
| - | Fluorides | F | 2.5 mg/m3 | TWA | A4; BEI | ACGIH |

Notes: A4: Not Classifiable as a Human Carcinogen.

Exposure controls

Engineering measures:

Provide adequate ventilation. Observe Occupational Exposure Limits and minimise the risk of inhalation of dust and fumes.

Personal protection:

Personal protection equipment should be chosen according to the relevant standards and in discussion with the supplier of the personal protective equipment. Use special welding equipment for protection of eyes, skin and respiratory system.

Respiratory equipment:

Normal use precludes use of special protection as material is generally used out of doors, in small quantities and is of short duration. In case of inadequate ventilation and work of long duration or on large surface areas in confined rooms. Wear suitable respiratory equipment for dusts and metal fumes.

Hand protection:

Heat insulated protective gloves. Recommended for handling hot equipment.

Eye protection:

Wear goggles/face shield. Avoid direct eye contact with "flash" of light from reaction.

Skin protection:

Use protective clothing, which covers arms and legs.

Hygiene measures:

Wash hands after handling. Change contaminated clothing.

SAFETY DATA SHEET

Product name: CADWELD® Plus Welding Material
Supersedes date: 2013-09-25
SDS-ID: CADWELD_PLUS_US

Page: 7/12
Revision: 2015-07-21
Version number: US-EN/4.0

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties

Form: Granular.
Color: Gray-black
Odor: Odorless.
pH: Not available.
Melting point / freezing point: 2000°F
Boiling point: Not available.
Evaporation rate: Not relevant.
Vapor pressure: Not relevant.
Vapor density: Not relevant.
Solubility: Insoluble in water
Partition coefficient (n-octanol/water): Not available.
Auto-ignition temperature (°C): > 1750°F
Decomposition temperature (°C): Not available.
Viscosity: Not relevant.
Explosive properties: Not available.
Oxidizing properties: Not available.
Other information
Other data: SPECIFIC GRAVITY (water=1): 5.5

SAFETY DATA SHEET

| | | | |
|------------------|--------------------------------|-----------------|------------|
| Product name: | CADWELD® Plus Welding Material | Page: | 8/12 |
| Supersedes date: | 2013-09-25 | Revision: | 2015-07-21 |
| SDS-ID: | CADWELD_PLUS_US | Version number: | US-EN/4.0 |

SECTION 10: STABILITY AND REACTIVITY

Reactivity

Reactivity: See hazardous reactions.

Chemical stability

Stability: Stable. Not sensitive to vibrations, shock or impact and is not subject to spontaneous ignition.

Possibility of hazardous reactions

Hazardous Reactions: Aggressive reactions are possible if excess moisture is present in the mold or on the conductors to be welded. Care should be taken to ensure proper preparation in accordance with instruction prints.

Conditions to avoid

Conditions/materials to avoid: Temperatures above ignition point. 1750°F

Incompatible materials

Incompatible materials: Typical of problems associated with molten metals.

Hazardous decomposition products

Hazardous decomposition products: None under normal conditions. Polymerization will not occur.

SECTION 11: TOXICOLOGICAL INFORMATION

Information on toxicological effects

Inhalation: Dust may irritate throat and respiratory system and cause coughing. Heating above the melting point releases metallic oxides which may cause metal fume fever by inhalation. The symptoms are shivering, fever, malaise and muscular pain.

Skin contact: Dust has an irritating effect on moist skin. Prolonged and/or repeated contact: May cause eczema-like skin disorders (dermatitis). The molten product can cause serious burns.

Eye contact: Particles/fumes in the eyes may cause discomfort/irritation.

Ingestion: Ingestion may cause nausea, headache, dizziness and intoxication.
Dicopper oxide: LD50 > 500 mg/kg

Specific effects: Frequent inhalation of dust over a long period of time increases the risk of developing lung diseases. Copper oxide may by repeated or prolonged inhalation occasionally cause ulceration and perforation of the nasal septum. Long term exposure to copper containing dusts may cause allergic dermatitis.
This product contains no ingredient listed on the NTP, OSHA or IARC carcinogen lists.

SAFETY DATA SHEET

| | | | |
|------------------|--------------------------------|-----------------|------------|
| Product name: | CADWELD® Plus Welding Material | Page: | 9/12 |
| Supersedes date: | 2013-09-25 | Revision: | 2015-07-21 |
| SDS-ID: | CADWELD_PLUS_US | Version number: | US-EN/4.0 |

SECTION 12: ECOLOGICAL INFORMATION

Toxicity

Ecotoxicity: Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
Dicopper oxide: EC50 (Daphnia magna, 48 hours): 0.51 mg/l

Persistence and degradability

Degradability: The product solely consists of inorganic compounds which are not biodegradable.

Bioaccumulative potential

Bioaccumulative potential: No data available on bioaccumulation.

Mobility in soil

Mobility: The product is not volatile but may be spread by dust-raising handling.

Results of PBT and vPvB assessment

PBT/vPvB: This product does not contain any PBT or vPvB substances.

Other adverse effects

Other adverse effects: None known.

SECTION 13: DISPOSAL CONSIDERATIONS

Waste treatment methods

Dispose of waste and residues in accordance with local authority requirements.

SAFETY DATA SHEET

| | | | |
|------------------|--------------------------------|-----------------|------------|
| Product name: | CADWELD® Plus Welding Material | Page: | 10/12 |
| Supersedes date: | 2013-09-25 | Revision: | 2015-07-21 |
| SDS-ID: | CADWELD_PLUS_US | Version number: | US-EN/4.0 |

SECTION 14: TRANSPORT INFORMATION

The product material has been tested by independent facilities in accordance with D.O.T. / U.N. CFR 49 and I.A.T.A. Dangerous Goods Regulations to determine the applicable ratings of this material. Based on the results of this testing, the exothermic mixture contained within the CADWELD PLUS unit and the unit itself is not classified as a flammable solid. These findings indicate that no special package label and no special restrictions apply for transport or shipping of this material by motor vehicle, rail car, sea or air.

UN number

UN-No: -

UN proper shipping name

Proper Shipping Name: -

Transport hazard class(es)

Class: -

Packing group

PG: -

Environmental hazards

Marine pollutant: -

Environmentally Hazardous substance: -

Special precautions for user

Special precautions: -

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code

Transport in bulk: -

SAFETY DATA SHEET

| | | | |
|------------------|--------------------------------|-----------------|------------|
| Product name: | CADWELD® Plus Welding Material | Page: | 11/12 |
| Supersedes date: | 2013-09-25 | Revision: | 2015-07-21 |
| SDS-ID: | CADWELD_PLUS_US | Version number: | US-EN/4.0 |

SECTION 15: REGULATORY INFORMATION

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

Special provisions:

State and local regulation may apply.
TSCA: The ingredients of this product are on the TSCA Inventory.
SARA Section 302: No
SARA Section 313: Yes

NFPA Rating: Health:2 Fire:1 Reactivity:1 Other:-
HMIS Rating: Health:2 Fire:1 Reactivity:1 Personal protection:B

B = Safety Glasses and Gloves.

National regulation:

The following lists have been checked:
Threshold Limit Values (2014), ACGIH, by the American Conference on Governmental Industrial Hygienists.
The Code of Federal Regulation, Title 29, part 1910. Occupational Safety and Health Standards, Air contaminants (OSHA), with amendments.
NIOSH Pocket Guide to Chemical Hazards.
The Code of Federal Regulation, Title 29, part 1910. Occupational Safety and Health Standards, Hazard Communication, with amendments.
U.S. Department of health and human services: 2014 - Report on Carcinogens - 13th Edition.
International Agency for Research on Cancer (IARC): IARC Monographs on the Evaluation of Carcinogenic Risks to Humans. Lyon: IARC, World Health Organization.
Threshold Limit Values (2015), ACGIH, by the American Conference on Governmental Industrial Hygienists.
The Code of Federal Regulation. Title 40, part 355.50. Emergency Planning and Notification.
The Code of Federal Regulation. Title 40, part 372.65. Toxic Chemical Release Reporting: Community Right to Know.

Chemical Safety Assessment in compliance with Regulation (EC) No 1907/2006 (REACH)

CSA status: Not relevant.

SAFETY DATA SHEET

| | | | |
|------------------|--------------------------------|-----------------|------------|
| Product name: | CADWELD® Plus Welding Material | Page: | 12/12 |
| Supersedes date: | 2013-09-25 | Revision: | 2015-07-21 |
| SDS-ID: | CADWELD_PLUS_US | Version number: | US-EN/4.0 |

SECTION 16: OTHER INFORMATION

The user must be instructed in the proper work procedure and be familiar with the contents of these instructions.

The following sections contain revisions or new statements: 1-16

Abbreviations and acronyms used in the safety data sheet: PBT = Persistent, Bioaccumulative and Toxic.
vPvB = very Persistent and very Bioaccumulative.

Wording of H-statements:

| | |
|------|---|
| H228 | Flammable solid. |
| H261 | In contact with water releases flammable gases. |
| H302 | Harmful if swallowed. |
| H400 | Very toxic to aquatic life. |
| H410 | Very toxic to aquatic life with long lasting effects. |
| H412 | Harmful to aquatic life with long lasting effects. |

The information on this data sheet represents our current data and is reliable provided that the product is used under the prescribed conditions and in accordance with the application specified on the packaging and/or in the technical guidance literature. Any other use of the product which involves using the product in combination with any other product or any other process is the responsibility of the user.

SAFETY DATA SHEET

| | | | |
|------------------|------------------------------------|-----------------|------------|
| Product name: | CADWELD® Aluminum Welding Material | Page: | 1/12 |
| Supersedes date: | 2013-04-11 | Revision: | 2015-07-29 |
| SDS-ID: | CADWELD_AWM_US | Version number: | US-EN/2.2 |

SECTION 1: IDENTIFICATION OF THE SUBSTANCE/MIXTURE AND OF THE COMPANY/UNDERTAKING

Product identifier

Product name: CADWELD® Aluminum Welding Material

Inclusive of material types: A22
Applicable prefixes: ACB, ACC, ACL

Container size: 30 g - 2.5 kg

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

Application: Exothermic Welding material

Details of the supplier of the safety data sheet

Manufacturer ERICO International Corporation
34600 Solon Road
Solon, Ohio 44139
Tel:(440) 248-0100

Emergency telephone number

Emergency telephone: Chemtel
1-800-255-3924 USA
+01-813-248-0585 International

SAFETY DATA SHEET

Product name: CADWELD® Aluminum Welding Material
Supersedes date: 2013-04-11
SDS-ID: CADWELD_AWM_US

Page: 2/12
Revision: 2015-07-29
Version number: US-EN/2.2

SECTION 2: HAZARDS IDENTIFICATION

Classification of the substance or mixture

OSHA 2012: Flammable Solid, category 2;H228

Label elements



WARNING

H228 Flammable solid.

P210 Keep away from heat/sparks/open flames/hot surfaces. - No smoking.

P260 Do not breathe dust/fume

P280 Wear eye protection and gloves.

P305 + P351 + P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

P370 + P378 In case of fire: Use dry sand to extinguish.

P501 Dispose of contents/container in accordance with local regulations.

Other hazards

Other: Improper use of the product or inadequate preparation of the conductors, molds or surroundings can result in aggressive reactions. Self-propagating high temperature reaction will occur if heated above ignition temperature. Generates molten metal in excess of 2500°F (1370°C), slag and dense, dusty smoke. The molten product can cause serious burns. Inhalation of powder or fumes may cause metal fume fever. Exposure to reaction by-products: See section 8.

SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS

Mixtures

Only classified substances above threshold limits are shown.

SAFETY DATA SHEET

| | | | |
|------------------|------------------------------------|-----------------|------------|
| Product name: | CADWELD® Aluminum Welding Material | Page: | 3/12 |
| Supersedes date: | 2013-04-11 | Revision: | 2015-07-29 |
| SDS-ID: | CADWELD_AWM_US | Version number: | US-EN/2.2 |

OSHA 2012:

| <u>%:</u> | <u>CAS-No.:</u> | <u>EC No.:</u> | <u>REACH Reg. No:</u> | <u>Chemical name:</u> | <u>Hazard classification:</u> | <u>Notes:</u> |
|-----------|-----------------|----------------|-----------------------|-------------------------------|---|---------------|
| 30-60 | 7429-90-5 | 231-072-3 | 01-2119529243-45- | Aluminium powder (stabilised) | Water-react. 2;H261 Flam. Sol. 1;H228 | |
| 1-<15 | 1317-39-1 | 215-270-7 | 01-2119513794-36- | Dicopper oxide | Acute Tox. 4;H302 Aquatic Acute 1;H400 Aquatic Chronic 1;H410 | M = 1 |
| 1-<10 | 1317-38-0 | 215-269-1 | 01-2119502447-44- | Copper oxide | Acute Tox. 4;H302 Aquatic Acute 1;H400 Aquatic Chronic 3;H412 | M = 1 |

Notes: M: M-Factor

References: The full text for all hazard statements is displayed in section 16.

SECTION 4: FIRST AID MEASURES

Description of first aid measures

Molten product will cause skin burns and if in contact with eyes while in a molten state may cause serious damage.

Inhalation: Inhalation of welding fumes/Dust inhalation: Move into fresh air and keep at rest. In case of persistent throat irritation or coughing: Seek medical attention and bring these instructions.

Skin contact: Remove contaminated clothes and rinse skin thoroughly with water. If material is hot, treat for thermal burns and get immediate medical attention.

Eye contact: Dust in the eyes: Do not rub eye. Immediately flush with plenty of water for up to 15 minutes. Remove any contact lenses and open eyelids widely. If irritation persists: Seek medical attention and bring these instructions.

Ingestion: Immediately rinse mouth and drink plenty of water. Keep person under observation. If person becomes uncomfortable seek hospital and bring these instructions.

Most important symptoms and effects, both acute and delayed

Symptoms/effects: Inhalation of powder or fumes may cause metal fume fever. Symptoms like headache, fatigue and nausea may appear. See section 11 for more detailed information on health effects and symptoms.

Indication of any immediate medical attention and special treatment needed

Medical attention/treatments: Burns (in contact with molten metal, slag or hot equipment): Flush with water immediately. While flushing, remove clothes which do not adhere to affected area. Call an ambulance. Continue flushing during transport to hospital.

SAFETY DATA SHEET

| | | | |
|------------------|------------------------------------|-----------------|------------|
| Product name: | CADWELD® Aluminum Welding Material | Page: | 4/12 |
| Supersedes date: | 2013-04-11 | Revision: | 2015-07-29 |
| SDS-ID: | CADWELD_AWM_US | Version number: | US-EN/2.2 |

SECTION 5: FIREFIGHTING MEASURES

Extinguishing media

Extinguishing media: Dry sand and/or flooding with large amounts of water after reaction is complete.

Extinguishing media which are not suitable: Hand water buckets or hand storage pumps. Molten metal contact with water can cause small pockets of superheated steam.

Use fire-extinguishing media appropriate for surrounding materials.

Special hazards arising from the substance or mixture

Specific hazards: During fire, health hazardous gases may be formed.
Ignition temperature: > 1650°F

The ignition of the packaging materials may, in rare cases, lead to ignition. Direct application of water is not recommended. This product makes use of fine grade aluminums that have the potential to have adverse chemical reactions if exposed to large volumes of water. These reactions can result in evolution of hydrogen gas that can significantly increase fire intensity and potential "explosion" hazards.

Ignition of large quantities of exothermic materials may result in large volumes of dense smoke.

Advice for firefighters

Protective equipment for fire-fighters: Selection of respiratory protection for fire fighting: follow the general fire precautions indicated in the workplace.

SECTION 6: ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures

Personal precautions: Avoid inhalation of dust. Do not breathe fumes. Avoid contact with skin and eyes. Follow precautions for safe handling described in this safety data sheet.

Remove sources of ignition. Ventilate well.

Environmental precautions

Environmental precautions: Precaution should be taken to prevent hot material and reaction byproducts from contact with combustible materials in surrounding areas. Avoid spreading dust or contaminated materials. Avoid discharge to the aquatic environment. Contact local authorities in case of spillage to drain/aquatic environment.

Methods and material for containment and cleaning up

Spill Cleanup Methods: Remove sources of ignition. Sweep up spilled substance and remove to safe place.
For large spills use natural fiber brush or broom with a conductive, non-sparking pan.

Reference to other sections

References: For personal protection, see section 8. For waste disposal, see section 13.

SAFETY DATA SHEET

| | | | |
|------------------|------------------------------------|-----------------|------------|
| Product name: | CADWELD® Aluminum Welding Material | Page: | 5/12 |
| Supersedes date: | 2013-04-11 | Revision: | 2015-07-29 |
| SDS-ID: | CADWELD_AWM_US | Version number: | US-EN/2.2 |

SECTION 7: HANDLING AND STORAGE

Precautions for safe handling

Safe handling advice: Avoid inhalation of dust. Do not breathe fumes. Avoid contact with skin and eyes. Observe good chemical hygiene practices. CADWELD Aluminum Welding Material is designed for use in CADWELD equipment only. Use of improper or damaged equipment can lead to exposure to molten metal and reaction byproducts, resulting in personal injury.

Technical measures: Do not smoke or use open fire or other sources of ignition. Work practice should minimize risk of contact. All product instructions should be followed to ensure proper welding and safety. For additional information, see American National Standard, Safety In Welding And Cutting, and Z49.1.

Technical precautions: Confined space: Local exhaust is recommended.

Conditions for safe storage, including any incompatibilities

Technical measures for safe storage: CADWELD Aluminum Welding Material should be stored in a clean, dry and secure location. Storage should include provisions to minimize rough handling, excessive vibration and physical abuse. All outer packages must be stored in accordance with label markings. Follow the rules for storage of flammable products.

Storage conditions: If evidence is present of damaged or contaminated products, these units should not be used.

If proper storage is maintained, CADWELD Materials do not exhibit any storage or shelf life.

Specific end use(s)

Specific use(s): Welding material

SAFETY DATA SHEET

Product name: CADWELD® Aluminum Welding Material Page: 6/12
Supersedes date: 2013-04-11 Revision: 2015-07-29
SDS-ID: CADWELD_AWM_US Version number: US-EN/2.2

SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

Control parameters

Occupational exposure limits:

| <u>CAS-No.:</u> | <u>Chemical name:</u> | <u>As:</u> | <u>Exposure limits:</u> | <u>Type:</u> | <u>Notes:</u> | <u>References:</u> |
|-----------------|---|------------|-------------------------|--------------|---------------|--------------------|
| 7429-90-5 | Aluminum, metal, total dust | Al | 15 mg/m3 | TWA | - | OSHA |
| 7429-90-5 | Aluminum, metal, respirable fraction | Al | 5 mg/m3 | TWA | - | OSHA |
| 7429-90-5 | Aluminum metal, respirable fraction | - | 1 mg/m3 | TWA | A4 | ACGIH |
| 7440-50-8 | Copper, dusts and mists | Cu | 1 mg/m3 | TWA | - | OSHA |
| 7440-50-8 | Copper, fume | Cu | 0.1 mg/m3 | TWA | - | OSHA |
| 7440-50-8 | Copper dusts and mists | Cu | 1 mg/m3 | TWA | - | ACGIH |
| 7440-50-8 | Copper, fume | - | 0.2 mg/m3 | TWA | - | ACGIH |
| 18282-10-5 | Tin inorganic compounds (except oxides) | Sn | 2 mg/m3 | TWA | - | OSHA |
| - | Tin oxide & inorganic compounds, except tin hydride | Sn | 2 mg/m3 | TWA | - | ACGIH |
| - | Fluorides | F | 2.5 mg/m3 | TWA | A4 | ACGIH |
| - | Fluorides | F | 2.5 mg/m3 | TWA | - | OSHA |

Notes: A4: Not Classifiable as a Human Carcinogen.

