



MATERIAL SAFETY DATA SHEET

Prepared to U.S. OSHA, CMA, ANSI and Canadian WHMIS Standards. This Material Safety Data Sheet is offered pursuant to OSHA's Hazard Communication Standard (29 CFR 1910.1200). Other government regulations must be reviewed for applicability to these products.

WARNING: PRODUCT COMPONENTS PRESENT HEALTH AND SAFETY HAZARDS. READ AND UNDERSTAND THIS MATERIAL SAFETY DATA SHEET (M.S.D.S.). ALSO, FOLLOW YOUR EMPLOYER'S SAFETY PRACTICES. This product may contain Chromium and/or Nickel, which are listed by OSHA, NTP, or IARC as being a carcinogen or potential carcinogen. Use of this product may expose you or others to fumes and gases at levels exceeding those established by the American Conference of Governmental Industrial Hygienists (ACGIH) or the Occupational Safety and Health Administration (OSHA) The information contained herein relates only to the specific product. If the product is combined with other materials, all component properties must be considered. **BE SURE TO CONSULT THE LATEST VERSION OF THE MSDS. MATERIAL SAFETY DATA SHEETS ARE AVAILABLE FROM HARRIS PRODUCTS GROUP** salesinfo@wharris.com 513-754-2000 www.harrisproductsgroup.com

STATEMENT OF LIABILITY-DISCLAIMER

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PART I *What is the material and what do I need to know in an emergency?*

1. PRODUCT IDENTIFICATION

**TRADE NAME (AS LABELED): COPPER BASED ALLOYS, INCLUDING:
SILICON BRONZE, PHOSPHOR BRONZE C, DEOXIDIZED COPPER, ALUMINUM
BRONZE A2, ALUMINUM BRONZE A1**

CHEMICAL NAME/CLASS: Metal Alloy
SYNONYMS: Not Applicable
PRODUCT USE: Metal Welding
DOCUMENT NUMBER: 0079
SUPPLIER/MANUFACTURER'S NAME: HARRIS PRODUCTS GROUP
ADDRESS: 4501 Quality Place Mason, Ohio 45040
EMERGENCY PHONE: CHEMTREC: 1-800-424-9300
BUSINESS PHONE: 513-754-2000 **FAX** 513-754-8778
DATE OF PREPARATION: August 20, 2010

2. COMPOSITION and INFORMATION ON INGREDIENTS*

NOMINAL COMPOSITION WEIGHT % WIRE									
ALLOY	Cu	Zn	Sn	Mn	Fe	Si	P	Al	Pb
Silicon Bronze	Balance	1.0	1.0	1.5	0.50	2.8-4.0		0.01	0.02
Deoxidized Copper	Balance		1.0	0.50		0.50	0.15	0.01	0.02
Phosphor Bronze C	Balance		7.0-9.0				0.10-0.35	0.01	0.02
Aluminum Bronze A1	Balance	0.20		0.50		0.10		6.0-8.5	0.02
Aluminum Bronze A2	Balance	0.20			1.5			8.5-11.0	0.02

*Single values are maximum percentages.

2. COMPOSITION and INFORMATION ON INGREDIENTS (Continued)

CHEMICAL NAME	CAS #	% w/w	EXPOSURE LIMITS IN AIR					
			ACGIH-TLV		OSHA-PEL		IDLH mg/m ³	OTHER mg/m ³
			TWA mg/m ³	STEL mg/m ³	TWA mg/m ³	STEL mg/m ³		
Aluminum (exposure limits are for aluminum, metal dust and aluminum, welding fume, as aluminum)	7429-90-5	See Table Previous Page	10 (dust) 5 (fumes)	NE	15 (Total dust) 5 (Respirable fraction) 5 (fume) (vacated 1989 PEL)	NE	NE	NIOSH RELS: TWA = 10 (Total dust); 5 (Respirable fraction); 5 (fumes) DFG MAK: TWA = 1.5 (dust - Respirable fraction)
Copper (exposure limits are for copper fume and dusts and mists, as Cu)	7440-50-8	See Table Previous Page	0.2 (fume) 1 (dust and mists)	NE	0.1 (fume) 1 (dust and mists)	NE	100	NIOSH RELS: TWA 1 = (dust); 0.1 (fume) DFG MAKs: TWA = 0.1 (fume-Respirable fraction); 1 (dusts & mists-inhalable fraction) PEAK = 2 MAK, 30 min., average value Carcinogen: EPA-D (dusts & mists)
Iron (exposure limits are for Iron Oxide dust and fume as Fe)	1309-37-1	See Table Previous Page	5, A4 (Not Classifiable as a Human Carcinogen)	NE	10	NE	2500	NIOSH REL: TWA = 5 DFG MAK: TWA = 6 (Respirable Fraction) Carcinogen: IARC-3, TLV-A4
Lead (exposure limits are for Lead, elemental & inorganic compounds, as Pb)	7439-92-1	See Table Previous Page	0.05, A3 (Confirmed Animal Carcinogen)	NE	0.05 (see 29 CFR 1910.1025)	NE	100	NIOSH REL: TWA = < 0.1; Blood Lead Content <0.06 mg/100 g whole blood. DFG MAKs: TWA = 0.1 (Measured as the inhalable fraction of the aerosol) DFG MAK Pregnancy Risk Classification: B Carcinogen: EPA-B2, IARC-2B, TLV-A3
Manganese (exposure limits are for Manganese, elemental, inorganic compounds, and fume, as manganese)	7439-96-5	See Table Previous Page	0.2	NE	1 (vacated 1989 PEL)	5 (ceiling) 3 (vacated 1989 PEL)	500	NIOSH RELS: TWA = 1 STEL = 3 DFG MAK: TWA = 0.5 (Inhalable Fraction) PEAK = 10•MAK 30 min., average value DFG MAK Pregnancy Risk Classification: C Carcinogen: EPA-D

NE = Not Established.

