

LEAD FREE SOLDERS

MATERIAL SAFETY DATA SHEET

01/11/00

MSDS PROVIDED BY:
STOODY INDUSTRIAL AND WELDING SUPPLY, INC.
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MILITARY EMERGENCY RESPONSE NUMBER 1-800-851-8061

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. 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 J.W. HARRIS CO., INC. & HARRIS WELCO DIVISION/J.W. HARRIS CO.**

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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): **LEAD FREE SOLDERS:**

STAY-BRITE®	STAY-BRITE® ROSIN CORE	STAY-BRITE® 8
STAY-SAFE 50®	BRIDGIT®	SPEEDY
NICK®	85/15	95/5

CHEMICAL NAME/CLASS: Solder Alloy
SYNONYMS: Not Applicable
PRODUCT USE: Metal Soldering
DOCUMENT NUMBER: 0125
SUPPLIER/MANUFACTURER'S NAME: J.W. HARRIS CO. INC.
ADDRESS: 4501 Quality Place
Mason, Ohio 45040
EMERGENCY PHONE: CHEMTREC: 1-800-424-9300
BUSINESS PHONE: 800-733-4533
DATE OF PREPARATION: December 10, 1999

2. NOMINAL COMPOSITION and INFORMATION ON INGREDIENTS

NOMINAL COMPOSITION WEIGHT % FOR WIRES						
PRODUCT NAME	Ag	Sb	Cu	Sn	Zn	Ni
BRIDGIT®	0.05-0.15	4.5-5.5	2.5-3.5	Balance		0.15-0.25
NICK®	0.05-0.15		3.5-4.5	Balance		0.15-0.25
SPEEDY			2.5-3.5	Balance		
STAY-BRITE®	3.4-3.8			Balance		
STAY-BRITE® 8	5.0-6.0			Balance		
STAY-BRITE® ROSIN CORE	3.4-3.8			Balance		
STAY-SAFE® 50	0.5	3.0	0.5	Balance	1.50	
85/15				85.0	15.0	
95/5		5.0		95.0		

ROSIN CORE COMPOSITION

ELEMENT	WEIGHT (% of Core Weight)	WEIGHT (% of Total Solder Weight)
Activated Rosin	2.6-3.9%	96.1-97.4%

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2. NOMINAL COMPOSITION and INFORMATION ON INGREDIENTS (Continued)

WIRE COMPOSITION:

CHEMICAL NAME	CAS #	EXPOSURE LIMITS IN AIR					
		ACGIH		OSHA			OTHER
		TLV mg/m ³	STEL mg/m ³	PEL mg/m ³	STEL mg/m ³	IDLH mg/m ³	
Antimony & exposure compounds, as Sb	7440-36-0	0.5	NE	0.5	NE	50	NIOSH RELs: TWA = 0.5 DFG MAK: TWA = 0.5 (Antimony, elemental - measured as the Inhalable fraction of the aerosol) PEAK = 10 MAK, 30 min., average value
Copper (exposure limits are for copper fume, as Copper)	7440-50-8	0.2	NE	0.1	NE	100	NIOSH RELs: TWA = (fume): 0.1 TWA = (dust): 1 DFG MAKs: TWA = (fume): 0.1 (Respirable fraction) TWA = (dusts & mists): 1 (Total respirable dust fraction) PEAK = 2 MAK, 30 min., average value Carcinogen (dusts & mists): EPA-D
Nickel, Elemental metal	7440-02-0	1.5, A5 (Inhalable Fraction) (Not Suspected as a Human Carcinogen)	NE	1	NE	10	NIOSH RELs: TWA = 0.015 Carcinogen: EPA-A, IARC-2B, MAK-A1, NIOSH-X, NTP-2B
Silver The following exposure limits are for "Silver, Metal".	7440-22-4	0.1	NE	0.01	NE	10	NIOSH REL TWA = (dust): 0.01 DFG MAKs: TWA = 0.01 (Inhalable Fraction) PEAK = 2 MAK, 5 min., momentary value (Inhalable Fraction) Carcinogen: EPA-D
Tin The following exposure limits are for "Tin, Metal".	7440-31-5	2	NE	2	NE	100	NIOSH REL: TWA = 2
Zinc (exposure limits are for zinc oxide, fume)	7440-66-6	5	10	5	NE	NE	NIOSH RELs: TWA = 5 (fume & dusts) STEL = 10 (fume) STEL = 15 (ceiling, 15 minutes, dusts) DFG MAKs: TWA = 5 (Respirable fraction, fume) PEAK = 10 MAK, 30 min., average value Carcinogen: EPA-D

NE = Not Established. C = Ceiling Limit. 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. classifies

NOTE(2): All WHMIS required information is included. It is located in appropriate sections based on the ANSI Z400.1-1993 format.