Exposure controls

Engineering measures:

Provide adequate ventilation. Observe Occupational Exposure Limits and minimise the risk of inhalation of dust and fumes.

Personal protection:

Personal protection equipment should be chosen according to the relevant standards and in discussion with the supplier of the personal protective equipment. Use special welding equipment for protection of eyes, skin and respiratory system.

Respiratory equipment:

Normal use precludes use of special protection as material is generally used out of doors, in small quantities and is of short duration. In case of inadequate ventilation and work of long duration or on large surface areas in confined rooms. Wear suitable respiratory equipment for dusts and metal fumes.

Hand protection:

Heat insulated protective gloves. Recommended for handling hot equipment.

Eye protection:

Wear goggles/face shield. Avoid direct eye contact with "flash" of light from reaction.

Skin protection:

Use protective clothing, which covers arms and legs.

Hygiene measures:

Wash hands after handling. Change contaminated clothing.

SAFETY DATA SHEET

Product name: CADWELD® Aluminum Welding Material
Supersedes date: 2013-04-11
SDS-ID: CADWELD_AWM_US

Page: 7/12
Revision: 2015-07-29
Version number: US-EN/2.2

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties

Form: Powder
Color: Silvery-white
Odor: Odorless.
pH: Not available.
Melting point / freezing point: 428°F
Boiling point: Not available.
Flash point: > 1650°F
Evaporation rate: Not relevant.
Vapor pressure: Not relevant.
Vapor density: Not relevant.
Relative density: 5.0
Solubility: Insoluble in water
Partition coefficient (n-octanol/water): Not available.
Auto-ignition temperature (°C): > 1650°F
Decomposition temperature (°C): Not available.
Viscosity: Not relevant.
Explosive properties: Not available.
Oxidizing properties: Not available.
Other information
Other data: -

SAFETY DATA SHEET

| | | | |
|------------------|------------------------------------|-----------------|------------|
| Product name: | CADWELD® Aluminum Welding Material | Page: | 8/12 |
| Supersedes date: | 2013-04-11 | Revision: | 2015-07-29 |
| SDS-ID: | CADWELD_AWM_US | Version number: | US-EN/2.2 |

SECTION 10: STABILITY AND REACTIVITY

Reactivity

Reactivity: See hazardous reactions.

Chemical stability

Stability: Stable. Not sensitive to vibrations, shock or impact and is not subject to spontaneous ignition.

Possibility of hazardous reactions

Hazardous Reactions: Aggressive reactions are possible if excess moisture is present in the mold or on the conductors to be welded. Care should be taken to ensure proper preparation in accordance with instruction prints.

Conditions to avoid

Conditions/materials to avoid: Temperatures above ignition point. 1650°F

Incompatible materials

Incompatible materials: Typical of problems associated with molten metals.

Hazardous decomposition products

Hazardous decomposition products: None under normal conditions. Polymerization will not occur.

SECTION 11: TOXICOLOGICAL INFORMATION

Information on toxicological effects

Inhalation: Dust may irritate throat and respiratory system and cause coughing. Heating above the melting point releases metallic oxides which may cause metal fume fever by inhalation. The symptoms are shivering, fever, malaise and muscular pain.

Skin contact: Dust has an irritating effect on moist skin. Prolonged and/or repeated contact: May cause eczema-like skin disorders (dermatitis). The molten product can cause serious burns.

Eye contact: Particles/fumes in the eyes may cause discomfort/irritation.

Ingestion: Ingestion may cause nausea, headache, dizziness and intoxication.
Dicopper oxide: LD50 > 500 mg/kg

Specific effects: Frequent inhalation of dust over a long period of time increases the risk of developing lung diseases. Copper oxide may by repeated or prolonged inhalation occasionally cause ulceration and perforation of the nasal septum. Long term exposure to copper containing dusts may cause allergic dermatitis. Long term exposure to tin oxide may cause stannosis.
This product contains no ingredient listed on the NTP, OSHA or IARC carcinogen lists.

SAFETY DATA SHEET

| | | | |
|------------------|------------------------------------|-----------------|------------|
| Product name: | CADWELD® Aluminum Welding Material | Page: | 9/12 |
| Supersedes date: | 2013-04-11 | Revision: | 2015-07-29 |
| SDS-ID: | CADWELD_AWM_US | Version number: | US-EN/2.2 |

SECTION 12: ECOLOGICAL INFORMATION

Toxicity

Ecotoxicity: Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
Dicopper oxide: EC50 (Daphnia magna, 48 hours): 0.51 mg/l

Persistence and degradability

Degradability: The product solely consists of inorganic compounds which are not biodegradable.

Bioaccumulative potential

Bioaccumulative potential: No data available on bioaccumulation.

Mobility in soil

Mobility: The product is not volatile but may be spread by dust-raising handling.

Results of PBT and vPvB assessment

PBT/vPvB: This product does not contain any PBT or vPvB substances.

Other adverse effects

Other adverse effects: None known.

SECTION 13: DISPOSAL CONSIDERATIONS

Waste treatment methods

Dispose of waste and residues in accordance with local authority requirements.

SAFETY DATA SHEET

| | | | |
|------------------|------------------------------------|-----------------|------------|
| Product name: | CADWELD® Aluminum Welding Material | Page: | 10/12 |
| Supersedes date: | 2013-04-11 | Revision: | 2015-07-29 |
| SDS-ID: | CADWELD_AWM_US | Version number: | US-EN/2.2 |

SECTION 14: TRANSPORT INFORMATION

UN number

UN-No: 3089

UN proper shipping name

Proper Shipping Name: METAL POWDER, FLAMMABLE, N.O.S. (Aluminum powder (stabilized))

Transport hazard class(es)

Class: 4.1

Packing group

PG: II

Environmental hazards

Marine pollutant: -

Environmentally Hazardous substance: -

Special precautions for user

Special precautions: -

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code

Transport in bulk: -

SAFETY DATA SHEET

| | | | |
|------------------|------------------------------------|-----------------|------------|
| Product name: | CADWELD® Aluminum Welding Material | Page: | 11/12 |
| Supersedes date: | 2013-04-11 | Revision: | 2015-07-29 |
| SDS-ID: | CADWELD_AWM_US | Version number: | US-EN/2.2 |

SECTION 15: REGULATORY INFORMATION

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

Special provisions: State and local regulation may apply.

TSCA: The ingredients of this product are on the TSCA Inventory.
SARA Section 302: No
SARA Section 313: Yes

NFPA Rating: Health:2 Fire:1 Reactivity:1 Other:-
HMIS Rating: Health:2 Fire:1 Reactivity:1 Personal protection:B

B = Safety Glasses and Gloves.

National regulation:

The following lists have been checked:

Threshold Limit Values (2014), ACGIH, by the American Conference on Governmental Industrial Hygienists.

The Code of Federal Regulation, Title 29, part 1910. Occupational Safety and Health Standards, Air contaminants (OSHA), with amendments.

NIOSH Pocket Guide to Chemical Hazards.

The Code of Federal Regulation, Title 29, part 1910. Occupational Safety and Health Standards, Hazard Communication, with amendments.

U.S. Department of health and human services: 2014 - Report on Carcinogens - 13th Edition.

International Agency for Research on Cancer (IARC): IARC Monographs on the Evaluation of Carcinogenic Risks to Humans. Lyon: IARC, World Health Organization.

Threshold Limit Values (2015), ACGIH, by the American Conference on Governmental Industrial Hygienists.

The Code of Federal Regulation. Title 40, part 355.50. Emergency Planning and Notification.

The Code of Federal Regulation. Title 40, part 372.65. Toxic Chemical Release Reporting: Community Right to Know.

Chemical Safety Assessment in compliance with Regulation (EC) No 1907/2006 (REACH)

CSA status: Not relevant.

SAFETY DATA SHEET

| | | | |
|------------------|------------------------------------|-----------------|------------|
| Product name: | CADWELD® Aluminum Welding Material | Page: | 12/12 |
| Supersedes date: | 2013-04-11 | Revision: | 2015-07-29 |
| SDS-ID: | CADWELD_AWM_US | Version number: | US-EN/2.2 |

SECTION 16: OTHER INFORMATION

The user must be instructed in the proper work procedure and be familiar with the contents of these instructions.

The following sections contain revisions or new statements: 1-16

Abbreviations and acronyms used in the safety data sheet: PBT = Persistent, Bioaccumulative and Toxic.
vPvB = very Persistent and very Bioaccumulative.

Wording of H-statements:

| | |
|------|---|
| H228 | Flammable solid. |
| H261 | In contact with water releases flammable gases. |
| H302 | Harmful if swallowed. |
| H400 | Very toxic to aquatic life. |
| H410 | Very toxic to aquatic life with long lasting effects. |
| H411 | Toxic to aquatic life with long lasting effects. |
| H412 | Harmful to aquatic life with long lasting effects. |

The information on this data sheet represents our current data and is reliable provided that the product is used under the prescribed conditions and in accordance with the application specified on the packaging and/or in the technical guidance literature. Any other use of the product which involves using the product in combination with any other product or any other process is the responsibility of the user.

SAFETY DATA SHEET

| | | | |
|------------------|------------|-----------------|------------|
| Product name: | GEM25A | Page: | 1/8 |
| Supersedes date: | 2013-09-25 | Revision: | 2015-07-07 |
| SDS-ID: | GEM25A_US | Version number: | US-EN/3.0 |

SECTION 1: IDENTIFICATION OF THE SUBSTANCE/MIXTURE AND OF THE COMPANY/UNDERTAKING

Product identifier

Product name: GEM25A
GEM25ABKT

Container size: GEM25A: 25-lb. (11.36 kg) bag with handles
GEM25ABKT: 25-lb. (11.36 kg) plastic bucket with locking lid

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

Application: Ground Enhancing Material

Details of the supplier of the safety data sheet

Manufacturer ERICO International Corporation
34600 Solon Road
Solon, Ohio 44139
Tel:(440) 248-0100

Further information can be obtained from: ALucia@erico.com

Emergency telephone number

Emergency telephone: Chemtel
1-800-255-3924 USA
+01-813-248-0585 International

SAFETY DATA SHEET

| | | | |
|------------------|------------|-----------------|------------|
| Product name: | GEM25A | Page: | 2/8 |
| Supersedes date: | 2013-09-25 | Revision: | 2015-07-07 |
| SDS-ID: | GEM25A_US | Version number: | US-EN/3.0 |

SECTION 2: HAZARDS IDENTIFICATION

Classification of the substance or mixture

OSHA 2012: Eye Dam. 1;H318
Skin Irrit. 2;H315
Skin Sens. 1;H317
STOT SE 3;H335

Label elements



DANGER

- H318 Causes serious eye damage.
- H315 Causes skin irritation.
- H317 May cause an allergic skin reaction.
- H335 May cause respiratory irritation.
- P260 Do not breathe dust.
- P280 Wear eye protection and gloves.
- P302 + P352 IF ON SKIN: Wash with plenty of soap and water.
- P305/351/338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
- P310 Immediately call a poison center/doctor.
- P501 Dispose of contents/container in accordance with local regulations.
- P264 Wash skin thoroughly after handling.
- P271 Use only outdoors or in a well-ventilated area.
- P272 Contaminated work clothing should not be allowed out of the workplace.
- P304 + P340 IF INHALED: Remove person to fresh air and keep comfortable for breathing.
- P332 + P313 If skin irritation occurs: Get medical advice/attention.
- P362 + P364 Take off contaminated clothing and wash it before reuse.
- P403 + P233 Store in a well-ventilated place. Keep container tightly closed.
- P405 Store locked up.

Other hazards

Other: Contact with wet cement/mixture may cause burns. Dust may irritate throat and respiratory system and cause coughing. Dust has an irritating effect on moist skin. Frequent inhalation of dust over a long period of time increases the risk of developing lung diseases.

SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS

SAFETY DATA SHEET

| | | | |
|------------------|------------|-----------------|------------|
| Product name: | GEM25A | Page: | 3/8 |
| Supersedes date: | 2013-09-25 | Revision: | 2015-07-07 |
| SDS-ID: | GEM25A_US | Version number: | US-EN/3.0 |

Mixtures

Only classified substances above threshold limits are shown.

OSHA 2012:

| <u>%:</u> | <u>CAS-No.:</u> | <u>EC No.:</u> | <u>REACH Reg. No:</u> | <u>Chemical name:</u> | <u>Hazard classification:</u> | <u>Notes:</u> |
|-----------|-----------------|----------------|---------------------------|-----------------------|--|---------------|
| 10-30 | 65997-15-1 | 266-043-4 | - | Portland cement | Skin Irrit. 2;H315 Eye Dam. 1;H318 Skin Sens. 1;H317 STOT SE 3;H335 | |

References: The full text for all hazard statements is displayed in section 16. The full text for all hazard statements is displayed in section 16.

SECTION 4: FIRST AID MEASURES

Description of first aid measures

Inhalation: Move injured person into fresh air and keep person calm under observation. If uncomfortable: Seek hospital and bring these instructions.

Skin contact: Remove contaminated clothing immediately and wash skin with soap and water. Seek medical attention for all burns, regardless how minor they may seem.

Eye contact: Important! Immediately rinse with water for at least 15 minutes. Do not rub eye. Seek medical attention for all burns, regardless how minor they may seem.

Ingestion: Immediately rinse mouth and drink plenty of water or milk. Keep person under observation. Do not induce vomiting. If vomiting occurs, keep head low. Transport immediately to hospital and bring along these instructions.

Most important symptoms and effects, both acute and delayed

Symptoms/effects: Contact with wet cement/mixture may cause burns. Chronic inflammation of nose, throat and bronchial tubes. May cause allergic skin disorders in sensitive individuals.

Indication of any immediate medical attention and special treatment needed

Medical attention/treatments: Treat symptomatically.

SECTION 5: FIREFIGHTING MEASURES

Extinguishing media

Extinguishing media: Extinguish with foam, carbon dioxide, dry powder or water fog.

Special hazards arising from the substance or mixture

Specific hazards: No specific precautions.

Advice for firefighters

Protective equipment for fire-fighters: Selection of respiratory protection for fire fighting: follow the general fire precautions indicated in the workplace.

SAFETY DATA SHEET

| | | | |
|------------------|------------|-----------------|------------|
| Product name: | GEM25A | Page: | 4/8 |
| Supersedes date: | 2013-09-25 | Revision: | 2015-07-07 |
| SDS-ID: | GEM25A_US | Version number: | US-EN/3.0 |

SECTION 6: ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures

Personal precautions: Avoid inhalation of dust. Avoid contact with eyes and prolonged skin contact.

Protective equipment: Wear eye protection and gloves.

Environmental precautions

Environmental precautions: Avoid release to the environment. Inform Authorities if large amounts are involved.

Methods and material for containment and cleaning up

Spill Cleanup Methods: Remove spillage with vacuum cleaner. If not possible, collect spillage with shovel, broom or the like.

Reference to other sections

References: For personal protection, see section 8. For waste disposal, see section 13.

SECTION 7: HANDLING AND STORAGE

Precautions for safe handling

Safe handling advice: Avoid spreading dust. Avoid inhalation of dust. Avoid contact with eyes and prolonged skin contact. Change contaminated clothing. Observe good chemical hygiene practices.

Technical measures: Use work methods which minimize dust production.

Technical precautions: Mechanical ventilation may be required. Provide easy access to water supply and eye wash facilities.

Conditions for safe storage, including any incompatibilities

Technical measures for safe storage: No special precautions.

Storage conditions: Store in closed original container in a dry place. Seal opened containers and use up as soon as possible. When stored in humid conditions, the chromate neutralisation will decrease.

Specific end use(s)

Specific use(s): Ground Enhancing Material

SAFETY DATA SHEET

Product name: GEM25A Page: 5/8
Supersedes date: 2013-09-25 Revision: 2015-07-07
SDS-ID: GEM25A_US Version number: US-EN/3.0

SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

Control parameters

Occupational exposure limits:

| <u>CAS-No.:</u> | <u>Chemical name:</u> | <u>As:</u> | <u>Exposure limits:</u> | <u>Type:</u> | <u>Notes:</u> | <u>References:</u> |
|-----------------|--------------------------------------|------------|-------------------------|--------------|---------------|--------------------|
| 65997-15-1 | Portland cement, respirable fraction | - | 5 mg/m3 | TWA | - | OSHA |
| 65997-15-1 | Portland cement, total dust | - | 15 mg/m3 | TWA | - | OSHA |
| 65997-15-1 | Portland cement, inhalable fraction | - | 1 mg/m3 | TWA | A4 | ACGIH |

Exposure controls

| | |
|-------------------------------|---|
| <u>Engineering measures:</u> | Provide adequate ventilation. Observe Occupational Exposure Limits and minimize the risk of inhalation of dust. An eye wash bottle must be available at the work site. |
| <u>Personal protection:</u> | Personal protection equipment should be chosen according to the relevant standards and in discussion with the supplier of the personal protective equipment. Personal protection equipment should be chosen according to the relevant standards and in discussion with the supplier of the personal protective equipment. |
| <u>Respiratory equipment:</u> | NIOSH approved dust mask recommended. In case of inadequate ventilation or risk of inhalation of dust, use suitable respiratory equipment with particle filter. |
| <u>Hand protection:</u> | Wear protective gloves. Nitrile gloves are recommended. Other types of gloves can be recommended by the glove supplier. |
| <u>Eye protection:</u> | Wear goggles/face shield. |
| <u>Skin protection:</u> | Wear suitable protective clothing as protection against splashing or contamination. |
| <u>Hygiene measures:</u> | Wash hands after handling. Do not eat, drink or smoke when using the product. Change contaminated clothing. Wash contaminated clothing before reuse. |

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties

| | |
|--|----------------------------|
| <u>Appearance:</u> | gray powder |
| <u>Odor:</u> | Odorless. |
| <u>Melting point / freezing point:</u> | 3500 °C |
| <u>Boiling point:</u> | Not relevant. |
| <u>Flash point:</u> | Not available. |
| <u>Explosion limits:</u> | Not available. |
| <u>Vapor pressure:</u> | Not relevant. |
| <u>Relative density:</u> | 0.9 |
| <u>Solubility:</u> | Slightly soluble in water. |

Other information

Other data: None.

SAFETY DATA SHEET

| | | | |
|------------------|------------|-----------------|------------|
| Product name: | GEM25A | Page: | 6/8 |
| Supersedes date: | 2013-09-25 | Revision: | 2015-07-07 |
| SDS-ID: | GEM25A_US | Version number: | US-EN/3.0 |

SECTION 10: STABILITY AND REACTIVITY

Reactivity

Reactivity: Not reactive.