See Section 16 for Definitions of Terms Used.

NOTE (1): The ACGIH has an established exposure limit for Welding Fumes, Not Otherwise Classified. The Threshold Limit Value is 5 mg/m³. NIOSH classifies welding fumes as carcinogens. Single values shown are maximum, unless otherwise noted.

NOTE (2): ALL WHMIS required information is included in appropriate sections based on the ANSI Z400.1-1998 format. This product has been classified in accordance with the hazard criteria of the CPR and the MSDS contains all the information required by the CPR.

2. COMPOSITION and INFORMATION ON INGREDIENTS (Continued)

CHEMICAL NAME	CAS #	% w/w	EXPOSURE LIMITS IN AIR					
			ACGIH-TLV		OSHA-PEL		IDLH mg/m ³	OTHER mg/m ³
			TWA mg/m ³	STEL mg/m ³	TWA mg/m ³	STEL mg/m ³		
Phosphorous (yellow)	7723-14-0	See Table Previous Page	0.1	NE	0.1	NE	5	NIOSH REL: TWA = 0.1 DFG MAKs: TWA = 0.1 PEAK = 2•MAK 5 min., momentary value DFG Pregnancy Risk Classification: D Carcinogen: EPA-D
Silicon	7440-21-3	See Table Previous Page	10	NE	15 (Total dust) 5 (Respirable fraction) 10 (Total dust) (vacated 1989 PEL)	NE	NE	NIOSH REL: TWA = 10 (Total dust; 5 (Respirable fraction)
Tin, metal	7440-31-5	See Table Previous Page	2	NE	2	NE	100	NIOSH REL: TWA = 2
Zinc Exposure limits given are for Zinc oxide, Fume & Dust	7440-66-6	See Table Page 1	5 (fume) 10 (dust)	10 (fume)	5 (fume) 5 (total dust) 15 (dust, respirable dust) 5 (dust, respirable dust, Vacated 1989 PEL)	NE	500	NIOSH RELs: TWA = 5 (dust & fume) STEL = 10 (fume), 15 (ceiling, 15 min., dust) DFG MAK: TWA = 1.5 (Respirable Fraction, fume) Carcinogen: EPA-D

NE = Not Established.

See Section 16 for Definitions of Terms Used.

NOTE (1): The ACGIH has an established exposure limit for Welding Fumes, Not Otherwise Classified. The Threshold Limit Value is 5 mg/m³. NIOSH classifies welding fumes as carcinogens. Single values shown are maximum, unless otherwise noted.

NOTE (2): ALL WHMIS required information is included in appropriate sections based on the ANSI Z400.1-1998 format. This product has been classified in accordance with the hazard criteria of the CPR and the MSDS contains all the information required by the CPR.

3. HAZARD IDENTIFICATION

EMERGENCY OVERVIEW: These products consist of odorless, light yellow to dark brown metal rods. There are no immediate health hazards associated with these products. These products are not flammable nor reactive. If involved in a fire, these products may generate irritating fumes and a variety of metal oxides. Copper, components of these products, are sensitizers upon repeated or prolonged exposure. Additionally, Lead (present in some of these products in trace amounts) is a suspect human carcinogen. Emergency responders must wear personal protective equipment suitable for the situation to which they are responding.

SYMPTOMS OF OVER-EXPOSURE BY ROUTE OF EXPOSURE: During welding operations, the most significant route of over-exposure is via inhalation of fumes.

INHALATION: Inhalation of large amounts of particulates generated by these products during metal processing operations may result in irritation. Inhalation of copper oxide and zinc oxide fumes can cause metal fume fever. Initial symptoms of metal fume fever can include a metallic or sweet taste in the mouth, dryness or irritation of the throat, and coughing. Later symptoms (after 4–48 hours) can include sweating, shivering, headache, fever, chills, thirstiness, muscle aches, nausea, vomiting, weakness, and tiredness. Repeated over-exposures, via inhalation, to the dusts or fumes generated by these products during welding operations may have adverse effects on the lungs with possible pulmonary edema and emphysema (life-threatening lung injuries). Chronic over-exposure to Copper dust may cause tiredness, stuffiness, diarrhea, and vomiting. Refer to Section 10 (Stability and Reactivity) for information on the specific composition of welding fumes and gases. This product contains trace amounts of lead. Exposure to Lead fumes is not anticipated to be significant during occupational use of this product.

3. HAZARD IDENTIFICATION (Continued)

CONTACT WITH SKIN or EYES: Contact of these products with the skin is not anticipated to be irritating. Rare cases of allergic contact dermatitis have been reported in people working with copper dust. Contact with these products can be physically damaging to the eye (i.e. foreign object). Fumes generated during welding operations can be irritating to the skin and eyes.. Symptoms of skin over-exposure may include irritation and redness. Contact with the molten wire will burn contaminated skin or eyes.

SKIN ABSORPTION: Skin absorption is not known to be a significant route of over-exposure for any component of these products.

INGESTION: Ingestion is not anticipated to be a route of occupational exposure for these products. If swallowed call physician immediately! Do not induce vomiting unless directed by medical personnel. Rinse mouth with water if person is conscious. Never give fluids or induce vomiting if person is unconscious, having convulsions, or not breathing.