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2. NOMINAL COMPOSITION and INFORMATION ON INGREDIENTS (Continued)

ROSIN CORE COMPOSITION:

CHEMICAL NAME	CAS #	EXPOSURE LIMITS IN AIR					
		ACGIH		OSHA			OTHER
		TLV mg/m ³	STEL mg/m ³	PEL mg/m ³	STEL mg/m ³	IDLH mg/m ³	
WW Rosin The following exposure limits are for "Rosin Core Solder decomposition products, as resin acids-colophony"	8050-09-7	Sensitizer, reduce exposure as low as possible.	NE	NE	NE	NE	DFG MAK: Danger of sensitization of the skin

NE = Not Established. C = Ceiling Limit. 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 [per NIOSH (NIOSH-X category)].

NOTE(2): All WHMIS required information is included. It is located in appropriate sections based on the ANSI Z400.1-1993 format.

3. HAZARD IDENTIFICATION

EMERGENCY OVERVIEW: These products consist of gray to silver-colored, odorless wires, which may have a plastic core through the center. There is no immediate health hazard associated with the wire product. The plastic core of these products contains a sensitizer; prolonged or repeated exposure to this plastic can cause respiratory and skin allergy-like reactions. Nickel, a component of the Bridgit[®], and Nick[®] wires, is a suspect carcinogen. Though the wire is not flammable, if involved in a fire and exposed to extremely high temperatures, harmful fumes containing Tin, Silver, Antimony and Copper and a variety of metal oxides may be generated. These products are not reactive under normal circumstances of use. Emergency responders must wear the proper personal protective equipment suitable for the situation to which they are responding.

SYMPTOMS OF OVER-EXPOSURE BY ROUTE OF EXPOSURE: During soldering operations, the most significant routes of exposure are inhalation, and contact of the skin and eyes.

INHALATION: If any exposure to these fumes does occur, however, the main health effect will be irritation of the nose, throat, and other tissues of the respiratory system. Inhalation of copper oxide and zinc oxide (components of this product) 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 soldering operations may have adverse effects on the lungs with possible pulmonary edema and emphysema (life-threatening lung injuries). Exposure to large quantities of the plastic core component of these products may cause irritation of the nose and respiratory system. Repeated or prolonged inhalation of Rosin, a component of some of the plastic core of these products, can cause allergy-like reactions (i.e. wheezing and asthma).

CONTACT WITH SKIN or EYES: Contact of the wire form of these products with skin is not anticipated to be irritating. Symptoms of skin over-exposures to the fumes or rosin core of these products may include irritation and redness; prolonged or repeated skin over-exposures may lead to dermatitis. Contact of the liquid core of these products with the skin can cause allergic reactions (i.e. rashes and inflammation of the skin). Contact with the wire form of these products can be physically damaging to the eye. Fumes generated during soldering operations can be irritating to the skin and eyes. Symptoms of eye over-exposure include pain, redness, irritation, and tearing. Contact with the molten core solder will burn contaminated skin or eyes.

SKIN ABSORPTION: No component of these products can be absorbed through the skin.

INGESTION: 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.

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3. HAZARD IDENTIFICATION (Continued)



INJECTION: Though not a likely route of occupational exposure for these products, injection of these products (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 soldering operations, are as follows:

ACUTE: 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 solder will burn contaminated skin or eyes.

CHRONIC: Chronic skin over-exposure to the fumes of these products generated during soldering operations may produce dermatitis (red, inflamed skin). Chronic skin contact or ingestion of dusts, salts, or fumes of Silver (a component of some these products) can result in a condition known as Argyria. This condition is marked by a bluish appearance of the skin and eyes. The liquid core of these products contains a sensitizer, prolonged or repeated exposure to this plastic can cause respiratory and skin allergy-like reactions. Nickel, a component of some of these products, is a suspect carcinogen. Refer to Section 11 (Toxicological Information) for further information.