Chemical stability

Stability: Stable under normal temperature conditions.

Possibility of hazardous reactions

Hazardous Reactions: None known.

Conditions to avoid

Conditions/materials to avoid: Keep dry until used.

Incompatible materials

Incompatible materials: None known.

Hazardous decomposition products

Hazardous decomposition products: Polymerization will not occur.

SECTION 11: TOXICOLOGICAL INFORMATION

Information on toxicological effects

Inhalation: Dust may irritate throat and respiratory system and cause coughing.

Skin contact: Prolonged contact with wet cement/mixture may cause burns. Dust has an irritating effect on moist skin.

Eye contact: Dust or splashes from the mixture may cause permanent eye damage. Immediate first aid is necessary.

Ingestion: Ingestion may cause severe irritation of the mouth, the esophagus and the gastrointestinal tract.

Specific effects: Frequent inhalation of dust over a long period of time increases the risk of developing lung diseases. May cause allergic skin disorders in sensitive individuals.

SAFETY DATA SHEET

| | | | |
|------------------|------------|-----------------|------------|
| Product name: | GEM25A | Page: | 7/8 |
| Supersedes date: | 2013-09-25 | Revision: | 2015-07-07 |
| SDS-ID: | GEM25A_US | Version number: | US-EN/3.0 |

SECTION 12: ECOLOGICAL INFORMATION

Toxicity

Ecotoxicity: The environmental hazard of the product is considered to be limited.

Persistence and degradability

Degradability: In the presence of water the product hardens to a solid mass which is not biodegradable.

Bioaccumulative potential

Bioaccumulative potential: No data available on bioaccumulation.

Mobility in soil

Mobility: The product is not volatile but may be spread by dust-raising handling.

Results of PBT and vPvB assessment

PBT/vPvB: No data available.

Other adverse effects

Other adverse effects: None known.

SECTION 13: DISPOSAL CONSIDERATIONS

Waste treatment methods

Dispose of waste and residues in accordance with local authority requirements.

SECTION 14: TRANSPORT INFORMATION

The product is not covered by international regulation on the transport of dangerous goods (IMDG, IATA, DOT).

UN number

UN-No: -

UN proper shipping name

Proper Shipping Name: -

Transport hazard class(es)

Class: -

Packing group

PG: -

Environmental hazards

Marine pollutant: -

Environmentally Hazardous substance: -

Special precautions for user

Special precautions: -

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code

Transport in bulk: -

SAFETY DATA SHEET

| | | | |
|------------------|------------|-----------------|------------|
| Product name: | GEM25A | Page: | 8/8 |
| Supersedes date: | 2013-09-25 | Revision: | 2015-07-07 |
| SDS-ID: | GEM25A_US | Version number: | US-EN/3.0 |

SECTION 15: REGULATORY INFORMATION

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

Special provisions: State and local regulation may apply.

TSCA: The ingredients of this product are on the TSCA Inventory.
SARA Section 302: No
SARA Section 313: No

NFPA Rating: Health:2 Fire:1 Reactivity:1 Other:-
HMIS Rating: Health:2 Fire:1 Reactivity:1 Personal protection:B

B = Safety Glasses and Gloves.

National regulation:

The following lists have been checked:

The Code of Federal Regulation, Title 29, part 1910. Occupational Safety and Health Standards, Hazard Communication, with amendments.

Threshold Limit Values (2014), ACGIH, by the American Conference on Governmental Industrial Hygienists.

The Code of Federal Regulation, Title 29, part 1910. Occupational Safety and Health Standards, Air contaminants (OSHA), with amendments.

NIOSH Pocket Guide to Chemical Hazards.

U.S. Department of health and human services: 2014 - Report on Carcinogens - 13th Edition.

International Agency for Research on Cancer (IARC): IARC Monographs on the Evaluation of Carcinogenic Risks to Humans. Lyon: IARC, World Health Organization.

Chemical Safety Assessment in compliance with Regulation (EC) No 1907/2006 (REACH)

CSA status: No chemical safety assessment has been carried out.

SECTION 16: OTHER INFORMATION

The user must be instructed in the proper work procedure and be familiar with the contents of these instructions.

The following sections contain revisions or new statements: 1-16

Wording of H-statements:

| | |
|------|--------------------------------------|
| H315 | Causes skin irritation. |
| H317 | May cause an allergic skin reaction. |
| H318 | Causes serious eye damage. |
| H335 | May cause respiratory irritation. |

The information on this data sheet represents our current data and is reliable provided that the product is used under the prescribed conditions and in accordance with the application specified on the packaging and/or in the technical guidance literature. Any other use of the product which involves using the product in combination with any other product or any other process is the responsibility of the user.

SECTION 1: Identification of the substance/mixture and of the company/undertaking**Trade name: 275 Flux-Cored Lead (Pb) Solder****Relevant identified uses of the substance or mixture and uses advised against**
Solder

Professional use of lead solder

1.3 Details of the supplier of the safety data sheet

This Safety Data Sheet has been updated in accordance with the Globally Harmonized System (GHS).

Manufacturer/Supplier:

Kester Inc.

800 West Thorndale Avenue

Itasca, IL 60143

Tel 00+1 + 630 616 4000

ITW Specialty Materials (Suzhou) Co., Ltd.

Hengqiao Road, Wujiang Economic Development Zone

Suzhou, Jiangsu Province, China 215200

Tel +86 512 82060807

Further information obtainable from: Product Compliance: EHS_Kester@kester.com**1.4 Emergency telephone number:**

TRANSPORT EMERGENCY Phone: CHEMTREC (800) 424-9300 (Outside US & Canada): 00+1 +703 527 3887

SECTION 2: Hazards identification**2.1 Classification of the substance or mixture****Classification according to Regulation (EC) No 1272/2008**

GHS08 health hazard

Carc. 2 H351 Suspected of causing cancer.

Repr. 1B H360 May damage fertility or the unborn child.

STOT RE 2 H373 May cause damage to organs through prolonged or repeated exposure.



GHS07

Acute Tox. 4 H302 Harmful if swallowed.

Acute Tox. 4 H312 Harmful in contact with skin.

Acute Tox. 4 H332 Harmful if inhaled.

2.2 Label elements**Labelling according to Regulation (EC) No 1272/2008**

The product is classified and labelled according to the CLP regulation.

Hazard pictograms

GHS07 GHS08

Signal word Danger**Hazard-determining components of labelling:**

LEAD (Pb)

Hazard statements

H302+H312+H332 Harmful if swallowed, in contact with skin or if inhaled.

(Continued on page 2)

Trade name: 275 Flux-Cored Lead (Pb) Solder

(Continued from page 1)

H351 Suspected of causing cancer.
 H360 May damage fertility or the unborn child.
 H373 May cause damage to organs through prolonged or repeated exposure.

Precautionary statements

P280 Wear protective gloves / eye protection.
 P270 Do not eat, drink or smoke when using this product.
 P304+P340 IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.
 P301+P330+P331 IF SWALLOWED: rinse mouth. Do NOT induce vomiting.
 P302+P352 IF ON SKIN: Wash with plenty of soap and water.
 P402 Store in a dry place.
 P501 Dispose of contents/container in accordance with local/regional/national/international regulations.

Additional information:

Warning! Contains lead.
 For use in industrial installations only.
 Restricted to professional users.

2.3 Other hazards
Results of PBT and vPvB assessment

PBT: Not applicable.
 vPvB: Not applicable.

SECTION 3: Composition/information on ingredients
Description: Mixture of substances listed below with nonhazardous additions.

Chemical components:

| | | |
|-------------------------------------|---|----------|
| CAS: 7440-31-5 EINECS: 231-141-8 | TIN (Sn) | 30-65% |
| CAS: 7439-92-1 EINECS: 231-100-4 | LEAD (Pb) ⚠ Carc. 2, H351; Repr. 1B, H360; STOT RE 2, H373 ⚠ Acute Tox. 4, H302; Acute Tox. 4, H312; Acute Tox. 4, H332 | 30-65% |
| | Rosin ⚠ Skin Sens. 1, H317 | 3.0-5.0% |
| CAS: 7440-22-4 EINECS: 231-131-3 | SILVER (Ag) | ^^ |
| CAS: 7440-50-8 EINECS: 231-159-6 | COPPER (Cu) | ^^ |
| CAS: 7440-36-0 EINECS: 231-146-5 | ANTIMONY (Sb) | ^^ |
| CAS: 7440-69-9 EINECS: 231-177-4 | BISMUTH (Bi) | ^^ |

Additional information:

Composition and weight percent of solder alloys varies widely and can be determined by product label. ^{^^ See Product Alloy Table}
 This solder product does not contain any Substance of Very High Concern (SVHC) on the European Chemicals Agency (ECHA) candidate list.

SECTION 4: First aid measures
4.1 Description of first aid measures
General information: Follow general first aid procedures.

After inhalation:

In case of unconsciousness place patient stably in side position for transportation.
 Supply fresh air; consult doctor in case of complaints.

After skin contact: Immediately wash with water and soap and rinse thoroughly.

After eye contact: Rinse opened eye for several minutes under running water.

After swallowing: Seek immediate medical advice.

(Continued on page 3)

Trade name: 275 Flux-Cored Lead (Pb) Solder

(Continued from page 2)

4.2 Most important symptoms and effects, both acute and delayed No further relevant information available.**4.3 Indication of any immediate medical attention and special treatment needed**
No further relevant information available.**SECTION 5: Firefighting measures****5.1 Extinguishing media****Suitable extinguishing agents:** CO₂. Do not use water.**For safety reasons unsuitable extinguishing agents:** Water**5.2 Special hazards arising from the substance or mixture**

In case of fire, the following can be released:

Carbon monoxide (CO)

Nitrogen oxides (NO_x)Carbon dioxide (CO₂)**5.3 Advice for firefighters****Protective equipment:** Wear self-contained respiratory protective device.**SECTION 6: Accidental release measures****6.1 Personal precautions, protective equipment and emergency procedures** Ensure adequate ventilation**6.2 Environmental precautions:** Do not allow to enter sewers/ surface or ground water.**6.3 Methods and material for containment and cleaning up:**

Dispose contaminated material as waste according to item 13.

Ensure adequate ventilation.

6.4 Reference to other sections

See Section 7 for information on safe handling.

See Section 8 for information on personal protection equipment.

See Section 13 for disposal information.

SECTION 7: Handling and storage**7.1 Precautions for safe handling**

Thorough dedusting.

Ensure good ventilation/exhaustion at the workplace.

Information about fire - and explosion protection: No special measures required.**7.2 Conditions for safe storage, including any incompatibilities****Storage:****Requirements to be met by storerooms and receptacles:** Store in a cool location.**Information about storage in one common storage facility:** Not required.**Further information about storage conditions:** Keep container tightly sealed.**7.3 Specific end use(s)** No further relevant information available.**SECTION 8: Exposure controls/personal protection****Additional information about design of technical facilities:** No further data; see item 7.**8.1 Control parameters****Ingredients with limit values that require monitoring at the workplace:****7439-92-1 LEAD (Pb)**PEL Long-term value 0.05* mg/m³REL Long-term value 0.05* mg/m³

(Continued on page 4)

Trade name: 275 Flux-Cored Lead (Pb) Solder

(Continued from page 3)

*8-hr TWA, excl. lead arsenate; See PocketGuideApp.C

TLV Long-term value 0.05* mg/m³

*and inorganic compounds, as Pb; BEI

7440-31-5 TIN (Sn)

PEL Long-term value 2 mg/m³ metal

REL Long-term value 2 mg/m³

TLV Long-term value 2 mg/m³ metal

8.2 Exposure controls

Personal protective equipment:

General protective and hygienic measures:

The usual precautionary measures are to be adhered to when handling chemicals.

Keep away from foodstuffs, beverages and feed.

Immediately remove all soiled and contaminated clothing

Wash hands before breaks and at the end of work.

Respiratory protection:

When ventilation is not sufficient to remove fumes from the breathing zone, a safety approved respirator or self-contained breathing apparatus should be worn.

Protection of hands:



Protective gloves

Material of gloves

Nitrile rubber, NBR

Natural rubber, NR

Penetration time of glove material

The exact break through time has to be found out by the manufacturer of the protective gloves and has to be observed.

Eye protection: Safety Glasses with Side Shields Required

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

General Information

Appearance:

Form: Solid

Colour: Silver grey

Odour: Odourless

pH-value: Not applicable.

Change in condition

Melting point/Melting range: 183 - 301 °C
Undetermined.

Flash point: Undetermined.

Flammability (solid, gaseous): Not determined.

Self-igniting: Product is not selfigniting.

Danger of explosion: Product does not present an explosion hazard.

Vapour pressure: Not applicable.

Density at 20 °C: 8.4 - 11.1 g/cm³

(Continued on page 5)

Trade name: 275 Flux-Cored Lead (Pb) Solder**Vapour density** Not applicable.

(Continued from page 4)

Solubility in / Miscibility with water: Insoluble.**SECTION 10: Stability and reactivity****10.1 Reactivity****10.2 Chemical stability****Thermal decomposition / conditions to be avoided:** No decomposition if used according to specifications.**10.3 Possibility of hazardous reactions** No dangerous reactions known.**10.4 Conditions to avoid** No further relevant information available.**10.5 Incompatible materials:** Strong acids, strong oxidizers.**10.6 Hazardous decomposition products:** No dangerous decomposition products known.**SECTION 11: Toxicological information****11.1 Information on toxicological effects****Acute toxicity****Primary irritant effect:****Skin corrosion/irritation** Irritant to skin and mucous membranes.**Serious eye damage/irritation** Smoke during soldering can cause eye irritation.**Additional toxicological information:**

The product shows the following dangers according to the calculation method of the General EU Classification Guidelines for Preparations as issued in the latest version:

Harmful

Irritant

SECTION 12: Ecological information**12.1 Toxicity****Aquatic toxicity:** No further relevant information available.**Additional ecological information:****General notes:**

The product contains heavy metals. Avoid transfer into the environment. Specific preliminary treatments are necessary.

12.5 Results of PBT and vPvB assessment**PBT:** Not applicable.**vPvB:** Not applicable.**SECTION 13: Disposal considerations****13.1 Waste treatment methods****Recommendation**

Must not be disposed together with household garbage. Do not allow product to reach sewage system. Disposal must be made according to official regulations.

Uncleaned packaging:**Recommendation:** Disposal must be made according to official regulations.**SECTION 14: Transport information****14.1 UN-Number**

Not regulated

(Continued on page 6)

Trade name: 275 Flux-Cored Lead (Pb) Solder

(Continued from page 5)

| | |
|---|-----------------|
| 14.2 UN proper shipping name | Not regulated |
| IMDG, IATA | Not regulated |
| 14.3 Transport hazard class(es) | Not regulated |
| ADR, IMDG, IATA | |
| Class | Not regulated. |
| 14.4 Packing group | Not regulated |
| 14.5 Environmental hazards: | Not applicable. |
| Marine pollutant: | No |
| 14.6 Special precautions for user | Not applicable. |
| 14.7 Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code | Not applicable. |

SECTION 15: Regulatory information

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

All ingredients are listed on the following Government Inventories:

| | |
|--------------|---|
| China: | Inventory of Existing Chemical Substances in China (IECSC) |
| Korea: | Korea Existing Chemicals List (ECL) |
| Europe: | European Inventory of Existing Commercial Chemical Substances (EINECS) |
| Japan: | Inventory of Existing and New Chemical Substances (ENCS) |
| Philippines: | Philippine Inventory of Chemicals and Chemical Substances (PICCS) |
| USA: | TSCA (Toxic Substances Control Act) TSCA Inventory of Chemical Substances |

Labelling according to Regulation (EC) No 1272/2008

The product is classified and labelled according to the CLP regulation.

Hazard pictograms



GHS07 GHS08

Signal word Danger

Hazard-determining components of labelling:

LEAD (Pb)

Hazard statements

| | |
|----------------|--|
| H302+H312+H332 | Harmful if swallowed, in contact with skin or if inhaled. |
| H351 | Suspected of causing cancer. |
| H360 | May damage fertility or the unborn child. |
| H373 | May cause damage to organs through prolonged or repeated exposure. |

Precautionary statements

| | |
|----------------|---|
| P280 | Wear protective gloves / eye protection. |
| P270 | Do not eat, drink or smoke when using this product. |
| P304+P340 | IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. |
| P301+P330+P331 | IF SWALLOWED: rinse mouth. Do NOT induce vomiting. |
| P302+P352 | IF ON SKIN: Wash with plenty of soap and water. |
| P402 | Store in a dry place. |
| P501 | Dispose of contents/container in accordance with local/regional/national/international regulations. |

Directive 2012/18/EU

Named dangerous substances - ANNEX I None of the ingredients is listed.

15.2 Chemical safety assessment: A Chemical Safety Assessment has not been carried out.

Trade name: 275 Flux-Cored Lead (Pb) Solder

(Continued from page 6)

SECTION 16: Other information

This information is based on our present knowledge. However, this shall not constitute a guarantee for any specific product features and shall not establish a legally valid contractual relationship.

The information contained herein is based on data considered accurate and is offered solely for information, consideration and investigation. Kester extends no warranties, makes no representations and assumes no responsibility as to the accuracy, completeness or suitability of this data for any purchaser's use. The data on this Safety Data Sheet (SDS) relates only to this product and does not relate to use with any other material or in any process. All chemical products should be used only by, or under the direction of, technically qualified personnel who are aware of the hazards involved and the necessity for reasonable care in handling. Hazard communication regulations require that employees must be trained on how to use a Safety Data Sheet (SDS) as a source for hazard information.