INJECTION: Though not a likely route of occupational exposure for these products, injection (via punctures or lacerations in the skin) may cause local reddening, tissue swelling, and discomfort.

HEALTH EFFECTS OR RISKS FROM EXPOSURE: An Explanation in Lay Terms. Symptoms associated with over-exposure to these products and the fumes generated during welding operations are as follows:

ACUTE: The chief acute health hazard associated with these products would be the potential for irritation of contaminated skin and eyes when exposed to fumes during welding operations. Inhalation of large amounts of particulates generated by these products during metal processing operations may result in irritation. Inhalation of copper oxide and zinc oxide fumes can cause metal fume fever. Inhalation of large amounts of particulates generated by these products during metal processing operations can result in pneumoconiosis (a disease of the lungs). Contact with the molten material will burn contaminated skin or eyes. Severe ingestion over-exposure to Copper (a component of these products) may be fatal.

CHRONIC: Chronic skin over-exposure to the fumes of these products during welding operations may produce dermatitis (red, inflamed skin). Chronic over-exposure to Copper dust may cause tiredness, stuffiness, diarrhea, vomiting, discoloration of the skin and eyes, and kidney and liver disorder. Additionally, rare cases of allergic contact dermatitis have been reported in people working with copper dust. Exposure to high levels of airborne Lead may produce symptoms of anemia, insomnia, weakness, constipation, nausea and abdominal pain. Prolonged exposure may result in kidney and nervous system involvement. Women of child-bearing age should avoid exposure to Lead due to post natal effects. Lead, a trace component of these products, is potentially carcinogenic to humans. Refer to Section 11 (Toxicological Information) for further information.

TARGET ORGANS: For fumes: ACUTE: Skin, eyes, respiratory system. CHRONIC: Skin, respiratory system, kidneys, central nervous system, and liver.

HAZARDOUS MATERIAL IDENTIFICATION SYSTEM			
HEALTH		(BLUE)	2
FLAMMABILITY		(RED)	0
REACTIVITY		(YELLOW)	0
PROTECTIVE EQUIPMENT			X
EYES	RESPIRATORY	HANDS	BODY
	See Section 8		See Section 8
For routine industrial applications for the wires			

See Section 16 for Definition of Ratings

PART II *What should I do if a hazardous situation occurs?*

4. FIRST-AID MEASURES

Victims of chemical exposure must be taken for medical attention. Rescuers should be taken for medical attention, if necessary. Take a copy of label and MSDS to health professional with victim.

SKIN EXPOSURE: If fumes generated by welding operations involving this product contaminate the skin, begin decontamination with running water. If molten material contaminates the skin, immediately begin decontamination with cold, running water. Minimum flushing is for 15 minutes. Victim must seek medical attention if any adverse reaction occurs.

EYE EXPOSURE: If fumes generated by welding operations involving this product enter the eyes, open victim's eyes while under gently running water. Use sufficient force to open eyelids. Have victim "roll" eyes. Minimum flushing is for 15 minutes. Victim must seek immediate medical attention.

4. FIRST-AID MEASURES (Continued)

INHALATION: If fumes generated by welding operations involving this product are inhaled, remove victim to fresh air. If necessary, use artificial respiration to support vital functions.

INGESTION: Ingestion is not a likely route of exposure for these products. If swallowed call physician immediately! Do not induce vomiting unless directed by medical personnel. Rinse mouth with water if person is conscious. Never give fluids or induce vomiting if person is unconscious, having convulsions, or not breathing.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Skin, respiratory disorders, kidney and liver disorders may be aggravated by prolonged over-exposures to the dusts or fumes generated by these products. Additionally, lead over-exposures can cause adverse effects on the human reproductive system.

RECOMMENDATIONS TO PHYSICIANS: Very heavy intoxication with Lead (a component of this product) can sometimes be detected by formation of a dark line on the gum margins, the so-called "lead line." Treat symptoms and eliminate over-exposure. Be observant for renal problems and encephalopathy in the event of chronic over-exposures. Zinc (a component of this product) is antagonistic to the toxic effects of lead. Refer to the OSHA Lead Standard (29 CFR 1910.1025; paragraph J) for specific information on Medical Surveillance requirements (i.e. Biological Monitoring, Medical examinations and consultations, blood tests and re-examination protocol).

5. FIRE-FIGHTING MEASURES

FLASH POINT: Not flammable.

AUTOIGNITION TEMPERATURE: Not flammable.

FLAMMABLE LIMITS (in air by volume, %):

Lower (LEL): Not applicable.

Upper (UEL): Not applicable.

FIRE EXTINGUISHING MATERIALS:

Water Spray: YES

Halon: YES

Dry Chemical: YES

Carbon Dioxide: YES

Foam: YES

Other: Any "ABC" Class

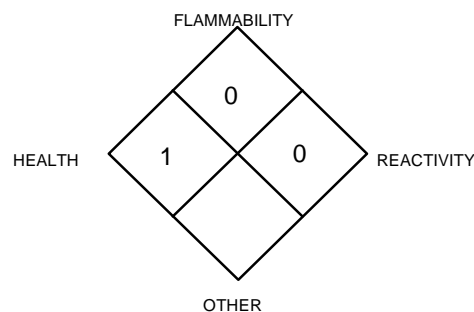
UNUSUAL FIRE AND EXPLOSION HAZARDS: When involved in a fire, these products may generate irritating fumes and a variety of copper, zinc, and aluminum and other metal compounds. The molten material can present a significant thermal hazard to firefighters.

Explosion Sensitivity to Mechanical Impact: Not sensitive.

Explosion Sensitivity to Static Discharge: Not sensitive.