Department issuing MSDS: Product Compliance / EHS Department

Contact: EHS_Kester@kester.com

Abbreviations and acronyms:

ADR: Accord européen sur le transport des marchandises dangereuses par Route (European Agreement concerning the International Carriage of Dangerous Goods by Road)

IMDG: International Maritime Code for Dangerous Goods

IATA: International Air Transport Association

GHS: Globally Harmonised System of Classification and Labelling of Chemicals

EINECS: European Inventory of Existing Commercial Chemical Substances

ELINCS: European List of Notified Chemical Substances

CAS: Chemical Abstracts Service (division of the American Chemical Society)

Acute Tox. 4: Acute toxicity, Hazard Category 4

Skin Sens. 1: Sensitisation - Skin, Hazard Category 1

Carc. 2: Carcinogenicity, Hazard Category 2

Repr. 1B: Reproductive toxicity, Hazard Category 1B

STOT RE 2: Specific target organ toxicity - Repeated exposure, Hazard Category 2

* **Data compared to the previous version altered.**

275 Flux-Cored Lead (Pb) Product Alloys included in this SDS

| Alloy | Flux | Diameter | Core | Description | Part # |
|----------|------|----------|------|--------------------------------|------------|
| SN60PB40 | 275 | 0.062 | 50 | SN60PB40 #50/275 .062 5 LB SPL | 2660407614 |
| SN63PB37 | 275 | 0.01 | 66 | SN63PB37 #66/275 .010 1 LB SPL | 2463377631 |
| SN63PB37 | 275 | 0.015 | 50 | SN63PB37 #50/275 .015 1 LB SPL | 2463377604 |
| SN63PB37 | 275 | 0.02 | 50 | SN63PB37 #50/275 .020 1 LB SPL | 2463377602 |
| SN63PB37 | 275 | 0.02 | 58 | SN63PB37 #58/275 .020 1 LB SPL | 2463377603 |
| SN63PB37 | 275 | 0.025 | 50 | SN63PB37 #50/275 .025 1 LB SPL | 2463377616 |
| SN63PB37 | 275 | 0.025 | 58 | SN63PB37 #58/275 .025 1 LB SPL | 2463377617 |
| SN63PB37 | 275 | 0.031 | 50 | SN63PB37 #50/275 .031 1 LB SPL | 2463377600 |
| SN63PB37 | 275 | 0.031 | 58 | SN63PB37 #58/275 .031 1 LB SPL | 2463377601 |
| SN63PB37 | 275 | 0.031 | 66 | SN63PB37 #66/275 .031 1 LB SPL | 2463377618 |
| SN63PB37 | 275 | 0.04 | 66 | SN63PB37 #66/275 .040 1 LB SPL | 2463377611 |
| SN63PB37 | 275 | 0.05 | 50 | SN63PB37 #50/275 .050 1 LB SPL | 2463377612 |
| SN63PB37 | 275 | 0.062 | 50 | SN63PB37 #50/275 .062 1 LB SPL | 2463377614 |
| SN63PB37 | 275 | 0.062 | 66 | SN63PB37 #66/275 .062 1 LB SPL | 2463377615 |



SAFETY DATA SHEET

Page: 1(5)
SDS Number: 21-K
Date Revised: 05/01/2014

This Safety Data Sheet complies with Regulation (EC) No. 1907/2006, ISO 11014-1 and ANSI Z400.1

1. PRODUCT AND COMPANY IDENTIFICATION

Product Name: ALL-STATE GENERAL PURPOSE BRAZE WELDING AND WELDING FLUXES
 ALL-STATE BRAZALOY NO. 1 FLUX P/N: 69080200
 ALL-STATE BRAZALOY NO. 5 FLUX P/N: 69080204
 ALL-STATE BRAZO FLUX P/N: 69080205

Application: Brazing and Welding Flux
Classification: None
Supplier: THE ESAB GROUP, INC., 801 Wilson Avenue, Hanover, PA 17331
Telephone No.: 1-717-637-8911, 1-800-933-7070
Emergency No.: 1-717-637-8911 and 1-800-424-9300 (CHEMTREC)
Web site: www.esabna.com

2. HAZARDS IDENTIFICATION

Emergency Overview: A fine white, blue or red powder with no odor. Harmful if swallowed.

Avoid eye contact or inhalation of dust from these products. Dusts may irritate the eyes and can cause respiratory irritation.

These products are normally not considered hazardous as shipped. Gloves should be worn when handling to prevent contaminating hands with product dust.

Persons with a pacemaker should not go near brazing or welding operations until they have consulted their doctor and obtained information from the manufacturer of the device.

When these products are used in a brazing or welding process, the most important hazards are heat, radiation, electric shock and brazing and welding fumes.

Heat: Spatter and melting metal can cause burn injuries and start fires.

Radiation: Arc rays can severely damage eyes or skin.

Electricity: Electric shock can kill.

Fumes: Overexposure to brazing and welding fumes may result in symptoms like metal fume fever, dizziness, nausea, dryness or irritation of the nose, throat or eyes. Chronic overexposure to brazing and welding fumes may affect pulmonary function. Prolonged inhalation of nickel and chromium compounds above safe exposure limits can cause cancer. Overexposure to manganese and manganese compounds above safe exposure limits can cause irreversible damage to the central nervous system, including the brain, symptoms of which may include slurred speech, lethargy, tremor, muscular weakness, psychological disturbances and spastic gait.

Flame Processing: When used with combustible gas equipment (e.g., oxy-acetylene torch), read the use and safety information for that equipment.

3. COMPOSITION/INFORMATION ON INGREDIENTS

These products are powders.

| Ingredients | REACH Reg. # | CAS# | EINECS# | Hazard classification ⁽¹⁾ | IARC ⁽²⁾ | NTP ⁽³⁾ | OSHA List ⁽⁴⁾ |
|-------------|--------------|------------|-----------|--------------------------------------|---------------------|--------------------|--------------------------|
| Borax | -- | 1330-43-4 | 215-540-4 | No | -- | -- | -- |
| Boric Acid | -- | 10043-35-3 | 233-139-2 | Repr. Cat. 2; R60-61 | -- | -- | -- |
| Iron Oxide | -- | 1309-37-1 | 215-168-2 | No | -- | -- | -- |

⁽¹⁾ Hazard Classification according to European Council Directive 67/548/EEC, for R-phrases, see Section 16.

⁽²⁾ Evaluation according to the International Agency for Research on Cancer.

1 – Carcinogenic to humans. 2A – Probably carcinogenic to humans. 2B – Possibly carcinogenic to humans.

⁽³⁾ Classification according to the 11th Report on Carcinogens, published by the US National Toxicology Program.

K – Known Carcinogen S – Suspect Carcinogen

⁽⁴⁾ Carcinogen listing according to OSHA, Occupational Safety & Health Administration (USA).

APPROXIMATE COMPOSITION (Wt. %)

| Product Trade Name | All-State Brazaloy No. 1 Flux | All-State Brazaloy No. 5 Flux | All-State Brazo Flux |
|--------------------|-------------------------------|-------------------------------|----------------------|
| Borax | 15-40 | 15-40 | 10-30 |
| Boric Acid | 60-100 | 30-60 | 60-100 |
| Iron Oxide | -- | 1-5 | -- |

4. FIRST AID MEASURES

- Inhalation:** If breathing has stopped, perform artificial respiration and obtain medical assistance immediately! If breathing is difficult, provide fresh air and call physician.
- Eye contact:** For radiation burns due to arc flash, see physician. To remove dusts or fumes flush with water for at least fifteen minutes. If irritation persists, obtain medical assistance.
- Skin contact:** For skin burns from arc radiation, promptly flush with cold water. Get medical attention for burns or irritations that persist. To remove dust or particles wash with mild soap and water.
- Ingestion:** Call a physician or poison control center immediately. Do not induce vomiting unless directed to do so by a physician.
- Electric shock:** Disconnect and turn off the power. Use a nonconductive material to pull victim away from contact with live parts or wires. If not breathing, begin artificial respiration, preferably mouth-to-mouth. If no detectable pulse, begin Cardio Pulmonary Resuscitation (CPR). Immediately call a physician.
- General:** Move to fresh air and call for medical aid.

5. FIRE FIGHTING MEASURES

No specific recommendations for brazing and welding consumables. Brazing and welding arcs and sparks can ignite combustible and flammable materials. Use the extinguishing media recommended for the burning materials and fire situation. Wear self-contained breathing apparatus as fumes or vapors may be harmful.

6. ACCIDENTAL RELEASE MEASURES

Solid objects may be picked up and placed into a container. Liquids or pastes should be scooped up and placed into a container. Wear proper protective equipment while handling these materials. Do not discard as refuse.

- Personal precautions:** refer to Section 8.
- Environmental precautions:** refer to Section 13.

7. HANDLING AND STORAGE

Handling:

Avoid contact with skin, eyes and clothing. Wear gloves when handling brazing and welding consumables. Do not swallow or breathe vapors produced by use of product. Wash hands after using. Some individuals can develop an allergic reaction to certain materials. Retain all warning and identity labels.

Storage:

Keep separate from chemical substances like acids and strong bases, which could cause chemical reactions. Store in cool, dry, well-ventilated place.

8. EXPOSURE CONTROL/PERSONAL PROTECTION

Avoid exposure to brazing and welding fumes, radiation, spatter, electric shock, heated materials and dust.

Engineering measures (Brazing and welding operations):

Ensure sufficient ventilation, local exhaust, or both, to keep brazing and welding fumes and gases from breathing zone and general area. Keep working place and protective clothing clean and dry. Train welders to avoid contact with live electrical parts and insulate conductive parts. Check condition of protective clothing and equipment on a regular basis.

Personal protective equipment (Brazing and welding operations):

Use respirator or air supplied respirator when brazing or welding in a confined space, or where local exhaust or ventilation is not sufficient to keep exposure values within safe limits. Use special care when brazing or welding painted or coated steels since hazardous substances from the coating may be emitted. Wear hand, head, eyes, ear and body protection like welders gloves, helmet or face shield with filter lens, safety boots, apron, arm and shoulder protection. Keep protective clothing clean and dry.



Use industrial hygiene monitoring equipment to ensure that exposure does not exceed applicable national exposure limits. The following limits can be used as guidance. For information about brazing and welding flux fume analysis refer to Section 10. When used with brazing and welding products, refer to the brazing or welding product SDS, Section 10, for information on brazing and welding fumes.

| Substance | | CAS# | ACGIH TLV ⁽¹⁾ mg/m ³ | OSHA PEL ⁽²⁾ mg/m ³ |
|------------|--------------|------------|--|---|
| Borax | (as borates) | 1330-43-4 | 2 ^{***} , 6 (STEL) ^{***} | None |
| Boric Acid | (as borates) | 10043-35-3 | 2 ^{***} , 6 (STEL) ^{***} | None |
| Iron Oxide | | 1309-37-1 | 5 ^{**} | 10 (fume) |

(1) Threshold Limit Values according to American Conference of Governmental Industrial Hygienists, 2014

(2) Permissible Exposure Limits according to the Occupational Safety & Health Administration (USA)

Unless noted, all values are for 8 hour time weighted averages (TWA).

* Total dust, ** Respirable fraction, *** Inhalable fraction.

NOTE: Some of these products may not contain all of the materials listed. For details of composition, refer to the COMPOSITION TABLES in Section 3.

9. PHYSICAL AND CHEMICAL PROPERTIES

| | |
|----------------------------|--|
| Appearance: | Blue (No. 1 Flux), red (No. 5 Flux) or white (Brazo Flux) powder with no odor. |
| Specific Gravity: | 1.62-1.82 (H ₂ O = 1) |
| Boiling Point: | Not determined. |
| Freezing Point: | Not determined. |
| Vapor Pressure: | Negligible. |
| Vapor Density: | Not applicable. |
| Evaporation Rate: | Solid. Does not evaporate. |
| Solubility in Water: | None. |
| Flash Point: | None. |
| Upper/Lower Flame Limit: | None. |
| Auto-ignition Temperature: | Not determined. |

10. STABILITY AND REACTIVITY

General: These products are only intended for normal brazing and welding purposes.

Stability: These products are stable under normal conditions.

Reactivity: Contact with chemical substances like acids or strong bases could cause generation of gas.

When these products are used in a brazing and welding process, hazardous decomposition products would include those from the volatilization, reaction or oxidation of the materials listed in Section 3 and those from the brazing and welding consumables, the base metal and coating.

Refer to applicable national exposure limits for fume compounds, including those exposure limits for fume compounds found in Section 8 of this SDS and the brazing and welding consumable SDS. A significant amount of the chromium in the fumes can be hexavalent chromium, which has a very low exposure limit in some countries. Manganese and nickel also have low exposure limits, in some countries, that may be easily exceeded.

Reasonably expected gaseous products would include carbon oxides, nitrogen oxides and ozone. Air contaminants around the brazing and welding area can be affected by the brazing and welding process and influence the composition and quantity of fumes and gases produced.

11. TOXICOLOGICAL INFORMATION

Inhalation of brazing and welding fumes and gases can be dangerous to your health. Classification of brazing and welding fumes is difficult because of varying base materials, coatings, air contamination and processes. The International Agency for Research on Cancer has classified welding fumes as possibly carcinogenic to humans (Group 2B).

Acute toxicity: Overexposure to brazing and welding fumes may result in symptoms like metal fume fever, dizziness, nausea, dryness or irritation of the nose, throat or eyes.

Borax: 2.66 g/kg

Boric acid: 2.6 g/kg

Iron oxide: No value found but considered very low toxicity.



Chronic toxicity: Overexposure to brazing and welding fumes may affect pulmonary function. Prolonged inhalation of nickel and chromium compounds above safe exposure limits can cause cancer. Overexposure to manganese and manganese compounds above safe exposure limits can cause irreversible damage to the central nervous system, including the brain, symptoms of which may include slurred speech, lethargy, tremor, muscular weakness, psychological disturbances and spastic gait.

12. ECOLOGICAL INFORMATION

Brazing and welding consumables and materials could degrade/weather into components originating from the consumables or from the materials used in the brazing and welding processes. Avoid exposure to conditions that could lead to accumulation in soils or groundwater.

13. DISPOSAL CONSIDERATIONS

Discard any product, residue, disposable container or liner in an environmentally acceptable manner, in full compliance with federal and local regulations. Use recycling procedures if available.

USA RCRA: These products are not considered hazardous waste if discarded.

Residues from brazing and welding consumables and processes could degrade and accumulate in soils and groundwater.

14. TRANSPORT INFORMATION

No international regulations or restrictions are applicable.

15. REGULATORY INFORMATION

Read and understand the manufacturer's instructions, your employer's safety practices and the health and safety instructions on the label. Observe any federal and local regulations. Take precautions when brazing and welding and protect yourself and others.

WARNING: Brazing and welding fumes and gases are hazardous to your health and may damage lungs and other organs. Use adequate ventilation.

ELECTRIC SHOCK can kill.

ARC RAYS and SPARKS can injure eyes and burn skin.

Wear correct hand, head, eye and body protection.

Canada: WHMIS classification: Class D; Division 2, Subdivision A

Canadian Environmental Protection Act (CEPA): All constituents of these products are on the Domestic Substance List (DSL).

USA: Under the OSHA Hazard Communication Standard, these products are considered hazardous.

These products contain or produce a chemical known to the state of California to cause cancer and birth defects (or other reproductive harm). (California Health & Safety Code § 25249.5 et seq.)

United States EPA Toxic Substance Control Act: All constituents of these products are on the TSCA inventory list or are excluded from listing.

CERCLA/SARA Title III

Reportable Quantities (RQs) and/or Threshold Planning Quantities (TPQs):

| Ingredient name | RQ (lb) | TPQ (lb) |
|--|---------|----------|
| No ingredients listed in this section. | -- | -- |

Spills or releases resulting in the loss of any ingredient at or above its RQ require immediate notification to the National Response Center and to your Local Emergency Planning Committee.

Section 311 Hazard Class

As shipped: Immediate In use: Immediate

EPCRA/SARA Title III 313 Toxic Chemicals

The following metallic components are listed as SARA 313 "Toxic Chemicals" and potential subject to annual SARA 313 reporting. See Section 3 for weight percent.

| Ingredient name | Disclosure threshold |
|--|----------------------|
| No ingredients listed in this section. | -- |

16. OTHER INFORMATION

This Safety Data Sheet has been revised due to modifications to Section 8. This SDS supersedes 21-J.

Refer to ESAB "Welding and Cutting - Risks and Measures", F52-529 "Precautions and Safe Practices for Electric Welding and Cutting" and F2035 "Precautions and Safe Practices for Gas Welding, Cutting and Heating" available from ESAB, and to:

USA: Contact ESAB at www.esabna.com or 1-800-ESAB-123 if you have questions about this SDS.

American National Standard Z49.1 "Safety in Welding and Cutting", ANSI/AWS F1.5 "Methods for Sampling and Analyzing Gases from Welding and Allied Processes", ANSI/AWS F1.1 "Method for Sampling Airborne Particles Generated by Welding and Allied Processes", AWSF3.2M/F3.2 "Ventilation Guide for Weld Fume", American Welding Society, 550 North Le Jeune Road, Miami, Florida, 33135. Safety and Health Fact Sheets available from AWS at www.aws.org.

OSHA Publication 2206 (29 C.F.R. 1910), U.S. Government Printing Office, Superintendent of Documents, P.O. Box 371954, Pittsburgh, PA 15250-7954.

American Conference of Governmental Hygienists (ACGIH), Threshold Limit Values and Biological Exposure Indices, 6500 Glenway Ave., Cincinnati, Ohio 45211, USA.

NFPA 51B "Standard for Fire Prevention During Welding, Cutting and Other Hot Work" published by the National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02169.

UK: WMA Publication 236 and 237, "Hazards from Welding Fume", "The arc welder at work, some general aspects of health and safety".

Germany: Unfallverhütungsvorschrift BGV D1, "Schweißen, Schneiden und verwandte Verfahren".

Canada: CSA Standard CAN/CSA-W117.2-01 "Safety in Welding, Cutting and Allied Processes".

These products have been classified according to the hazard criteria of the CPR and the SDS contains all the information required by the CPR.

Explanation of risk phrases mentioned in this SDS:

R-phrases: R60 – May impair fertility.

R61 – May cause harm to the unborn child.

ESAB requests the users of these products to study this Safety Data Sheet (SDS) and become aware of product hazards and safety information. To promote safe use of these products a user should:

- notify its employees, agents and contractors of the information on this SDS and any product hazards/safety information.
- furnish this same information to each of its customers for these products.
- request such customers to notify employees and customers for the same product hazards and safety information.

The information herein is given in good faith and based on technical data that ESAB believes to be reliable. Since the conditions of use are outside our control, we assume no liability in connection with any use of this information and no warranty, expressed or implied is given. Contact ESAB for more information.



Aluminum Welding Wires/Rods

Safety Data Sheet

According To Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules And Regulations
Revision Date: 06/09/2015 Date of issue: 06/09/2015 Supersedes Date: 09/15/2014

Version: 1.0

SECTION 1: IDENTIFICATION

Product Identifier

Product Form: Mixture

Product Name: Aluminum Welding Wires/Rods

Product Code: 1100, 2319, 4043, 4047, 4145, 5087, 5183, 5356, 5554, 5556, 5754, 4043, 4047

Intended Use of the Product

Aluminum Welding Electrodes and Rods

Name, Address, and Telephone of the Responsible Party

Company

Harris Products Group

4501 Quality Place

Mason, OH 45040

T +1 (513) 234-2000

SDS@lincolnelectric.com

Emergency Telephone Number

Emergency Number : CHEMTREC: 3E Company Access Code: 333988 USA/Canada/Mexico +1 (888) 609-1762
Americas/Europe +1 (216) 383-8962 CHEMTREC

SECTION 2: HAZARDS IDENTIFICATION

Classification of the Substance or Mixture

Classification (GHS-US)

Not classified

Label Elements

GHS-US Labeling No labeling applicable

Other Hazards

This product as shipped in its massive form, is inert and not hazardous to human health. Under normal conditions of use during welding, this product and its fumes pose separate hazards. These hazards under normal conditions of use are outlined in this document. Exposure may aggravate those with pre-existing eye, skin, or respiratory conditions. Inhalation of dusts and fumes can cause metal fume fever. Symptoms can include a metallic or sweet taste in the mouth, sweating, shivering, headache, throat irritation, fever, chills, thirstiness, muscle aches, nausea, vomiting, weakness, fatigue, and shortness of breath. Overexposure to manganese fumes may affect the brain and central nervous system, resulting in poor coordination, difficulty speaking, and arm or leg tremor. This condition can be irreversible. Electric shock from welding equipment or electrodes may be fatal. Hot metal spatter and heat from electric arcs and welding flames may cause burns to the hands and body or may cause fire if it comes into contact with combustible materials. UV, IR and light radiation from an electric arc or welding flame process may cause damage to unprotected eyes. Fumes and gases generated during the welding process can be harmful to your health. If dust is generated, the dust may be flammable solid, water reactive, and self-heating. Take appropriate precautions if dust is generated and ensure proper engineering controls.

Unknown Acute Toxicity (GHS-US) Not available

SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS

Mixture

| Name | Product Identifier | % (w/w) | Classification (GHS-US) |
|-----------|--------------------|----------|--|
| Aluminum | (CAS No) 7429-90-5 | 87 - 100 | Comb. Dust Flam. Sol. 1, H228 Water-react. 2, H261 |
| Silicon | (CAS No) 7440-21-3 | 5 - 13 | Comb. Dust |
| Copper | (CAS No) 7440-50-8 | <= 7 | Comb. Dust Aquatic Acute 1, H400 Aquatic Chronic 2, H411 |
| Magnesium | (CAS No) 7439-95-4 | < 5 | Comb. Dust Flam. Sol. 1, H228 |

Aluminum Welding Wires/Rods

Safety Data Sheet

According To Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules And Regulations

| | | | |
|-----------|--------------------|-------|---|
| | | | Self-heat. 2, H252 Water-react. 2, H261 |
| Manganese | (CAS No) 7439-96-5 | < 1 | Comb. Dust |
| Chromium | (CAS No) 7440-47-3 | < 0.5 | Comb. Dust |
| Zirconium | (CAS No) 7440-67-7 | < 0.5 | Comb. Dust Pyr. Sol. 1, H250 Self-heat. 1, H251 Water-react. 1, H260 |
| Vanadium | (CAS No) 7440-62-2 | < 0.5 | Comb. Dust |

Full text of H-phrases: see section 16

The specific chemical identity and/or exact percentage of composition have been withheld as a trade secret [29 CFR 1910.1200].

More than one of the ranges of concentration prescribed by the Controlled Products Regulations has been used where necessary, due to varying composition.

SECTION 4: FIRST AID MEASURES

Description of First Aid Measures

General: Never give anything by mouth to an unconscious person. If you feel unwell, seek medical advice (show the label if possible).

Inhalation: Remove to fresh air and keep at rest in a position comfortable for breathing. Ventilate the area. Call a POISON CENTER/doctor/physician if you feel unwell.

Skin Contact: Remove contaminated clothing. Drench affected area with water for at least 15 minutes. Obtain medical attention if irritation develops or persists. Wash contaminated clothing before reuse. In molten form: Cool skin rapidly with cold water after contact with molten product. Removal of solidified molten material from skin requires medical assistance.

Eye Contact: Rinse cautiously with water for at least 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Obtain medical attention. In molten form: . Removal of solidified molten material from the eyes requires medical assistance.

Ingestion: Do NOT induce vomiting. Rinse mouth. Call a physician or poison control center immediately.

Most Important Symptoms and Effects Both Acute and Delayed

General: Welding, cutting, or processing this material may release dust or fumes that are hazardous. During processing, inhalation of fumes may cause dizziness and/or irritation to the eyes, nose, and throat. Hot molten product will cause thermal burns to the skin.

Inhalation: The primary acute health hazard associated with this product would be the potential for exposure to fumes during metal processing operations. During processing, the most significant route of exposure is by the inhalation (breathing) of fumes. If fumes are inhaled, they can cause a condition commonly known as metal fume fever with symptoms which resemble influenza; Symptoms may be delayed 4-12 hours and begin with a sudden onset of thirst, and a sweet, metallic or foul taste in the mouth. Other symptoms may include upper respiratory tract irritation accompanied by coughing and a dryness of the mucous membranes, lassitude and a generalized feeling of malaise. Fever, chills, muscular pain, mild to severe headache, nausea, occasional vomiting, exaggerated mental activity, profuse sweating, excessive urination, diarrhea and prostration may also occur.

Skin Contact: Contact with hot, molten metal will cause thermal burns.

Eye Contact: Fumes from thermal decomposition may cause eye irritation. Risk of thermal burns on contact with molten product. Arc rays and sparks can burn eyes.

Ingestion: Ingestion is likely to be harmful or have adverse effects.

Chronic Symptoms: This product is intended for use in ARC welding. During this process UV rays irritate the superficial corneal epithelium, causing inhibition of mitosis, production of nuclear fragmentation, and loosening of the epithelial layer. Under experimental conditions in animals, phototoxic effects have been demonstrated at all levels of the cornea, including the stroma and endothelium. Aluminum: Inhalation of finely divided aluminum powder may cause pulmonary fibrosis. Silicon: Can cause chronic bronchitis and narrowing of the airways. Manganese: Chronic exposure can cause inflammation of the lung tissue, scarring the lungs (pulmonary fibrosis). Copper: Overexposure to fumes may cause metal fume fever (chills, muscle aches, nausea, fever, dry throat, cough, weakness, lassitude); metallic or sweet taste; discoloration of skin and hair. Tissue damage of mucous membranes may follow chronic dust exposure. Chromium: Certain hexavalent chromium compounds have been demonstrated to be carcinogenic on the basis of epidemiological investigations on workers and experimental studies in animals. Increased incidences of respiratory cancer have been found in chromium (VI) workers. There is an increased incidence of lung cancer in industrial workers exposed to chromium (VI) compounds. Please refer to IARC volume 23 for a more detailed discussion.

Indication of Any Immediate Medical Attention and Special Treatment Needed

If exposed or concerned, get medical advice and attention. If medical advice is needed, have product container or label at hand.

Aluminum Welding Wires/Rods

Safety Data Sheet

According To Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules And Regulations

SECTION 5: FIRE-FIGHTING MEASURES

Extinguishing Media

Suitable Extinguishing Media: Class D Extinguishing Agent (for metal powder fires). Dry chemical powder, alcohol-resistant foam, carbon dioxide (CO₂), dry sand.

Unsuitable Extinguishing Media: Do not use a high powered water stream. Use of a high powered stream may spread fire.

Special Hazards Arising From the Substance or Mixture

Fire Hazard: Not considered flammable but will burn at high temperatures.

Explosion Hazard: Product is not explosive. Ensure proper welding procedures to avoid welding explosions.

Reactivity: Hazardous reactions will not occur under normal conditions. If dust are formed: Metallic dusts may ignite or explode.

Advice for Firefighters

Precautionary Measures Fire: Exercise caution when fighting any chemical fire.

Firefighting Instructions: Use water spray or fog for cooling exposed containers. Do not breathe fumes from fires or vapors from decomposition. Do not allow run-off from firefighting to enter drains or water sources. Avoid raising dust.

Protection During Firefighting: Do not enter fire area without proper protective equipment, including respiratory protection.

Hazardous Combustion Products: Carbon oxides (CO, CO₂). Metal oxides.

Reference to Other Sections

Refer to section 9 for flammability properties.

SECTION 6: ACCIDENTAL RELEASE MEASURES

Personal Precautions, Protective Equipment and Emergency Procedures

General Measures: Do not breathe vapors from molten product. Avoid all contact with skin, eyes, or clothing. Avoid breathing (vapor, mist, gas).

For Non-Emergency Personnel

Protective Equipment: Use appropriate personal protection equipment (PPE).

Emergency Procedures: Evacuate unnecessary personnel.

For Emergency Personnel

Protective Equipment: Equip cleanup crew with proper protection.

Emergency Procedures: Evacuate unnecessary personnel. Eliminate ignition sources. Ventilate area.

Environmental Precautions

Prevent entry to sewers and public waters.

Methods and Material for Containment and Cleaning Up

For Containment: Where possible allow molten material to solidify naturally. Contain and collect as any solid.

Methods for Cleaning Up: Clean up spills immediately and dispose of waste safely. Avoid generation of dust during clean-up of spills. Ventilate area. Use explosion proof vacuum during cleanup, with appropriate filter. Do not mix with other materials. Use only non-sparking tools. Transfer spilled material to a suitable container for disposal.

Reference to Other Sections

See heading 8, Exposure Controls and Personal Protection. Concerning disposal elimination after cleaning, see item 13.

SECTION 7: HANDLING AND STORAGE

Precautions for Safe Handling

Additional Hazards When Processed: Risk of electric shock when welding. Arc rays and sparks can burn skin. Fumes from welding, or processing of this material can be harmful if inhaled. See ANSI Z49.1-1967 Safety in Welding and Cutting published by the American Welding Society and OSHA Hazard Communication Standard 1910.1200 for additional details regarding the handling and storage of this material.

Precautions for Safe Handling: Avoid contact with skin and eyes. Do not breathe dust. Use appropriate personal protective equipment when handling and observe good personal hygiene measures after handling. Do not handle until all safety precautions have been read and understood.

Hygiene Measures: Handle in accordance with good industrial hygiene and safety procedures. Wash hands and other exposed areas with mild soap and water before eating, drinking, or smoking and again when leaving work.

Conditions for Safe Storage, Including Any Incompatibilities

Storage Conditions: Store in a dry, cool and well-ventilated place. Keep container closed when not in use. Keep/Store away from direct sunlight, extremely high or low temperatures and incompatible materials.

Incompatible Materials: Strong acids. Strong bases. Strong oxidizers. Halogens. Nitric oxide/nitrogen dioxide. Hydrogen peroxide. Phosphorus.

Aluminum Welding Wires/Rods

Safety Data Sheet

According To Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules And Regulations

Specific End Use(s)

Aluminum Electrodes and Rods

SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

Control Parameters

For substances listed in section 3 that are not listed here, there are no established Exposure limits from the manufacturer, supplier, importer, or the appropriate advisory agency including: ACGIH (TLV), NIOSH (REL), OSHA (PEL), Canadian provincial governments, or the Mexican government

| Aluminum (7429-90-5) | | |
|------------------------------------|--------------------------------------|---|
| USA ACGIH | ACGIH TWA (mg/m ³) | 1 mg/m ³ (respirable fraction) |
| USA ACGIH | ACGIH chemical category | Not Classifiable as a Human Carcinogen |
| USA OSHA | OSHA PEL (TWA) (mg/m ³) | 15 mg/m ³ (total dust) 5 mg/m ³ (respirable fraction) |
| USA NIOSH | NIOSH REL (TWA) (mg/m ³) | 10 mg/m ³ (total dust) 5 mg/m ³ (respirable dust) |
| Alberta | OEL TWA (mg/m ³) | 10 mg/m ³ (dust) |
| British Columbia | OEL TWA (mg/m ³) | 1.0 mg/m ³ (respirable) |
| Manitoba | OEL TWA (mg/m ³) | 1 mg/m ³ (respirable fraction) |
| New Brunswick | OEL TWA (mg/m ³) | 10 mg/m ³ (metal dust) |
| Newfoundland & Labrador | OEL TWA (mg/m ³) | 1 mg/m ³ (respirable fraction) |
| Nova Scotia | OEL TWA (mg/m ³) | 1 mg/m ³ (respirable fraction) |
| Nunavut | OEL STEL (mg/m ³) | 20 mg/m ³ |
| Nunavut | OEL TWA (mg/m ³) | 10 mg/m ³ |
| Northwest Territories | OEL STEL (mg/m ³) | 20 mg/m ³ |
| Northwest Territories | OEL TWA (mg/m ³) | 10 mg/m ³ |
| Ontario | OEL TWA (mg/m ³) | 1 mg/m ³ (respirable) |
| Prince Edward Island | OEL TWA (mg/m ³) | 1 mg/m ³ (respirable fraction) |
| Québec | VEMP (mg/m ³) | 10 mg/m ³ |
| Saskatchewan | OEL STEL (mg/m ³) | 20 mg/m ³ (dust) |
| Saskatchewan | OEL TWA (mg/m ³) | 10 mg/m ³ (dust) |
| Silicon (7440-21-3) | | |
| USA OSHA | OSHA PEL (TWA) (mg/m ³) | 15 mg/m ³ (total dust) 5 mg/m ³ (respirable fraction) |
| USA NIOSH | NIOSH REL (TWA) (mg/m ³) | 10 mg/m ³ (total dust) 5 mg/m ³ (respirable dust) |
| British Columbia | OEL TWA (mg/m ³) | 10 mg/m ³ (total dust) 3 mg/m ³ (respirable fraction) |
| New Brunswick | OEL TWA (mg/m ³) | 10 mg/m ³ |
| Nunavut | OEL TWA (mg/m ³) | 5 mg/m ³ (respirable mass) 10 mg/m ³ (total mass) |
| Northwest Territories | OEL TWA (mg/m ³) | 5 mg/m ³ (respirable mass) 10 mg/m ³ (total mass) |
| Ontario | OEL TWA (mg/m ³) | 10 mg/m ³ (total dust) |
| Québec | VEMP (mg/m ³) | 10 mg/m ³ (containing no Asbestos and <1% Crystalline silica-total dust) |
| Saskatchewan | OEL STEL (mg/m ³) | 20 mg/m ³ |
| Saskatchewan | OEL TWA (mg/m ³) | 10 mg/m ³ |
| Yukon | OEL STEL (mg/m ³) | 20 mg/m ³ |
| Yukon | OEL TWA (mg/m ³) | 30 mppcf 10 mg/m ³ |
| Manganese (7439-96-5) | | |
| USA ACGIH | ACGIH TWA (mg/m ³) | 0.02 mg/m ³ (respirable fraction) |

Aluminum Welding Wires/Rods

Safety Data Sheet

According To Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules And Regulations

| | | |
|------------------------------------|---|--|
| | | 0.1 mg/m ³ (inhalable fraction) |
| USA ACGIH | ACGIH chemical category | Not Classifiable as a Human Carcinogen |
| USA OSHA | OSHA PEL (Ceiling) (mg/m ³) | 5 mg/m ³ (fume) |
| USA NIOSH | NIOSH REL (TWA) (mg/m ³) | 1 mg/m ³ (fume) |
| USA NIOSH | NIOSH REL (STEL) (mg/m ³) | 3 mg/m ³ |
| USA IDLH | US IDLH (mg/m ³) | 500 mg/m ³ |
| Alberta | OEL TWA (mg/m ³) | 0.2 mg/m ³ |
| British Columbia | OEL TWA (mg/m ³) | 0.2 mg/m ³ |
| Manitoba | OEL TWA (mg/m ³) | 0.02 mg/m ³ (respirable fraction) 0.1 mg/m ³ (inhalable fraction) |
| New Brunswick | OEL TWA (mg/m ³) | 0.2 mg/m ³ |
| Newfoundland & Labrador | OEL TWA (mg/m ³) | 0.02 mg/m ³ (respirable fraction) 0.1 mg/m ³ (inhalable fraction) |
| Nova Scotia | OEL TWA (mg/m ³) | 0.02 mg/m ³ (respirable fraction) 0.1 mg/m ³ (inhalable fraction) |
| Nunavut | OEL Ceiling (mg/m ³) | 5 mg/m ³ |
| Nunavut | OEL STEL (mg/m ³) | 3 mg/m ³ (fume) |
| Nunavut | OEL TWA (mg/m ³) | 1 mg/m ³ (fume) |
| Northwest Territories | OEL Ceiling (mg/m ³) | 5 mg/m ³ |
| Northwest Territories | OEL STEL (mg/m ³) | 3 mg/m ³ (fume) |
| Northwest Territories | OEL TWA (mg/m ³) | 1 mg/m ³ (fume) |
| Ontario | OEL TWA (mg/m ³) | 0.2 mg/m ³ |
| Prince Edward Island | OEL TWA (mg/m ³) | 0.02 mg/m ³ (respirable fraction) 0.1 mg/m ³ (inhalable fraction) |
| Québec | VEMP (mg/m ³) | 0.2 mg/m ³ (total dust and fume) |
| Saskatchewan | OEL STEL (mg/m ³) | 0.6 mg/m ³ |
| Saskatchewan | OEL TWA (mg/m ³) | 0.2 mg/m ³ |
| Yukon | OEL Ceiling (mg/m ³) | 5 mg/m ³ |
| Copper (7440-50-8) | | |
| USA ACGIH | ACGIH TWA (mg/m ³) | 0.2 mg/m ³ (fume) |
| USA OSHA | OSHA PEL (TWA) (mg/m ³) | 0.1 mg/m ³ (fume) 1 mg/m ³ (dust and mist) |
| USA NIOSH | NIOSH REL (TWA) (mg/m ³) | 1 mg/m ³ (dust and mist) 0.1 mg/m ³ (fume) |
| USA IDLH | US IDLH (mg/m ³) | 100 mg/m ³ (dust, fume and mist) |
| Alberta | OEL TWA (mg/m ³) | 0.2 mg/m ³ (fume) 1 mg/m ³ (dust and mist) |
| British Columbia | OEL TWA (mg/m ³) | 1 mg/m ³ (dust and mist) 0.2 mg/m ³ (fume) |
| Manitoba | OEL TWA (mg/m ³) | 0.2 mg/m ³ (fume) |
| New Brunswick | OEL TWA (mg/m ³) | 0.2 mg/m ³ (fume) 1 mg/m ³ (dust and mist) |
| Newfoundland & Labrador | OEL TWA (mg/m ³) | 0.2 mg/m ³ (fume) |
| Nova Scotia | OEL TWA (mg/m ³) | 0.2 mg/m ³ (fume) |
| Nunavut | OEL STEL (mg/m ³) | 0.6 mg/m ³ (fume) 2 mg/m ³ (dust and mist) |
| Nunavut | OEL TWA (mg/m ³) | 0.2 mg/m ³ (fume) 1 mg/m ³ (dust and mist) |
| Northwest Territories | OEL STEL (mg/m ³) | 0.6 mg/m ³ (fume) 2 mg/m ³ (dust and mist) |
| Northwest Territories | OEL TWA (mg/m ³) | 0.2 mg/m ³ (fume) 1 mg/m ³ (dust and mist) |