SPECIAL FIRE-FIGHTING PROCEDURES: Not applicable.

NFPA RATING



**See Section 16 for
Definition of Ratings**

6. ACCIDENTAL RELEASE MEASURES

SPILL AND LEAK RESPONSE: These products are solid wire, with no spill or leak hazards.

PART III *How can I prevent hazardous situations from occurring*

7. HANDLING and STORAGE

WORK PRACTICES AND HYGIENE PRACTICES: As with all chemicals, avoid getting these products ON YOU or IN YOU. Wash thoroughly after handling these products. Do not eat or drink while handling these products. Use in a well-ventilated location. Use ventilation and other engineering controls to minimize potential exposure to these products.

STORAGE AND HANDLING PRACTICES: All employees who handle this material should be trained to handle it safely. Avoid breathing fumes of these products during welding operations. Open containers on a stable surface. Packages of these products must be properly labeled. When these products are used during welding operations, follow the requirements of the Federal Occupational Safety and Health Welding and Cutting Standard (29 CFR 1910 Subpart Q) and the safety standards of the American National Standards Institute for welding and cutting (ANSI Z49.1).

Store packages in a cool, dry location. Storage in an atmosphere that is wet, moist, or highly humid may lead to corrosion of these products. Store away from incompatible materials (see Section 10, Stability and Reactivity).

8. EXPOSURE CONTROLS - PERSONAL PROTECTION

VENTILATION AND ENGINEERING CONTROLS: Use with adequate ventilation to ensure exposure levels are maintained below the limits provided in Section 2 (Composition and Information on Ingredients). Prudent practice is to ensure eyewash/safety shower stations are available near areas where these products are used.

RESPIRATORY PROTECTION: Maintain airborne contaminant concentrations below guidelines listed in Section 2 (Composition and Information on Ingredients). If respiratory protection is needed (i.e. a Weld Fume Respirator, or Air-Line Respirator for welding in confined spaces), U.S. Federal OSHA Standard (29 CFR 1910.134), applicable U.S. State regulations, or the Canadian CSA Standard Z94.4-93 and applicable standards of Canadian Provinces. Respiratory Protection is recommended to be worn during welding operations. Oxygen levels below 19.5% are considered IDLH by OSHA. In such atmospheres, use of a full-facepiece pressure/demand SCBA or a full facepiece, supplied air respirator with auxiliary self-contained air supply is required under OSHA's Respiratory Protection Standard (1910.134-1998). NIOSH respiratory protection recommendations for Copper (a main component of these products) are provided as follows:

CONCENTRATION

RESPIRATORY EQUIPMENT

Up to 5 mg/m³:

Dust and mist respirator.

Up to 10 mg/m³:

Dust and mist respirator except single-use and quarter-mask respirator (if not present as a fume); or Supplied Air Respirator (SAR).

Up to 25 mg/m³:

Powered air-purifying respirator with dust and mist filter(s); or SAR operated in a continuous-flow mode.

Up to 50 mg/m³:

Full-facepiece respirator with high-efficiency particulate filter(s); or full-facepiece Self-Contained Breathing Apparatus (SCBA); or full-facepiece SAR; or powered air-purifying respirator with tight-fitting facepiece and high-efficiency particulate filter.

Up to 100 mg/m³:

Positive pressure, full-facepiece SAR.

Emergency or Planned Entry into Unknown Concentrations or IDLH Conditions: Positive pressure, full-facepiece SCBA; or positive pressure, full-facepiece SAR with an auxiliary positive pressure SCBA.

NOTE: Follow the specific respiratory selection guidelines of the OSHA Lead Standard in regulated areas (as defined by 29 CFR 1910.1025)

EYE PROTECTION: Safety glasses. When these products are used in conjunction with welding, wear safety glasses, goggles, or face-shield with filter lens of appropriate shade number (per ANSI Z49.1-1988, "Safety in Welding and Cutting").

HAND PROTECTION: Wear gloves for routine industrial use. When these products are used in conjunction with welding, wear gloves that protect from sparks and flame (per ANSI Z49.1-1988, "Safety in Welding and Cutting").

BODY PROTECTION: Wear body protection appropriate for task.

9. PHYSICAL and CHEMICAL PROPERTIES

The following information is for Copper, a main component of these products, unless otherwise indicated:

RELATIVE VAPOR DENSITY (air = 1): Not applicable.

EVAPORATION RATE (nBuAc = 1): Not applicable.

SPECIFIC GRAVITY (water = 1): 7.6-8.95 (For product)

pH: Not applicable.

SOLUBILITY IN WATER: Insoluble.

ODOR THRESHOLD: Not applicable.

VAPOR PRESSURE, mm Hg @ 20°C: Not applicable.

BOILING POINT: 2595°C (4703°F)

FREEZING/MELTING POINT: 865-1243°C (1590-2270°F) [For product]

COEFFICIENT OF OIL/WATER DISTRIBUTION (PARTITION COEFFICIENT): Not applicable.

The following information is for the products:

APPEARANCE AND COLOR: These products consist of odorless, light yellow to dark brown solid metal rods.

HOW TO DETECT THIS SUBSTANCE (warning properties):The appearance is a distinctive characteristic of these products.

10. STABILITY and REACTIVITY

STABILITY: Stable.

DECOMPOSITION PRODUCTS: Thermal decomposition products can include copper, zinc, aluminum and lead compounds and a variety of metal oxides.

MATERIALS WITH WHICH SUBSTANCE IS INCOMPATIBLE: Strong acids, strong oxidizers, some halogenated compounds and mercury.