Aluminum Welding Wires/Rods

Safety Data Sheet

According To Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules And Regulations

| | | |
|-----------------------------|-------------------------------|---|
| Ontario | OEL TWA (mg/m ³) | 0.2 mg/m ³ (fume) 1 mg/m ³ (dust and mist) |
| Prince Edward Island | OEL TWA (mg/m ³) | 0.2 mg/m ³ (fume) |
| Québec | VEMP (mg/m ³) | 0.2 mg/m ³ (fume) 1 mg/m ³ (dust and mist) |
| Saskatchewan | OEL STEL (mg/m ³) | 0.6 mg/m ³ (fume) 3 mg/m ³ (dust and mist) |
| Saskatchewan | OEL TWA (mg/m ³) | 0.2 mg/m ³ (fume) 1 mg/m ³ (dust and mist) |
| Yukon | OEL STEL (mg/m ³) | 0.2 mg/m ³ (fume) 2 mg/m ³ (dust and mist) |
| Yukon | OEL TWA (mg/m ³) | 0.2 mg/m ³ (fume) 1 mg/m ³ (dust and mist) |

| | | |
|------------------------------------|--------------------------------------|--|
| Chromium (7440-47-3) | | |
| USA ACGIH | ACGIH TWA (mg/m ³) | 0.5 mg/m ³ |
| USA ACGIH | ACGIH chemical category | Not Classifiable as a Human Carcinogen |
| USA OSHA | OSHA PEL (TWA) (mg/m ³) | 1 mg/m ³ |
| USA NIOSH | NIOSH REL (TWA) (mg/m ³) | 0.5 mg/m ³ |
| USA IDLH | US IDLH (mg/m ³) | 250 mg/m ³ |
| Alberta | OEL TWA (mg/m ³) | 0.5 mg/m ³ |
| British Columbia | OEL TWA (mg/m ³) | 0.5 mg/m ³ |
| Manitoba | OEL TWA (mg/m ³) | 0.5 mg/m ³ |
| New Brunswick | OEL TWA (mg/m ³) | 0.5 mg/m ³ |
| Newfoundland & Labrador | OEL TWA (mg/m ³) | 0.5 mg/m ³ |
| Nova Scotia | OEL TWA (mg/m ³) | 0.5 mg/m ³ |
| Nunavut | OEL STEL (mg/m ³) | 1.5 mg/m ³ |
| Nunavut | OEL TWA (mg/m ³) | 0.5 mg/m ³ |
| Northwest Territories | OEL STEL (mg/m ³) | 1.5 mg/m ³ |
| Northwest Territories | OEL TWA (mg/m ³) | 0.5 mg/m ³ |
| Ontario | OEL TWA (mg/m ³) | 0.5 mg/m ³ |
| Prince Edward Island | OEL TWA (mg/m ³) | 0.5 mg/m ³ |
| Québec | VEMP (mg/m ³) | 0.5 mg/m ³ |
| Saskatchewan | OEL STEL (mg/m ³) | 1.5 mg/m ³ |
| Saskatchewan | OEL TWA (mg/m ³) | 0.5 mg/m ³ |
| Yukon | OEL STEL (mg/m ³) | 3.0 mg/m ³ |
| Yukon | OEL TWA (mg/m ³) | 0.1 mg/m ³ |

| | | |
|------------------------------|---------------------------------------|--|
| Zirconium (7440-67-7) | | |
| USA ACGIH | ACGIH TWA (mg/m ³) | 5 mg/m ³ |
| USA ACGIH | ACGIH STEL (mg/m ³) | 10 mg/m ³ |
| USA ACGIH | ACGIH chemical category | Not Classifiable as a Human Carcinogen |
| USA NIOSH | NIOSH REL (TWA) (mg/m ³) | 5 mg/m ³ |
| USA NIOSH | NIOSH REL (STEL) (mg/m ³) | 10 mg/m ³ |
| USA IDLH | US IDLH (mg/m ³) | 50 mg/m ³ |
| Alberta | OEL STEL (mg/m ³) | 10 mg/m ³ |
| Alberta | OEL TWA (mg/m ³) | 5 mg/m ³ |
| British Columbia | OEL STEL (mg/m ³) | 10 mg/m ³ |
| British Columbia | OEL TWA (mg/m ³) | 5 mg/m ³ |
| Manitoba | OEL STEL (mg/m ³) | 10 mg/m ³ |
| Manitoba | OEL TWA (mg/m ³) | 5 mg/m ³ |
| New Brunswick | OEL STEL (mg/m ³) | 10 mg/m ³ |
| New Brunswick | OEL TWA (mg/m ³) | 5 mg/m ³ |

Aluminum Welding Wires/Rods

Safety Data Sheet

According To Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules And Regulations

| | | |
|-------------------------|-------------------------------|----------------------|
| Newfoundland & Labrador | OEL STEL (mg/m ³) | 10 mg/m ³ |
| Newfoundland & Labrador | OEL TWA (mg/m ³) | 5 mg/m ³ |
| Nova Scotia | OEL STEL (mg/m ³) | 10 mg/m ³ |
| Nova Scotia | OEL TWA (mg/m ³) | 5 mg/m ³ |
| Ontario | OEL STEL (mg/m ³) | 10 mg/m ³ |
| Ontario | OEL TWA (mg/m ³) | 5 mg/m ³ |
| Prince Edward Island | OEL STEL (mg/m ³) | 10 mg/m ³ |
| Prince Edward Island | OEL TWA (mg/m ³) | 5 mg/m ³ |
| Québec | VECD (mg/m ³) | 10 mg/m ³ |
| Québec | VEMP (mg/m ³) | 5 mg/m ³ |
| Saskatchewan | OEL STEL (mg/m ³) | 10 mg/m ³ |
| Saskatchewan | OEL TWA (mg/m ³) | 5 mg/m ³ |

| | | |
|-----------------------------|---|---|
| Vanadium (7440-62-2) | | |
| USA OSHA | OSHA PEL (Ceiling) (mg/m ³) | 0.5 mg/m ³ (respirable dust) 0.1 mg/m ³ (fume) |
| USA NIOSH | NIOSH REL (TWA) (mg/m ³) | 1 mg/m ³ |
| USA NIOSH | NIOSH REL (STEL) (mg/m ³) | 3 mg/m ³ |

| | | |
|-----------------------------------|-------------------------------|--|
| Welding fumes (RR-00009-9) | | |
| New Brunswick | OEL TWA (mg/m ³) | 5 mg/m ³ |
| Nunavut | OEL STEL (mg/m ³) | 10 mg/m ³ (total particulate) |
| Nunavut | OEL TWA (mg/m ³) | 5 mg/m ³ (total particulate) |
| Northwest Territories | OEL STEL (mg/m ³) | 10 mg/m ³ (total particulate) |
| Northwest Territories | OEL TWA (mg/m ³) | 5 mg/m ³ (total particulate) |
| Québec | VEMP (mg/m ³) | 5 mg/m ³ (not otherwise classified) |
| Saskatchewan | OEL STEL (mg/m ³) | 10 mg/m ³ |
| Saskatchewan | OEL TWA (mg/m ³) | 5 mg/m ³ |
| Yukon | OEL STEL (mg/m ³) | 5 mg/m ³ |
| Yukon | OEL TWA (mg/m ³) | 5.0 mg/m ³ |

| | | |
|---|--------------------------------------|----------------------|
| Aluminum, welding fumes (RR-00020-4) | | |
| USA NIOSH | NIOSH REL (TWA) (mg/m ³) | 5 mg/m ³ |
| New Brunswick | OEL TWA (mg/m ³) | 5 mg/m ³ |
| Nunavut | OEL STEL (mg/m ³) | 10 mg/m ³ |
| Nunavut | OEL TWA (mg/m ³) | 5 mg/m ³ |
| Northwest Territories | OEL STEL (mg/m ³) | 10 mg/m ³ |
| Northwest Territories | OEL TWA (mg/m ³) | 5 mg/m ³ |
| Québec | VEMP (mg/m ³) | 5 mg/m ³ |

Exposure Controls

Appropriate Engineering Controls: Emergency eye wash fountains and safety showers should be available in the immediate vicinity of any potential exposure. Ensure adequate ventilation, especially in confined areas. Ensure all national/local regulations are observed. All equipment should comply with the National Electric Code. When cutting, grinding, crushing, or drilling, provide general or local ventilation systems, as needed, to maintain airborne dust concentrations below the regulatory limits. Local vacuum collection is preferred since it prevents release of contaminants into the work area by controlling it at the source. Other technologies that may aid in controlling airborne respirable dust include wet suppression, ventilation, process enclosure, and enclosed employee work stations. It is recommended that all dust control equipment such as local exhaust ventilation and material transport systems involved in handling of this product contain explosion relief vents or an explosion suppression system or an oxygen-deficient environment. Prevent dust accumulation (to minimize explosion hazard).

Personal Protective Equipment: Gloves. Protective clothing. Face shield. Insufficient ventilation: wear respiratory protection.



Aluminum Welding Wires/Rods

Safety Data Sheet

According To Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules And Regulations

Materials for Protective Clothing: With molten material wear thermally protective clothing.

Hand Protection: Leather gloves. Heat resistant gloves.

Eye Protection: Chemical goggles or safety glasses. Welders should wear goggles or safety glasses with side shields that comply with ANSI Z87.1 under welding helmets and always wear goggles or other suitable eye protection when gas welding or oxygen cutting.

Skin and Body Protection: Wear fire/flame resistant/retardant clothing.

Respiratory Protection: If exposure limits are exceeded or irritation is experienced, approved respiratory protection should be worn.

Thermal Hazard Protection: Fire retardant clothing and gloves, as well as safety shoes are required for safe furnace work.

Consumer Exposure Controls: Do not eat, drink or smoke during use

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

Information on Basic Physical and Chemical Properties

| | |
|---|---|
| Physical State | : Solid |
| Appearance | : Silver. Gray. Metallic. |
| Odor | : Not available |
| Odor Threshold | : Not available |
| pH | : Not available |
| Evaporation Rate | : Not available |
| Melting Point | : Not available |
| Freezing Point | : Not available |
| Boiling Point | : Not available |
| Flash Point | : Not available |
| Auto-ignition Temperature | : Not available |
| Decomposition Temperature | : Not available |
| Flammability (solid, gas) | : Not available |
| Lower Flammable Limit | : Not available |
| Upper Flammable Limit | : Not available |
| Vapor Pressure | : Not available |
| Relative Vapor Density at 20 °C | : Not available |
| Relative Density | : Not available |
| Specific Gravity | : Not available |
| Solubility | : Not available |
| Partition Coefficient: N-Octanol/Water | : Not available |
| Viscosity | : Not available |
| Explosion Data – Sensitivity to Mechanical Impact | : Not expected to present an explosion hazard due to mechanical impact. |
| Explosion Data – Sensitivity to Static Discharge | : Not expected to present an explosion hazard due to static discharge. |

SECTION 10: STABILITY AND REACTIVITY

Reactivity: Hazardous reactions will not occur under normal conditions. If dust are formed: Metallic dusts may ignite or explode.

Chemical Stability: Stable under normal conditions.

Possibility of Hazardous Reactions: Hazardous polymerization will not occur.

Conditions to Avoid: Incompatible materials.

Incompatible Materials: Strong acids. Strong bases. Strong oxidizers. Halogens. Nitrogen oxides. Nitrogen dioxide. Hydrogen peroxide.

Hazardous Decomposition Products: Metal oxides. Oxides of aluminum. Oxides of magnesium. Oxides of manganese. Oxides of copper. Oxides of zirconium. Oxides of titanium. Chromium oxides. Silicon oxides. Vanadium oxides.

SECTION 11: TOXICOLOGICAL INFORMATION

Information on Toxicological Effects - Product

Acute Toxicity: Not classified

LD50 and LC50 Data: Not available

Skin Corrosion/Irritation: Not classified

Serious Eye Damage/Irritation: Not classified

Aluminum Welding Wires/Rods

Safety Data Sheet

According To Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules And Regulations

Respiratory or Skin Sensitization: Not classified

Germ Cell Mutagenicity: Not classified

Teratogenicity: Not available

Carcinogenicity: Not classified.

Specific Target Organ Toxicity (Repeated Exposure): Not classified

Reproductive Toxicity: Not classified

Specific Target Organ Toxicity (Single Exposure): Not classified.

Aspiration Hazard: Not classified

Symptoms/Injuries After Inhalation: The primary acute health hazard associated with this product would be the potential for exposure to fumes during metal processing operations. During processing, the most significant route of exposure is by the inhalation (breathing) of fumes. If fumes are inhaled, they can cause a condition commonly known as metal fume fever with symptoms which resemble influenza; Symptoms may be delayed 4-12 hours and begin with a sudden onset of thirst, and a sweet, metallic or foul taste in the mouth. Other symptoms may include upper respiratory tract irritation accompanied by coughing and a dryness of the mucous membranes, lassitude and a generalized feeling of malaise. Fever, chills, muscular pain, mild to severe headache, nausea, occasional vomiting, exaggerated mental activity, profuse sweating, excessive urination, diarrhea and prostration may also occur.

Symptoms/Injuries After Skin Contact: Contact with hot, molten metal will cause thermal burns.

Symptoms/Injuries After Eye Contact: Fumes from thermal decomposition may cause eye irritation. Risk of thermal burns on contact with molten product. Arc rays and sparks can burn eyes.

Symptoms/Injuries After Ingestion: Ingestion is likely to be harmful or have adverse effects.

Chronic Symptoms: This product is intended for use in ARC welding. During this process UV rays irritate the superficial corneal epithelium, causing inhibition of mitosis, production of nuclear fragmentation, and loosening of the epithelial layer. Under experimental conditions in animals, phototoxic effects have been demonstrated at all levels of the cornea, including the stroma and endothelium. Aluminum: Inhalation of finely divided aluminum powder may cause pulmonary fibrosis. Silicon: Can cause chronic bronchitis and narrowing of the airways. Manganese: Chronic exposure can cause inflammation of the lung tissue, scarring the lungs (pulmonary fibrosis). Copper: Overexposure to fumes may cause metal fume fever (chills, muscle aches, nausea, fever, dry throat, cough, weakness, lassitude); metallic or sweet taste; discoloration of skin and hair. Tissue damage of mucous membranes may follow chronic dust exposure. Chromium: Certain hexavalent chromium compounds have been demonstrated to be carcinogenic on the basis of epidemiological investigations on workers and experimental studies in animals. Increased incidences of respiratory cancer have been found in chromium (VI) workers. There is an increased incidence of lung cancer in industrial workers exposed to chromium (VI) compounds. Please refer to IARC volume 23 for a more detailed discussion.

Information on Toxicological Effects - Ingredient(s)

LD50 and LC50 Data:

| | |
|---|---|
| Silicon (7440-21-3) | |
| LD50 Oral Rat | 3160 mg/kg |
| Manganese (7439-96-5) | |
| LD50 Oral Rat | > 2000 mg/kg |
| Chromium (7440-47-3) | |
| LD50 Oral Rat | > 5000 mg/kg |
| Chromium (7440-47-3) | |
| IARC Group | 3 |
| Welding fumes (RR-00009-9) | |
| IARC Group | 2B |
| OSHA Hazard Communication Carcinogen List | In OSHA Hazard Communication Carcinogen list. |

SECTION 12: ECOLOGICAL INFORMATION

Toxicity No additional information available

| | |
|------------------------------|---|
| Manganese (7439-96-5) | |
| NOEC chronic fish | 3.6 mg/l (Exposure time: 96h; Species: Oncorhynchus mykiss) |
| Copper (7440-50-8) | |
| LC50 Fish 1 | <= 0.0068 (0.0068 - 0.0156) mg/l (Exposure time: 96 h - Species: Pimephales promelas) |
| EC50 Daphnia 1 | 0.03 mg/l (Exposure time: 48 h - Species: Daphnia magna [Static]) |

Aluminum Welding Wires/Rods

Safety Data Sheet

According To Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules And Regulations

| | |
|---------------------------------------|---|
| EC50 Other Aquatic Organisms 1 | 0.0426 (0.0426 - 0.0535) mg/l (Exposure time: 72 h - Species: Pseudokirchneriella subcapitata [static]) |
| LC 50 Fish 2 | 0.3 mg/l (Exposure time: 96 h - Species: Pimephales promelas [static]) |
| EC50 Other Aquatic Organisms 2 | 0.031 (0.031 - 0.054) mg/l (Exposure time: 96 h - Species: Pseudokirchneriella subcapitata [static]) |

Persistence and Degradability

| | |
|--------------------------------------|----------------------------|
| Copper (7440-50-8) | |
| Persistence and Degradability | Not readily biodegradable. |

Bioaccumulative Potential Not available

Mobility in Soil Not available

Other Adverse Effects Not available

SECTION 13: DISPOSAL CONSIDERATIONS

Sewage Disposal Recommendations: Do not empty into drains; dispose of this material and its container in a safe way.

Waste Disposal Recommendations: Dispose of waste material in accordance with all local, regional, national, and international regulations.

Additional Information: Recycle where possible and/or dispose of spent material such as metals & metal-bearing waste and submerged arc welding (SAW) flux/slag appropriately.

SECTION 14: TRANSPORT INFORMATION

In Accordance with DOT Not regulated for transport

In Accordance with IMDG Not regulated for transport

In Accordance with IATA Not regulated for transport

In Accordance with TDG Not regulated for transport

SECTION 15: REGULATORY INFORMATION

US Federal Regulations

| | |
|---|--------------------------------|
| Aluminum (7429-90-5) | |
| Listed on the United States TSCA (Toxic Substances Control Act) inventory | |
| Listed on United States SARA Section 313 | |
| SARA Section 311/312 Hazard Classes | Fire hazard Reactive hazard |
| SARA Section 313 - Emission Reporting | 1.0 % (dust or fume only) |
| Silicon (7440-21-3) | |
| Listed on the United States TSCA (Toxic Substances Control Act) inventory | |
| Magnesium (7439-95-4) | |
| Listed on the United States TSCA (Toxic Substances Control Act) inventory | |
| Manganese (7439-96-5) | |
| Listed on the United States TSCA (Toxic Substances Control Act) inventory | |
| Listed on United States SARA Section 313 | |
| SARA Section 313 - Emission Reporting | 1.0 % |
| Copper (7440-50-8) | |
| Listed on the United States TSCA (Toxic Substances Control Act) inventory | |
| Listed on United States SARA Section 313 | |
| SARA Section 313 - Emission Reporting | 1.0 % |
| Chromium (7440-47-3) | |
| Listed on the United States TSCA (Toxic Substances Control Act) inventory | |
| Listed on United States SARA Section 313 | |
| SARA Section 313 - Emission Reporting | 1.0 % |
| Zirconium (7440-67-7) | |
| Listed on the United States TSCA (Toxic Substances Control Act) inventory | |

Aluminum Welding Wires/Rods

Safety Data Sheet

According To Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules And Regulations

| | |
|---|---|
| Vanadium (7440-62-2) | |
| Listed on the United States TSCA (Toxic Substances Control Act) inventory | |
| Listed on United States SARA Section 313 | |
| SARA Section 313 - Emission Reporting | 1.0 % (except when contained in an alloy) |

US State Regulations

| |
|---|
| Aluminum (7429-90-5) |
| U.S. - California - Toxic Air Contaminant List (AB 1807, AB 2728) |
| U.S. - Colorado - Primary Drinking Water Regulations - Secondary Maximum Contaminant Levels (SMCLs) |
| U.S. - Connecticut - Hazardous Air Pollutants - HLVs (30 min) |
| U.S. - Connecticut - Hazardous Air Pollutants - HLVs (8 hr) |
| U.S. - Connecticut - Water Quality Standards - Acute Freshwater Aquatic Life Criteria |
| U.S. - Connecticut - Water Quality Standards - Chronic Freshwater Aquatic Life Criteria |
| U.S. - Delaware - Pollutant Discharge Requirements - Reportable Quantities |
| U.S. - Florida - Drinking Water Standards - Secondary Maximum Contaminant Levels (SMCLs) |
| U.S. - Georgia - Drinking Water - Secondary Maximum Contaminant Levels (SMCLs) |
| U.S. - Idaho - Non-Carcinogenic Toxic Air Pollutants - Acceptable Ambient Concentrations |
| U.S. - Idaho - Non-Carcinogenic Toxic Air Pollutants - Emission Levels (ELs) |
| U.S. - Massachusetts - Drinking Water - Secondary Maximum Contaminant Levels (SMCLs) |
| RTK - U.S. - Massachusetts - Right To Know List |
| U.S. - Massachusetts - Toxics Use Reduction Act |
| U.S. - Michigan - Occupational Exposure Limits - TWAs |
| U.S. - Minnesota - Hazardous Substance List |
| U.S. - Minnesota - Permissible Exposure Limits - TWAs |
| U.S. - Missouri - Drinking Water - Secondary Maximum Contaminant Levels (SMCLs) |
| U.S. - Nevada - Drinking Water - Secondary Maximum Contaminant Levels (SMCLs) |
| U.S. - New Hampshire - Drinking Water - Secondary Maximum Contaminant Levels (SMCLs) |
| U.S. - New Hampshire - Regulated Toxic Air Pollutants - Ambient Air Levels (AALs) - 24-Hour |
| U.S. - New Hampshire - Regulated Toxic Air Pollutants - Ambient Air Levels (AALs) - Annual |
| U.S. - New Jersey - Discharge Prevention - List of Hazardous Substances |
| U.S. - New Jersey - Environmental Hazardous Substances List |
| RTK - U.S. - New Jersey - Right to Know Hazardous Substance List |
| U.S. - New Jersey - Secondary Drinking Water Standards - Recommended Upper Limits (RULs) |
| U.S. - New Jersey - Special Health Hazards Substances List |
| U.S. - New Jersey - Water Quality - Ground Water Quality Criteria |
| U.S. - New Jersey - Water Quality - Practical Quantitation Levels (PQLs) |
| U.S. - New Mexico - Water Quality - Standards for Ground Water of 10,000 mg/L TDS Concentration or Less |
| U.S. - New York - Occupational Exposure Limits - TWAs |
| U.S. - North Dakota - Air Pollutants - Guideline Concentrations - 8-Hour |
| U.S. - Oregon - Permissible Exposure Limits - TWAs |
| U.S. - California - Safer Consumer Products - Initial List of Candidate Chemicals and Chemical Groups |
| U.S. - Pennsylvania - Drinking Water - Secondary Maximum Contaminant Levels (SMCLs) |
| RTK - U.S. - Pennsylvania - RTK (Right to Know) - Environmental Hazard List |
| RTK - U.S. - Pennsylvania - RTK (Right to Know) List |
| U.S. - Rhode Island - Water Quality Standards - Acute Freshwater Aquatic Life Criteria |
| U.S. - Rhode Island - Water Quality Standards - Chronic Freshwater Aquatic Life Criteria |
| U.S. - South Carolina - Secondary Maximum Contaminant Levels (SMCLs) |
| U.S. - Tennessee - Occupational Exposure Limits - TWAs |
| U.S. - Texas - Drinking Water Standards - Secondary Constituent Levels (SCLs) |
| U.S. - Texas - Effects Screening Levels - Long Term |
| U.S. - Texas - Effects Screening Levels - Short Term |
| U.S. - Utah - Drinking Water - Secondary Maximum Contaminant Levels (SMCLs) |
| U.S. - Vermont - Permissible Exposure Limits - TWAs |
| U.S. - Washington - Permissible Exposure Limits - STELS |

Aluminum Welding Wires/Rods

Safety Data Sheet

According To Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules And Regulations

U.S. - Washington - Permissible Exposure Limits - TWAs
U.S. - Alaska - Water Quality Standards - Acute Aquatic Life Criteria for Fresh Water
U.S. - Alaska - Water Quality Standards - Chronic Aquatic Life Criteria for Fresh Water

Silicon (7440-21-3)

U.S. - Idaho - Non-Carcinogenic Toxic Air Pollutants - Acceptable Ambient Concentrations
U.S. - Idaho - Non-Carcinogenic Toxic Air Pollutants - Emission Levels (ELs)
U.S. - Idaho - Occupational Exposure Limits - TWAs
RTK - U.S. - Massachusetts - Right To Know List
U.S. - Michigan - Occupational Exposure Limits - TWAs
U.S. - Minnesota - Hazardous Substance List
U.S. - Minnesota - Permissible Exposure Limits - TWAs
RTK - U.S. - New Jersey - Right to Know Hazardous Substance List
U.S. - New Jersey - Special Health Hazards Substances List
U.S. - New York - Occupational Exposure Limits - TWAs
U.S. - Oregon - Permissible Exposure Limits - TWAs
RTK - U.S. - Pennsylvania - RTK (Right to Know) List
U.S. - Tennessee - Occupational Exposure Limits - TWAs
U.S. - Texas - Effects Screening Levels - Long Term
U.S. - Texas - Effects Screening Levels - Short Term
U.S. - Vermont - Permissible Exposure Limits - TWAs
U.S. - Washington - Permissible Exposure Limits - STELS
U.S. - Washington - Permissible Exposure Limits - TWAs

Magnesium (7439-95-4)

U.S. - Massachusetts - Oil & Hazardous Material List - Reportable Quantity
RTK - U.S. - Massachusetts - Right To Know List
U.S. - Nevada - Drinking Water - Secondary Maximum Contaminant Levels (SMCLs)
RTK - U.S. - New Jersey - Right to Know Hazardous Substance List
RTK - U.S. - Pennsylvania - RTK (Right to Know) List

Manganese (7439-96-5)

U.S. - California - SCAQMD - Toxic Air Contaminants - Non-Cancer Chronic
U.S. - California - Toxic Air Contaminant List (AB 1807, AB 2728)
U.S. - Colorado - Primary Drinking Water Regulations - Secondary Maximum Contaminant Levels (SMCLs)
U.S. - Connecticut - Hazardous Air Pollutants - HLVs (30 min)
U.S. - Connecticut - Hazardous Air Pollutants - HLVs (8 hr)
U.S. - Delaware - Pollutant Discharge Requirements - Reportable Quantities
U.S. - Florida - Drinking Water Standards - Secondary Maximum Contaminant Levels (SMCLs)
U.S. - Georgia - Drinking Water - Secondary Maximum Contaminant Levels (SMCLs)
U.S. - Idaho - Non-Carcinogenic Toxic Air Pollutants - Acceptable Ambient Concentrations
U.S. - Idaho - Non-Carcinogenic Toxic Air Pollutants - Emission Levels (ELs)
U.S. - Idaho - Occupational Exposure Limits - Ceilings
U.S. - Illinois - Toxic Air Contaminant Carcinogens
U.S. - Illinois - Toxic Air Contaminants
U.S. - Louisiana - Reportable Quantity List for Pollutants
U.S. - Maine - Air Pollutants - Hazardous Air Pollutants
U.S. - Massachusetts - Drinking Water - Secondary Maximum Contaminant Levels (SMCLs)
U.S. - Massachusetts - Drinking Water Guidelines
RTK - U.S. - Massachusetts - Right To Know List
U.S. - Massachusetts - Toxics Use Reduction Act
U.S. - Michigan - Occupational Exposure Limits - STELS
U.S. - Michigan - Occupational Exposure Limits - TWAs
U.S. - Minnesota - Chemicals of High Concern
U.S. - Minnesota - Groundwater Health Risk Limits
U.S. - Minnesota - Hazardous Substance List

Aluminum Welding Wires/Rods

Safety Data Sheet

According To Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules And Regulations

U.S. - Minnesota - Permissible Exposure Limits - STELs
U.S. - Minnesota - Permissible Exposure Limits - TWAs
U.S. - Missouri - Drinking Water - Secondary Maximum Contaminant Levels (SMCLs)
U.S. - Nevada - Drinking Water - Secondary Maximum Contaminant Levels (SMCLs)
U.S. - New Hampshire - Drinking Water - Secondary Maximum Contaminant Levels (SMCLs)
U.S. - New Hampshire - Regulated Toxic Air Pollutants - Ambient Air Levels (AALs) - 24-Hour
U.S. - New Hampshire - Regulated Toxic Air Pollutants - Ambient Air Levels (AALs) - Annual
U.S. - New Jersey - Discharge Prevention - List of Hazardous Substances
U.S. - New Jersey - Environmental Hazardous Substances List
RTK - U.S. - New Jersey - Right to Know Hazardous Substance List
U.S. - New Jersey - Secondary Drinking Water Standards - Recommended Upper Limits (RULs)
U.S. - New Jersey - Special Health Hazards Substances List
U.S. - New Jersey - Water Quality - Ground Water Quality Criteria
U.S. - New Jersey - Water Quality - Practical Quantitation Levels (PQLs)
U.S. - New Mexico - Water Quality - Standards for Ground Water of 10,000 mg/L TDS Concentration or Less
U.S. - New York - Occupational Exposure Limits - TWAs
U.S. - North Carolina - Control of Toxic Air Pollutants
U.S. - North Dakota - Air Pollutants - Guideline Concentrations - 8-Hour
U.S. - Oregon - Permissible Exposure Limits - Ceilings
U.S. - California - Safer Consumer Products - Initial List of Candidate Chemicals and Chemical Groups
U.S. - Pennsylvania - Drinking Water - Secondary Maximum Contaminant Levels (SMCLs)
RTK - U.S. - Pennsylvania - RTK (Right to Know) - Environmental Hazard List
RTK - U.S. - Pennsylvania - RTK (Right to Know) List
U.S. - Rhode Island - Air Toxics - Acceptable Ambient Levels - 24-Hour
U.S. - Rhode Island - Air Toxics - Acceptable Ambient Levels - Annual
U.S. - South Carolina - Secondary Maximum Contaminant Levels (SMCLs)
U.S. - Tennessee - Occupational Exposure Limits - STELs
U.S. - Tennessee - Occupational Exposure Limits - TWAs
U.S. - Texas - Drinking Water Standards - Secondary Constituent Levels (SCLs)
U.S. - Texas - Effects Screening Levels - Long Term
U.S. - Texas - Effects Screening Levels - Short Term
U.S. - Utah - Drinking Water - Secondary Maximum Contaminant Levels (SMCLs)
U.S. - Vermont - Permissible Exposure Limits - Ceilings
U.S. - Vermont - Permissible Exposure Limits - STELs
U.S. - Vermont - Permissible Exposure Limits - TWAs
U.S. - Virginia - Water Quality Standards - Public Water Supply Effluent Limits
U.S. - Washington - Permissible Exposure Limits - Ceilings
U.S. - Washington - Permissible Exposure Limits - STELs
U.S. - Wisconsin - Hazardous Air Contaminants - All Sources - Emissions From Stack Heights 25 Feet to Less Than 40 Feet
U.S. - Wisconsin - Hazardous Air Contaminants - All Sources - Emissions From Stack Heights 40 Feet to Less Than 75 Feet
U.S. - Wisconsin - Hazardous Air Contaminants - All Sources - Emissions From Stack Heights 75 Feet or Greater
U.S. - Wisconsin - Hazardous Air Contaminants - All Sources - Emissions From Stack Heights Less Than 25 Feet

Copper (7440-50-8)

U.S. - California - Priority Toxic Pollutants - Freshwater Criteria
U.S. - California - Priority Toxic Pollutants - Human Health Criteria
U.S. - California - Priority Toxic Pollutants - Saltwater Criteria
U.S. - California - SCAQMD - Toxic Air Contaminants - Non-Cancer Acute
U.S. - California - Toxic Air Contaminant List (AB 1807, AB 2728)
U.S. - Colorado - Primary Drinking Water Regulations - Maximum Contaminant Level Goals (MCLGs)
U.S. - Colorado - Primary Drinking Water Regulations - Secondary Maximum Contaminant Levels (SMCLs)
U.S. - Connecticut - Drinking Water Quality Standards - Groundwater Sources
U.S. - Connecticut - Drinking Water Quality Standards - Maximum Contaminant Levels
U.S. - Connecticut - Hazardous Air Pollutants - HLVs (30 min)

Aluminum Welding Wires/Rods

Safety Data Sheet

According To Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules And Regulations

U.S. - Connecticut - Hazardous Air Pollutants - HLVs (8 hr)
U.S. - Connecticut - Water Quality Standards - Acute Freshwater Aquatic Life Criteria
U.S. - Connecticut - Water Quality Standards - Acute Saltwater Aquatic Life Criteria
U.S. - Connecticut - Water Quality Standards - Chronic Freshwater Aquatic Life Criteria
U.S. - Connecticut - Water Quality Standards - Chronic Saltwater Aquatic Life Criteria
U.S. - Connecticut - Water Quality Standards - Consumption of Water and Organisms
U.S. - Connecticut - Water Quality Standards - Health Designations
U.S. - Delaware - Pollutant Discharge Requirements - Reportable Quantities
U.S. - Florida - Drinking Water Standards - Secondary Maximum Contaminant Levels (SMCLs)
U.S. - Georgia - Drinking Water - Secondary Maximum Contaminant Levels (SMCLs)
U.S. - Idaho - Non-Carcinogenic Toxic Air Pollutants - Acceptable Ambient Concentrations
U.S. - Idaho - Non-Carcinogenic Toxic Air Pollutants - Emission Levels (ELs)
U.S. - Idaho - Occupational Exposure Limits - TWAs
U.S. - Illinois - Toxic Air Contaminants
U.S. - Louisiana - Reportable Quantity List for Pollutants
U.S. - Maryland - Surface Water Quality Standards - Acute Freshwater Aquatic Life
U.S. - Maryland - Surface Water Quality Standards - Acute Saltwater Aquatic Life Criteria
U.S. - Maryland - Surface Water Quality Standards - Chronic Freshwater Aquatic Life
U.S. - Maryland - Surface Water Quality Standards - Chronic Saltwater Aquatic Life Criteria
U.S. - Maryland - Surface Water Quality Standards - Consumption of Water and Organisms
U.S. - Massachusetts - Allowable Ambient Limits (AALs)
U.S. - Massachusetts - Allowable Threshold Concentrations (ATCs)
U.S. - Massachusetts - Drinking Water - Maximum Contaminant Levels (MCLs)
U.S. - Massachusetts - Drinking Water - Secondary Maximum Contaminant Levels (SMCLs)
U.S. - Massachusetts - Oil & Hazardous Material List - Groundwater Reportable Concentration - Reporting Category 1
U.S. - Massachusetts - Oil & Hazardous Material List - Groundwater Reportable Concentration - Reporting Category 2
U.S. - Massachusetts - Oil & Hazardous Material List - Reportable Quantity
U.S. - Massachusetts - Oil & Hazardous Material List - Soil Reportable Concentration - Reporting Category 1
U.S. - Massachusetts - Oil & Hazardous Material List - Soil Reportable Concentration - Reporting Category 2
RTK - U.S. - Massachusetts - Right To Know List
U.S. - Massachusetts - Threshold Effects Exposure Limits (TELEs)
U.S. - Massachusetts - Toxics Use Reduction Act
U.S. - Michigan - Occupational Exposure Limits - TWAs
U.S. - Michigan - Polluting Materials List
U.S. - Minnesota - Hazardous Substance List
U.S. - Minnesota - Permissible Exposure Limits - TWAs
U.S. - Missouri - Drinking Water - Maximum Contaminant Levels (MCLs)
U.S. - Missouri - Drinking Water - Secondary Maximum Contaminant Levels (SMCLs)
U.S. - Nevada - Drinking Water - Secondary Maximum Contaminant Levels (SMCLs)
U.S. - New Hampshire - Drinking Water - Secondary Maximum Contaminant Levels (SMCLs)
U.S. - New Hampshire - Regulated Toxic Air Pollutants - Ambient Air Levels (AALs) - 24-Hour
U.S. - New Hampshire - Regulated Toxic Air Pollutants - Ambient Air Levels (AALs) - Annual
U.S. - New Jersey - Discharge Prevention - List of Hazardous Substances
U.S. - New Jersey - Environmental Hazardous Substances List
U.S. - New Jersey - Primary Drinking Water Standards - Action Levels - ALs
RTK - U.S. - New Jersey - Right to Know Hazardous Substance List
U.S. - New Jersey - Water Quality - Ground Water Quality Criteria
U.S. - New Jersey - Water Quality - Practical Quantitation Levels (PQLs)
U.S. - New Mexico - Water Quality - Standards for Ground Water of 10,000 mg/L TDS Concentration or Less
U.S. - New York - Occupational Exposure Limits - TWAs
U.S. - New York - Reporting of Releases Part 597 - List of Hazardous Substances
U.S. - North Dakota - Air Pollutants - Guideline Concentrations - 8-Hour
U.S. - North Dakota - Water Quality Standards - Aquatic Life Acute Value for Classes I, IA, II, III
U.S. - North Dakota - Water Quality Standards - Aquatic Life Chronic Value for Classes I, IA, II, III

Aluminum Welding Wires/Rods

Safety Data Sheet

According To Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules And Regulations

U.S. - North Dakota - Water Quality Standards - Human Health Value for Classes I, IA, II
U.S. - Oregon - Permissible Exposure Limits - TWAs
U.S. - Pennsylvania - Beneficial Use of Sewage Sludge by Land Application - Pollutant Ceiling Limits
U.S. - Pennsylvania - Drinking Water - Maximum Contaminant Levels (MCLs)
RTK - U.S. - Pennsylvania - RTK (Right to Know) - Environmental Hazard List
RTK - U.S. - Pennsylvania - RTK (Right to Know) List
U.S. - Rhode Island - Air Toxics - Acceptable Ambient Levels - 1-Hour
U.S. - Rhode Island - Air Toxics - Acceptable Ambient Levels - Annual
U.S. - Rhode Island - Water Quality Standards - Acute Freshwater Aquatic Life Criteria
U.S. - Rhode Island - Water Quality Standards - Acute Saltwater Aquatic Life Criteria
U.S. - Rhode Island - Water Quality Standards - Chronic Freshwater Aquatic Life Criteria
U.S. - Rhode Island - Water Quality Standards - Chronic Saltwater Aquatic Life Criteria
U.S. - Rhode Island - Water Quality Standards - Human Health Criteria for Consumption of Water and Aquatic Organisms
U.S. - South Carolina - Secondary Maximum Contaminant Levels (SMCLs)
U.S. - Tennessee - Occupational Exposure Limits - TWAs
U.S. - Texas - Drinking Water Standards - Secondary Constituent Levels (SCLs)
U.S. - Texas - Effects Screening Levels - Long Term
U.S. - Texas - Effects Screening Levels - Short Term
U.S. - Utah - Drinking Water - Secondary Maximum Contaminant Levels (SMCLs)
U.S. - Vermont - Permissible Exposure Limits - TWAs
U.S. - Virginia - Water Quality Standards - Acute Freshwater Aquatic Life
U.S. - Virginia - Water Quality Standards - Acute Saltwater Aquatic Life
U.S. - Virginia - Water Quality Standards - Chronic Freshwater Aquatic Life
U.S. - Virginia - Water Quality Standards - Chronic Saltwater Aquatic Life
U.S. - Virginia - Water Quality Standards - Public Water Supply Effluent Limits
U.S. - Washington - Permissible Exposure Limits - STELs
U.S. - Washington - Permissible Exposure Limits - TWAs
U.S. - West Virginia - Water Quality - Groundwater Standards - Ceiling Concentrations
U.S. - Wisconsin - Hazardous Air Contaminants - All Sources - Emissions From Stack Heights 25 Feet to Less Than 40 Feet
U.S. - Wisconsin - Hazardous Air Contaminants - All Sources - Emissions From Stack Heights 40 Feet to Less Than 75 Feet
U.S. - Wisconsin - Hazardous Air Contaminants - All Sources - Emissions From Stack Heights 75 Feet or Greater
U.S. - Wisconsin - Hazardous Air Contaminants - All Sources - Emissions From Stack Heights Less Than 25 Feet
U.S. - Alaska - Water Quality Standards - Acute Aquatic Life Criteria for Fresh Water
U.S. - Alaska - Water Quality Standards - Chronic Aquatic Life Criteria for Fresh Water
U.S. - Alaska - Water Quality Standards - Acute Aquatic Life Criteria for Marine Water
U.S. - Alaska - Water Quality Standards - Chronic Aquatic Life Criteria for Marine Water
U.S. - Arkansas - Surface Water Quality Standards - Chronic Aquatic Life Criteria
U.S. - Arkansas - Surface Water Quality Standards - Acute Aquatic Life Criteria