HAZARDOUS POLYMERIZATION: Will not occur.

CONDITIONS TO AVOID: Uncontrolled exposure to extreme temperatures, incompatible materials.

PART IV *Is there any other useful information about this material?*

11. TOXICOLOGICAL INFORMATION

TOXICITY DATA: Presented below are human toxicological data available for the components of these products present in concentration greater than 1%. Other data for animals are available for the components of these products, but are not presented in this Material Safety Data Sheet.

COPPER:

TDLo (oral, human) = 120 µg/kg; gastrointestinal tract effects

IRON:

TDLo (oral, child) = 77 mg/kg; BAH, gastrointestinal tract, blood effects

LEAD:

Cytogenic Analysis System (unreported route, human) = 50 :g/m³

TDLo (oral, women) 450 mg/kg; peripheral and central nervous system effects

TCLo (inhalation, human) = 10 :g/m³; gastrointestinal and liver effects

MANGANESE:

TCLo (inhalation, man) = 2300 µg/m³; BRN, central nervous system effects

ZINC:

Skin Irritancy (human) = 300 µg/ 3 days/ intermittent; mild

TCLo (inhalation, human) = 124 mg/m³/ 50 minutes; pulmonary system, skin effects

SUSPECTED CANCER AGENT: The components of these products are listed as follows:

COPPER: EPA-D (Not Classifiable as to Human Carcinogenicity)

IRON (as Iron Oxide): IARC-3 Possibly Carcinogenic to Humans); ACGIH TLV-A4 (Not Classifiable as a Human Carcinogen)

LEAD: ACGIH-A3 (Animal Carcinogen); EPA-B2 (Probable Human Carcinogen-Sufficient Evidence from Animal Studies, Inadequate Evidence or no Data from Epidemiologic Studies); IARC-2B (Possibly Carcinogenic to Humans); Cytogenetic Analysis-Human-Unreported 50 mg/m³

PHOSPHORUS: EPA-D (Not Classifiable as to Human Carcinogenicity)

MANGANESE: EPA-D (Not Classifiable as to Human Carcinogenicity)

ZINC: EPA-D, Not Classifiable as to Human Carcinogenicity (inadequate human and animal evidence of carcinogenicity or no data available)

The other components of these products are not found on the following lists: FEDERAL OSHA Z LIST, NTP, IARC, and CAL/OSHA and therefore are not considered to be, nor suspected to be, cancer-causing agents by these agencies.

IRRITANCY OF PRODUCT: These products' dusts or fumes may be irritating to contaminated skin and eyes. Fumes may be irritating to the respiratory system.

SENSITIZATION TO THE PRODUCT: Rare cases of allergic contact dermatitis have been reported in people working with copper dust.

REPRODUCTIVE TOXICITY INFORMATION: Listed below is information concerning the effects of these products and their components on the human reproductive system.

Mutagenicity: These products are not reported to produce mutagenic effects in humans. Animal mutation data are available for Lead (a trace component of these products); these data were obtained during clinical studies on specific animal tissues exposed to high doses of this compound.

Embryotoxicity: Lead, a component of these products, is a potential human embryotoxin.

Teratogenicity: These products are not reported to cause teratogenic effects in humans. Clinical studies on test animals exposed to relatively high doses of Copper, and Lead (components of these products) indicates teratogenic effects.

Reproductive Toxicity: These products are not reported to cause reproductive effects in humans. Clinical studies on test animals exposed to relatively high doses of Lead and Copper (components of these products) indicate adverse reproductive effects.

A mutagen is a chemical, which causes permanent changes to genetic material (DNA) such that the changes will propagate through generational lines. An embryotoxin is a chemical, which causes damage to a developing embryo (i.e. within the first eight weeks of pregnancy in humans), but the damage does not propagate across generational lines. A teratogen is a chemical, which causes damage to a developing fetus, but the damage does not propagate across generational lines. A reproductive toxin is any substance, which interferes in any way with the reproductive process.

11. TOXICOLOGICAL INFORMATION(Continued)

BIOLOGICAL EXPOSURE INDICES: The following Biological Exposure Indices (BEIs) have been determined for the components of this product.

CHEMICAL DETERMINANT	SAMPLING TIME	BEI
LEAD • Lead in blood	• Not critical	• 30 mg/100 ml

12. ECOLOGICAL INFORMATION

ALL WORK PRACTICES MUST BE AIMED AT ELIMINATING ENVIRONMENTAL CONTAMINATION.

ENVIRONMENTAL STABILITY: The components of these products are expected to persist in the environment for an extended period of time. Additional environmental data are available as follows:

COPPER:

Solubility: Insoluble.

There is no evidence of any biotransformation for copper compounds.

Copper is accumulated by all plants and animals.

BCF Algae = 12; plants = 1,000; invertebrate = 1,000, fish = 667 and fish = 200(Soluble copper salts).

LEAD: Solubility: Insoluble in water. Biological Half-Life for lead in bones of humans is 10 years. Bioconcentration: Lead was absorbed (by fresh water filed crab) through the gills, and distributed to the haenolymph to hepatopancrease, muscle, and exoskeleton. Lead bioaccumulated over the course of the study showed a high degree of organ specificity.

ZINC: Solubility: Insoluble in water. Biological Half-Life for normal humans 162-500 days. Bioconcentration: The Bioconcentration Factor in edible portions of *Crassostrea virginia*, adult oyster) is 16,700 (total zinc).

EFFECT OF MATERIAL ON PLANTS or ANIMALS: These products are not expected to cause adverse effects on plant or animal life. Specific data on test animals are available but are not presented in this Material Safety Data Sheet.