Chromium (7440-47-3)

U.S. - California - Toxic Air Contaminant List (AB 1807, AB 2728)
U.S. - Colorado - Hazardous Wastes - Maximum Concentration for the Toxicity Characteristics
U.S. - Colorado - Primary Drinking Water Regulations - Maximum Contaminant Level Goals (MCLGs)
U.S. - Colorado - Primary Drinking Water Regulations - Maximum Contaminant Levels (MCLs)
U.S. - Connecticut - Drinking Water Quality Standards - Groundwater Sources
U.S. - Connecticut - Drinking Water Quality Standards - Maximum Contaminant Levels
U.S. - Connecticut - Hazardous Air Pollutants - HLVs (30 min)
U.S. - Connecticut - Hazardous Air Pollutants - HLVs (8 hr)
U.S. - Delaware - Pollutant Discharge Requirements - Reportable Quantities
U.S. - Florida - Drinking Water Standards - Inorganic Contaminants - Maximum Contaminant Levels (MCLs)
U.S. - Georgia - Drinking Water - Maximum Contaminant Levels (MCLs)
U.S. - Idaho - Carcinogenic Toxic Air Pollutants - Emission Levels (ELs)
U.S. - Idaho - Non-Carcinogenic Toxic Air Pollutants - Acceptable Ambient Concentrations
U.S. - Idaho - Non-Carcinogenic Toxic Air Pollutants - Emission Levels (ELs)

Aluminum Welding Wires/Rods

Safety Data Sheet

According To Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules And Regulations

U.S. - Idaho - Occupational Exposure Limits - TWAs
U.S. - Illinois - Toxic Air Contaminants
U.S. - Louisiana - Reportable Quantity List for Pollutants
U.S. - Maine - Air Pollutants - Hazardous Air Pollutants
U.S. - Maryland - Surface Water Quality Standards - Consumption of Water and Organisms
U.S. - Massachusetts - Allowable Ambient Limits (AALs)
U.S. - Massachusetts - Allowable Threshold Concentrations (ATCs)
U.S. - Massachusetts - Drinking Water - Maximum Contaminant Levels (MCLs)
U.S. - Massachusetts - Oil & Hazardous Material List - Groundwater Reportable Concentration - Reporting Category 1
U.S. - Massachusetts - Oil & Hazardous Material List - Groundwater Reportable Concentration - Reporting Category 2
U.S. - Massachusetts - Oil & Hazardous Material List - Reportable Quantity
U.S. - Massachusetts - Oil & Hazardous Material List - Soil Reportable Concentration - Reporting Category 1
U.S. - Massachusetts - Oil & Hazardous Material List - Soil Reportable Concentration - Reporting Category 2
RTK - U.S. - Massachusetts - Right To Know List
U.S. - Massachusetts - Threshold Effects Exposure Limits (TEELs)
U.S. - Massachusetts - Toxics Use Reduction Act
U.S. - Michigan - Occupational Exposure Limits - TWAs
U.S. - Michigan - Polluting Materials List
U.S. - Minnesota - Hazardous Substance List
U.S. - Minnesota - Permissible Exposure Limits - TWAs
U.S. - Missouri - Drinking Water - Maximum Contaminant Levels (MCLs)
U.S. - Nebraska - Drinking Water - Maximum Contaminant Levels (MCLs)
U.S. - Nebraska - Maximum Concentration of Contaminants for the Toxicity Characteristic
U.S. - New Hampshire - Drinking Water - Maximum Contaminant Levels (MCLs)
U.S. - New Hampshire - Regulated Toxic Air Pollutants - Ambient Air Levels (AALs) - 24-Hour
U.S. - New Hampshire - Regulated Toxic Air Pollutants - Ambient Air Levels (AALs) - Annual
U.S. - New Jersey - Discharge Prevention - List of Hazardous Substances
U.S. - New Jersey - Environmental Hazardous Substances List
U.S. - New Jersey - Primary Drinking Water Standards - Maximum Contaminant Levels - MCLs
RTK - U.S. - New Jersey - Right to Know Hazardous Substance List
U.S. - New Jersey - Special Health Hazards Substances List
U.S. - New Jersey - Water Quality - Ground Water Quality Criteria
U.S. - New Jersey - Water Quality - Practical Quantitation Levels (PQLs)
U.S. - New Mexico - Water Quality - Standards for Ground Water of 10,000 mg/L TDS Concentration or Less
U.S. - New York - Occupational Exposure Limits - TWAs
U.S. - New York - Reporting of Releases Part 597 - List of Hazardous Substances
U.S. - North Dakota - Air Pollutants - Guideline Concentrations - 8-Hour
U.S. - North Dakota - Hazardous Wastes - Maximum Concentration for the Toxicity Characteristic
U.S. - Oregon - Permissible Exposure Limits - TWAs
U.S. - Pennsylvania - Drinking Water - Maximum Contaminant Levels (MCLs)
RTK - U.S. - Pennsylvania - RTK (Right to Know) - Environmental Hazard List
RTK - U.S. - Pennsylvania - RTK (Right to Know) - Special Hazardous Substances
RTK - U.S. - Pennsylvania - RTK (Right to Know) List
U.S. - South Carolina - Maximum Contaminant Levels (MCLs)
U.S. - Tennessee - Occupational Exposure Limits - TWAs
U.S. - Texas - Drinking Water Standards - Maximum Contaminant Levels (MCLs)
U.S. - Texas - Effects Screening Levels - Long Term
U.S. - Texas - Effects Screening Levels - Short Term
U.S. - Utah - Drinking Water - Maximum Contaminant Levels (MCLs)
U.S. - Vermont - Hazardous Waste - Hazardous Constituents
U.S. - Vermont - Hazardous Waste - Maximum Contaminant Concentration for Toxicity
U.S. - Vermont - Permissible Exposure Limits - TWAs
U.S. - Washington - Dangerous Waste - Dangerous Waste Constituents List
U.S. - Washington - Permissible Exposure Limits - TWAs

Aluminum Welding Wires/Rods

Safety Data Sheet

According To Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules And Regulations

U.S. - West Virginia - Water Quality - Groundwater Standards - Ceiling Concentrations
U.S. - Wisconsin - Hazardous Air Contaminants - All Sources - Emissions From Stack Heights 25 Feet to Less Than 40 Feet
U.S. - Wisconsin - Hazardous Air Contaminants - All Sources - Emissions From Stack Heights 40 Feet to Less Than 75 Feet
U.S. - Wisconsin - Hazardous Air Contaminants - All Sources - Emissions From Stack Heights 75 Feet or Greater
U.S. - Wisconsin - Hazardous Air Contaminants - All Sources - Emissions From Stack Heights Less Than 25 Feet

Zirconium (7440-67-7)

U.S. - Idaho - Non-Carcinogenic Toxic Air Pollutants - Acceptable Ambient Concentrations
U.S. - Idaho - Non-Carcinogenic Toxic Air Pollutants - Emission Levels (ELs)
U.S. - Idaho - Occupational Exposure Limits - TWAs
U.S. - Massachusetts - Oil & Hazardous Material List - Groundwater Reportable Concentration - Reporting Category 1
U.S. - Massachusetts - Oil & Hazardous Material List - Groundwater Reportable Concentration - Reporting Category 2
U.S. - Massachusetts - Oil & Hazardous Material List - Reportable Quantity
U.S. - Massachusetts - Oil & Hazardous Material List - Soil Reportable Concentration - Reporting Category 1
U.S. - Massachusetts - Oil & Hazardous Material List - Soil Reportable Concentration - Reporting Category 2
RTK - U.S. - Massachusetts - Right To Know List
RTK - U.S. - New Jersey - Right to Know Hazardous Substance List
U.S. - New Jersey - Special Health Hazards Substances List
U.S. - North Dakota - Air Pollutants - Guideline Concentrations - 1-Hour
U.S. - North Dakota - Air Pollutants - Guideline Concentrations - 8-Hour
U.S. - Oregon - Permissible Exposure Limits - TWAs
RTK - U.S. - Pennsylvania - RTK (Right to Know) List
U.S. - Wisconsin - Hazardous Air Contaminants - All Sources - Emissions From Stack Heights 25 Feet to Less Than 40 Feet
U.S. - Wisconsin - Hazardous Air Contaminants - All Sources - Emissions From Stack Heights 40 Feet to Less Than 75 Feet
U.S. - Wisconsin - Hazardous Air Contaminants - All Sources - Emissions From Stack Heights 75 Feet or Greater
U.S. - Wisconsin - Hazardous Air Contaminants - All Sources - Emissions From Stack Heights Less Than 25 Feet

Vanadium (7440-62-2)

U.S. - Delaware - Pollutant Discharge Requirements - Reportable Quantities
U.S. - Idaho - Non-Carcinogenic Toxic Air Pollutants - Acceptable Ambient Concentrations
U.S. - Idaho - Non-Carcinogenic Toxic Air Pollutants - Emission Levels (ELs)
U.S. - Massachusetts - Allowable Ambient Limits (AALs)
U.S. - Massachusetts - Allowable Threshold Concentrations (ATCs)
U.S. - Massachusetts - Oil & Hazardous Material List - Groundwater Reportable Concentration - Reporting Category 1
U.S. - Massachusetts - Oil & Hazardous Material List - Groundwater Reportable Concentration - Reporting Category 2
U.S. - Massachusetts - Oil & Hazardous Material List - Reportable Quantity
U.S. - Massachusetts - Oil & Hazardous Material List - Soil Reportable Concentration - Reporting Category 1
U.S. - Massachusetts - Oil & Hazardous Material List - Soil Reportable Concentration - Reporting Category 2
RTK - U.S. - Massachusetts - Right To Know List
U.S. - Massachusetts - Threshold Effects Exposure Limits (TELs)
U.S. - Massachusetts - Toxics Use Reduction Act
U.S. - Minnesota - Groundwater Health Risk Limits
U.S. - New Jersey - Discharge Prevention - List of Hazardous Substances
U.S. - New Jersey - Environmental Hazardous Substances List
RTK - U.S. - New Jersey - Right to Know Hazardous Substance List
RTK - U.S. - Pennsylvania - RTK (Right to Know) - Environmental Hazard List
RTK - U.S. - Pennsylvania - RTK (Right to Know) List
U.S. - Rhode Island - Air Toxics - Acceptable Ambient Levels - 1-Hour
U.S. - Tennessee - Occupational Exposure Limits - TWAs
U.S. - Texas - Effects Screening Levels - Long Term
U.S. - Texas - Effects Screening Levels - Short Term

Welding fumes (RR-00009-9)

U.S. - Connecticut - Hazardous Air Pollutants - HLVs (30 min)
U.S. - Connecticut - Hazardous Air Pollutants - HLVs (8 hr)
U.S. - Illinois - Toxic Air Contaminant Carcinogens

Aluminum Welding Wires/Rods

Safety Data Sheet

According To Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules And Regulations

| |
|---|
| U.S. - Illinois - Toxic Air Contaminants |
| U.S. - Michigan - Occupational Exposure Limits - TWAs |
| U.S. - Minnesota - Hazardous Substance List |
| U.S. - Minnesota - Permissible Exposure Limits - TWAs |
| U.S. - New Hampshire - Regulated Toxic Air Pollutants - Ambient Air Levels (AALs) - 24-Hour |
| U.S. - New Hampshire - Regulated Toxic Air Pollutants - Ambient Air Levels (AALs) - Annual |
| U.S. - New York - Occupational Exposure Limits - TWAs |
| RTK - U.S. - Pennsylvania - RTK (Right to Know) List |
| U.S. - Tennessee - Occupational Exposure Limits - TWAs |
| U.S. - Vermont - Permissible Exposure Limits - TWAs |
| U.S. - Washington - Permissible Exposure Limits - STELS |
| U.S. - Washington - Permissible Exposure Limits - TWAs |

| |
|---|
| Aluminum, welding fumes (RR-00020-4) |
| U.S. - Connecticut - Hazardous Air Pollutants - HLVs (30 min) |
| U.S. - Connecticut - Hazardous Air Pollutants - HLVs (8 hr) |
| U.S. - Michigan - Occupational Exposure Limits - TWAs |
| U.S. - Minnesota - Hazardous Substance List |
| U.S. - Minnesota - Permissible Exposure Limits - TWAs |
| U.S. - New Hampshire - Regulated Toxic Air Pollutants - Ambient Air Levels (AALs) - 24-Hour |
| U.S. - New Hampshire - Regulated Toxic Air Pollutants - Ambient Air Levels (AALs) - Annual |
| U.S. - New York - Occupational Exposure Limits - TWAs |
| RTK - U.S. - Pennsylvania - RTK (Right to Know) - Special Hazardous Substances |
| RTK - U.S. - Pennsylvania - RTK (Right to Know) List |
| U.S. - Tennessee - Occupational Exposure Limits - TWAs |
| U.S. - Washington - Permissible Exposure Limits - STELS |
| U.S. - Washington - Permissible Exposure Limits - TWAs |

Canadian Regulations

| | |
|---|--|
| Aluminum (7429-90-5) | |
| Listed on the Canadian DSL (Domestic Substances List) | |
| Listed on the Canadian IDL (Ingredient Disclosure List) | |
| IDL Concentration 1 % | |
| WHMIS Classification | Class B Division 6 - Reactive Flammable Material Class B Division 4 - Flammable Solid |

| | |
|---|---|
| Silicon (7440-21-3) | |
| Listed on the Canadian DSL (Domestic Substances List) | |
| WHMIS Classification | Uncontrolled product according to WHMIS classification criteria |

| | |
|---|--|
| Magnesium (7439-95-4) | |
| Listed on the Canadian DSL (Domestic Substances List) | |
| WHMIS Classification | Class B Division 4 - Flammable Solid Class B Division 6 - Reactive Flammable Material |

| | |
|---|---|
| Manganese (7439-96-5) | |
| Listed on the Canadian DSL (Domestic Substances List) | |
| Listed on the Canadian IDL (Ingredient Disclosure List) | |
| IDL Concentration 1 % | |
| WHMIS Classification | Uncontrolled product according to WHMIS classification criteria |

| | |
|---|---|
| Copper (7440-50-8) | |
| Listed on the Canadian DSL (Domestic Substances List) | |
| Listed on the Canadian IDL (Ingredient Disclosure List) | |
| IDL Concentration 1 % | |
| WHMIS Classification | Uncontrolled product according to WHMIS classification criteria |

Aluminum Welding Wires/Rods

Safety Data Sheet

According To Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules And Regulations

| | |
|---|---|
| Chromium (7440-47-3) | |
| Listed on the Canadian DSL (Domestic Substances List) | |
| Listed on the Canadian IDL (Ingredient Disclosure List) | |
| IDL Concentration 0.1 % | |
| WHMIS Classification | Uncontrolled product according to WHMIS classification criteria |
| Zirconium (7440-67-7) | |
| Listed on the Canadian DSL (Domestic Substances List) | |
| Listed on the Canadian IDL (Ingredient Disclosure List) | |
| IDL Concentration 1 % | |
| WHMIS Classification | Class B Division 4 - Flammable Solid |
| Vanadium (7440-62-2) | |
| Listed on the Canadian DSL (Domestic Substances List) | |
| Listed on the Canadian IDL (Ingredient Disclosure List) | |
| IDL Concentration 1 % | |
| WHMIS Classification | Uncontrolled product according to WHMIS classification criteria |

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the SDS contains all of the information required by CPR.

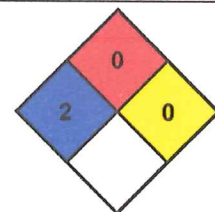
SECTION 16: OTHER INFORMATION, INCLUDING DATE OF PREPARATION OR LAST REVISION

Revision Date : 06/09/2015
Other Information : This document has been prepared in accordance with the SDS requirements of the OSHA Hazard Communication Standard 29 CFR 1910.1200.

GHS Full Text Phrases:

| | |
|-------------------|---|
| Aquatic Acute 1 | Hazardous to the aquatic environment - Acute Hazard Category 1 |
| Aquatic Chronic 2 | Hazardous to the aquatic environment - Chronic Hazard Category 2 |
| Comb. Dust | Combustible Dust |
| Flam. Sol. 1 | Flammable solids Category 1 |
| Pyr. Sol. 1 | Pyrophoric solids Category 1 |
| Self-heat. 1 | Self-heating substances and mixtures Category 1 |
| Self-heat. 2 | Self-heating substances and mixtures Category 2 |
| Water-react. 1 | Substances and mixtures which in contact with water emit flammable gases Category 1 |
| Water-react. 2 | Substances and mixtures which in contact with water emit flammable gases Category 2 |
| H228 | Flammable solid |
| H232 | May form combustible dust concentrations in air |
| H250 | Catches fire spontaneously if exposed to air |
| H251 | Self-heating; may catch fire |
| H252 | Self-heating in large quantities; may catch fire |
| H260 | In contact with water releases flammable gases which may ignite spontaneously |
| H261 | In contact with water releases flammable gases |
| H400 | Very toxic to aquatic life |
| H411 | Toxic to aquatic life with long lasting effects |

NFPA Health Hazard : 2 - Intense or continued exposure could cause temporary incapacitation or possible residual injury unless prompt medical attention is given.
NFPA Fire Hazard : 0 - Materials that will not burn.
NFPA Reactivity : 0 - Normally stable, even under fire exposure conditions, and are not reactive with water.



HMIS III Rating

Health : 1 Slight Hazard - Irritation or minor reversible injury possible
Flammability : 0 Minimal Hazard

Aluminum Welding Wires/Rods

Safety Data Sheet

According To Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules And Regulations

Physical : 0 Minimal Hazard

Party Responsible for the Preparation of This Document

Harris Products Group T 513.234.9127

Disclaimer Harris Products Group cannot anticipate all conditions under which this information and its product, or the products of other manufacturers in combination with its product, may be used. It is the user's responsibility to ensure safe conditions for use, handling, storage and disposal of the product, and to assume liability for loss, injury, damage or expense due to improper use. The information in the sheet was written based on the best knowledge and experience currently available. No warranty, expressed, or implied, is given.

This information is based on our current knowledge and is intended to describe the product for the purposes of health, safety and environmental requirements only. It should not therefore be construed as guaranteeing any specific property of the product.

North America GHS US 2012 & WHMIS 2