EFFECT OF CHEMICAL ON AQUATIC LIFE: These products may cause adverse effects on aquatic life, especially if large quantities are released into bodies of water. Additional data are available as follows:

COPPER:

LC₅₀ (fathead minnows) = 0.14 ppm in hard water

LC₅₀ (bluegill) = 0.02 ppm in soft water

LC₅₀ (brook trout) = 0.09 ppm in soft water

LC₅₀ (*Anguilla* American eel) 96 hours = 6.4

MATC (*Oncorhynchshawtsch* chinook salmon) = 0.0074

NOAEL (*Oncorhynchshawtsch* chinook salmon) = 0.0074

MATC (*Salmo gairdneri* brown trout) = 0.01901

NOAEL (*Salmo gairdneri* brown trout) = 0.0114

LOAEL (*Salmo gairdneri* brown trout) = 0.0317

IRON:

LC (*Gymnodinium spendens*, plankton) = 1-30 mg/L/ 48 hours

LC (*Isocrysis galbana*, plankton) > 35 mg/L/ 48 hours

TC (*Isocrysis galbana*, plankton) = 1-30 mg/L/ 48 hours; growth inhibition

TC (*Thalassiosira pseudonana*, plankton) = 8-20 mg/L/ 48 hours; growth inhibition

IRON (continued):

LC (*Glenodinium halli*, plankton) = 10 - 100 mg/L/ 48 hours

TC (*Glenodinium halli*, plankton) = 0.5-10 mg/L/ 48 hours; growth inhibition

LEAD:

LC₅₀ (Japanese quail) =, males, females, 14 days old, oral (5-day ad libitum in diet) = 5,000 ppm. At 1,000, 2236, and 5000 ppm, onset of toxic symptoms began at 7 days and remised at 11-12 days

Concentration for fresh and salt water fish, 0.1

Lobster die after 20 days when kept in lead-lined tanks.

LC₅₀ (brook trout) = 0.13 ppm

LC₅₀ (rainbow trout) = 0.43 ppm

ZINC: Odorless zinc poisoning causes inflamed gills in fish. Laboratory studies of Atlantic salmon, rainbow trout, carp, and goldfish have shown avoidance reactions by these fish to zinc in water.

13. DISPOSAL CONSIDERATIONS

PREPARING WASTES FOR DISPOSAL: Waste disposal must be in accordance with appropriate Federal, State, and local regulations. These products, if unaltered by use, may be disposed of by treatment at a permitted facility or as advised by your local hazardous waste regulatory authority.

EPA WASTE NUMBER: Wastes of this product should be analyzed for Toxicity Characteristic Leach Procedure chemicals, as follows: Lead: D008, Regulated Level: 0.4 mg/L

14. TRANSPORTATION INFORMATION

THIS MATERIAL IS NOT HAZARDOUS (Per 49 CFR 172.101) BY THE U.S. DEPARTMENT OF TRANSPORTATION.

PROPER SHIPPING NAME:

Not applicable.

HAZARD CLASS NUMBER and DESCRIPTION:

Not applicable.

UN IDENTIFICATION NUMBER:

Not applicable.

PACKING GROUP:

Not applicable.

DOT LABEL(S) REQUIRED:

Not applicable.

NORTH AMERICAN EMERGENCY RESPONSE GUIDEBOOK NUMBER, 2000: Not applicable.

14. TRANSPORTATION INFORMATION (Continued)

MARINE POLLUTANT: The Department of Transportation (49 CFR 172.101, Appendix B), lists Copper, metal powder, and Lead compounds, soluble, n.o.s., as Marine Pollutants. These components are not present in the specific forms listed and therefore these products do not meet the marking requirement of 49 CFR 172.322.

TRANSPORT CANADA TRANSPORTATION OF DANGEROUS GOODS REGULATIONS: This material is not considered as dangerous goods, per regulations of Transport Canada.

15. REGULATORY INFORMATION

ADDITIONAL U.S. REGULATIONS:

U.S. SARA REPORTING REQUIREMENTS: The components of these products are subject to the reporting requirements of Sections 302, 304 and 313 of Title III of the Superfund Amendments and Reauthorization Act, as follows:

CHEMICAL NAME	SARA 302 (40 CFR 355, Appendix A)	SARA 304 (40 CFR Table 302.4)	SARA 313 (40 CFR 372.65)
Aluminum (fume or dust)	No	No	Yes
Copper	No	Yes	Yes
Lead	No	Yes	Yes
Manganese	No	No	Yes
Phosphorous	Yes	Yes	Yes
Zinc	No	Yes	Yes (fume or dust)

U.S. SARA THRESHOLD PLANNING QUANTITY: Phosphorous 100 lb (45.4 kg)

U.S. TSCA INVENTORY STATUS: The components of these products are listed on the TSCA Inventory.

U.S. CERCLA REPORTABLE QUANTITY (RQ): Copper = 5000 lbs (2270 kg); Lead = 10 lbs (4.45 kg); Phosphorous 1 lb (0.454 kg) Zinc = 1000 lbs (454 kg) [for metal particles under 100 micrometers in diameter].

OTHER U.S. FEDERAL REGULATIONS: Lead is regulated under 1910.1025.

U.S. STATE REGULATORY INFORMATION: The components of these products are covered under specific State regulations, as denoted below:

Alaska-Designated Toxic and Hazardous Substances: Copper Fume, Dust, & Mist, Manganese, Lead, Tin, Aluminum, Metal and Oxide dust, welding fumes

California-Permissible Exposure Limits for Chemical Contaminants: Copper, Manganese, Silicon, Lead, Tin, Aluminum.

Florida-Substance List: Copper Fume, Dust, & Mist, Manganese, Lead, Tin, Zinc.

Illinois-Toxic Substance List: Copper, Manganese, Silicon, Lead, Zinc, Aluminum.

Kansas-Section 302/313 List: Copper, Manganese, Zinc, Aluminum.

Massachusetts-Substance List: Copper, Manganese, Lead, Tin, Zinc, Aluminum.

Minnesota-List of Hazardous Substances: Copper Dust & Mists, Manganese, Silicon, Lead, Tin, Aluminum, Metal and Oxide dust, welding fumes.

Missouri-Employer Information/Toxic Substance List: Copper, Manganese, Silicon, Lead, Tin, Aluminum.

New Jersey-Right to Know Hazardous Substance List: Copper, Manganese, Lead, Tin, Zinc, Aluminum.

North Dakota-List of Hazardous Chemicals, Reportable Quantities: Copper, Zinc.

Pennsylvania-Hazardous Substance List: Copper, Manganese, Silicon, Tin, Zinc, Aluminum.

Rhode Island-Hazardous Substance List: Copper Fume, Dust, & Mist, Manganese, Silicon, Lead, Tin, Zinc, Aluminum.

Texas-Hazardous Substance List: Copper Fume, Manganese, and Lead.

West Virginia-Hazardous Substance List: Copper Fume, Manganese, and Lead.

Wisconsin-Toxic and Hazardous Substances: Copper Fume, Manganese, and Lead.

15. REGULATORY INFORMATION (Continued)

ADDITIONAL U.S. REGULATIONS (continued):

CALIFORNIA PROPOSITION 65 Lead is present in some of these products in trace amounts and is on the California Proposition 65 Lists. **WARNING: This product may contain chemicals, and when used for welding may produce fumes or gases containing chemicals, known to the State of California to cause cancer, and/or birth defects (or other reproductive harm.)**

LABELING (Precautionary Statements):

WARNING: PROTECT yourself and others. Read and understand this information.

FUMES AND GASES can be hazardous to your health.

ARC RAYS can injure eyes and burn skin.

ELECTRIC SHOCK can kill.

- Before Use, read and understand the manufacturer's instructions. Material Safety Data Sheets (MSDSs), and your employer's safety policies.
- Keep your head out of the fumes.
- Use enough ventilation, exhaust at the arc, or both, to keep fumes and gases from your breathing zone and the general area.
- Wear correct eye, ear, and body protection.
- Do not touch live electrical parts.
- See American National Standard Z49.1 *Safety in Welding, Cutting, and Allied Processes*, published by the American Welding Society, 550 N.W. LeJeune Road, Miami, Florida 33126. OSHA Safety and Health Standards, available from the U.S. Government Printing Office, Washington, DC 20402.

DO NOT REMOVE THIS INFORMATION

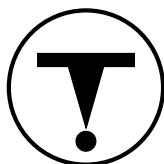
ADDITIONAL CANADIAN REGULATIONS:

CANADIAN DSL/NDL INVENTORY STATUS: The components of these products are on the DSL Inventory.

OTHER CANADIAN REGULATIONS: Not applicable.

CANADIAN ENVIRONMENTAL PROTECTION ACT (CEPA) PRIORITIES SUBSTANCES LISTS: The components of these products are not on the CEPA Priorities Substances Lists.

CANADIAN WHMIS SYMBOLS: **D2-A/D2-B:** Materials causing other toxic effects.



16. OTHER INFORMATION

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This Material Safety Data Sheet is offered pursuant to OSHA's Hazard Communication Standard (29 CFR 1910.1200). Other government regulations must be reviewed for applicability to these products. The information contained herein relates only to the specific product. If the product is combined with other materials, all component properties must be considered. To the best of the Harris Products Group knowledge, the information and recommendations contained in this publication are reliable and accurate as of the date of issue. However, accuracy, suitability, or completeness are not guaranteed, and no warranty, guarantee, or representation, expressed or implied, is made by Harris Products Group. as to the absolute correctness or sufficiency of any representation contained in this and other publications Harris Products Group. assumes no responsibility in connection therewith; nor can it be assumed that all acceptable safety measures may not be required under particular or exceptional conditions or circumstances. Data may be changed from time to time. Be sure to consult the latest edition.

DEFINITIONS OF TERMS

A large number of abbreviations and acronyms appear on a MSDS. Some of these, which are commonly used, include the following:

CAS #: This is the Chemical Abstract Service Number, which uniquely identifies each constituent.

EXPOSURE LIMITS IN AIR:

ACGIH - American Conference of Governmental Industrial Hygienists, a professional association which establishes exposure limits. **TLV** - Threshold Limit Value - an airborne concentration of a substance, which represents conditions under which it is generally believed that nearly all workers, may be repeatedly exposed without adverse effect. The duration must be considered, including the 8-hour Time Weighted Average (**TWA**), the 15-minute Short Term Exposure Limit, and the instantaneous Ceiling Level (**C**). Skin absorption effects must also be considered.

OSHA - U.S. Occupational Safety and Health Administration.

PEL - Permissible Exposure Limit - This exposure value means exactly the same as a TLV, except that it is enforceable by OSHA. The OSHA Permissible Exposure Limits are based in the 1989 PELs and the June, 1993 Air Contaminants Rule (Federal Register: 58: 35338-35351 and 58: 40191). Both the current PELs and the vacated PELs are indicated. The phrase, "Vacated 1989 PEL," is placed next to the PEL, which was vacated by Court Order. **IDLH** - Immediately Dangerous to Life and Health - This level represents a concentration from which one can escape within 30-minutes without suffering escape-preventing or permanent injury. **The DFG - MAK** is the Republic of Germany's Maximum Exposure Level, similar to the U.S. PEL. **NIOSH** is the National Institute of Occupational Safety and Health, which is the research arm of the U.S. Occupational Safety and Health Administration (**OSHA**). NIOSH issues exposure guidelines called Recommended Exposure Levels (**RELs**). When no exposure guidelines are established, an entry of **NE** is made for reference.

HAZARD RATINGS:

HAZARDOUS MATERIALS IDENTIFICATION SYSTEM: Health Hazard: **0** (minimal acute or chronic exposure hazard); **1** (slight acute or chronic exposure hazard); **2** (moderate acute or significant chronic exposure hazard); **3** (severe acute exposure hazard; onetime overexposure can result in permanent injury and may be fatal); **4** (extreme acute exposure hazard; onetime overexposure can be fatal). Flammability Hazard: **0** (minimal hazard); **1** (materials that require substantial pre-heating before burning); **2** (combustible liquid or solids; liquids with a flash point of 38-93°C [100-200°F]); **3** (Class IB and IC flammable liquids with flash points below 38°C [100°F]); **4** (Class IA flammable liquids with flash points below 23°C [73°F] and boiling points below 38°C [100°F]). Reactivity Hazard: **0** (normally stable); **1** (material that can become unstable at elevated temperatures or which can react slightly with water); **2** (materials that are unstable but do not detonate or which can react violently with water); **3** (materials that can detonate when initiated or which can react explosively with water); **4** (materials that can detonate at normal temperatures or pressures).

NATIONAL FIRE PROTECTION ASSOCIATION: Health Hazard: **0** (material that on exposure under fire conditions would offer no hazard beyond that of ordinary combustible materials); **1** (materials that on exposure under fire conditions could cause irritation or minor residual injury); **2** (materials that on intense or continued exposure under fire conditions could cause temporary incapacitation or possible residual injury); **3** (materials that can on short exposure could cause serious temporary or residual injury); **4** (materials that under very short exposure causes death or major residual injury). Flammability Hazard and Reactivity Hazard: Refer to definitions for "Hazardous Materials Identification System".

FLAMMABILITY LIMITS IN AIR:

Much of the information related to fire and explosion is derived from the National Fire Protection Association (**NFPA**). Flash Point - Minimum temperature at which a liquid gives off sufficient vapors to form an ignitable mixture with air. Autoignition Temperature: The minimum temperature required to initiate combustion in air with no other source of ignition. LEL - the lowest percent of vapor in air, by volume, that will explode or ignite in the presence of an ignition source. UEL - the highest percent of vapor in air, by volume, that will explode or ignite in the presence of an ignition source.

TOXICOLOGICAL INFORMATION:

Human and Animal Toxicology: Possible health hazards as derived from human data, animal studies, or from the results of studies with similar compounds are presented. Definitions of some terms used in this section are: **LD₅₀** - Lethal Dose (solids & liquids) which kills 50% of the exposed animals; **LC₅₀** - Lethal Concentration (gases) which kills 50% of the exposed animals; **ppm** concentration expressed in parts of material per million parts of air or water; **mg/m³** concentration expressed in weight of substance per volume of air; **mg/kg** quantity of material, by weight, administered to a test subject, based on their body weight in kg. Other measures of toxicity include **TDLo**, the lowest dose to cause a symptom and **TCLo**, the lowest concentration to cause a symptom; **TDo**, **LDLo**, and **LDo**, or **TC**, **TCo**, **LCLo**, and **LCo**, the lowest dose (or concentration) to cause lethal or toxic effects. **Cancer Information:** The sources are: **IARC** - the International Agency for Research on Cancer; **NTP** - the National Toxicology Program, **RTECS** - the Registry of Toxic Effects of Chemical Substances, **OSHA** and **CAL/OSHA**. IARC and NTP rate chemicals on a scale of decreasing potential to cause human cancer with rankings from 1 to 4. Subrankings (2A, 2B, etc.) are also used. **Other Information:** **BEI** - ACGIH Biological Exposure Indices, represent the levels of determinants which are most likely to be observed in specimens collected from a healthy worker who has been exposed to chemicals to the same extent as a worker with inhalation exposure to the TLV. **Ecological Information:** **EC** is the effect concentration in water. **BCF** = Bioconcentration Factor, which is used to determine if a substance will concentrate in lifeforms which consume contaminated plant or animal matter. Coefficient of Oil/Water Distribution is represented by **log K_{ow}** or **log K_{oc}** and is used to assess a substance's behavior in the environment.

REGULATORY INFORMATION:

This section explains the impact of various laws and regulations on the material. **U.S.:** **EPA** is the U.S. Environmental Protection Agency. **DOT** is the U.S. Department of Transportation. **SARA** is the Superfund Amendments and Reauthorization Act. **TSCA** is the U.S. Toxic Substance Control Act. **CERCLA (or Superfund)** refers to the Comprehensive Environmental Response, Compensation, and Liability Act. Labeling is per the American National Standards Institute (**ANSI Z129.1**). **CANADA:** **CEPA** is the Canadian Environmental Protection Act. **WHMIS** is the Canadian Workplace Hazardous Materials Information System. **TC** is Transport Canada. **DSL/NDL** are the Canadian Domestic/Non-Domestic Substances Lists. **The CPR is the Canadian Product Regulations.** This section also includes information on the precautionary warnings, which appear, on the materials package label.