TARGET ORGANS: Skin and eyes.

HAZARDOUS MATERIAL INFORMATION SYSTEM			
HEALTH		(BLUE)	1
FLAMMABILITY		(RED)	0
REACTIVITY		(YELLOW)	0
PROTECTIVE EQUIPMENT			X
EYES	RESPIRATORY	HANDS	BODY
	See Section 8		See Section 8
For routine industrial applications for rods			

See Section 16 for Definition of Ratings

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

4. FIRST-AID MEASURES

SKIN EXPOSURE: If the fumes or plastic core of the product irritates the skin, begin decontamination with running water. Victim must seek medical attention if any adverse reaction occurs. If molten solder contaminates the skin, immediately begin decontamination with cold, running water. Minimum flushing is for 15 minutes. Victim must seek immediate medical attention.

EYE EXPOSURE: If the product's fumes, or plastic core enters the eyes, open victim's eyes while under gentle running water. Use sufficient force to open eyelids. Have victim "roll" eyes. Minimum flushing is for 15 minutes. If molten solder contaminates the eyes, immediately begin decontamination with running water. Minimum flushing is for 15 minutes. Victim must seek immediate medical attention.

INHALATION: If fumes of these products are inhaled, remove victim to fresh air. If necessary, use artificial respiration to support vital functions.

INGESTION: 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.

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

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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.

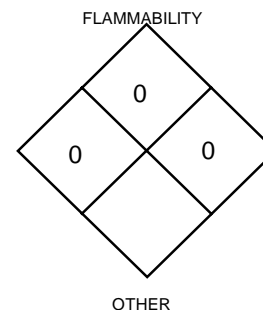
UNUSUAL FIRE AND EXPLOSION HAZARDS: When involved in a fire, this material may melt and produce fumes containing tin, zinc, copper compounds and a variety of metal oxides. When the plastic core is heated, the solvent will evaporate and the rosin core may be degraded to produce aliphatic aldehydes, acids and terpenes. The molten material can present a significant thermal hazard to fire-fighters.

Explosion Sensitivity to Mechanical Impact: Not sensitive.

Explosion Sensitivity to Static Discharge: Not sensitive.

SPECIAL FIRE-FIGHTING PROCEDURES: Incipient fire responders should wear eye protection. Structural fire fighters must wear Self-Contained Breathing Apparatus and full protective equipment. If possible, prevent run-off water from entering storm drains, bodies of water, or other environmentally sensitive areas.

NFPA RATING



See Section 16 for Definition of Ratings

6. ACCIDENTAL RELEASE MEASURES

SPILL AND LEAK RESPONSE: Not applicable.

Minimum Personal Protective Equipment should be gloves and goggles, as well as appropriate body protection. **If oxygen levels are below 19.5% or are unknown then Level B, which includes the use of Self-Contained Breathing Apparatus, should be worn.**

Pick-up, sweep-up, or vacuum solid materials carefully, absorb spilled liquid with polypads or other suitable absorbent material. If the material is molten, allow it to cool and solidify, then scrap-up the product carefully. Decontaminate the area thoroughly. Place all spilled residues in a suitable container and seal. Dispose of in accordance with Federal, State, and local hazardous waste disposal regulations (see Section 13, Disposal Considerations).

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 hands after handling these products. Do not eat or drink while handling this material. 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 soldering operations. Packages of these products must be properly labeled.

If these products are used during soldering operations, it is recommended that 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) be followed.

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8. EXPOSURE CONTROLS - PERSONAL PROTECTION

VENTILATION AND ENGINEERING CONTROLS: Use with adequate ventilation to ensure exposure limits are below those provided in Section 2 (Composition and Information on Ingredients). Use a mechanical fan or vent area to outside. 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 exposure limits 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 soldering in confined spaces), use only protection authorized in 29 CFR 1910.134, or applicable State regulations. Respiratory Protection is recommended to be worn during welding operations. Use supplied air respiration protection if oxygen levels are below 19.5% or are unknown. For additional information, the following respirator selection guidelines from NIOSH for Tin (the main component of these products) are provided:

NIOSH/OSHA RECOMMENDATIONS FOR TIN CONCENTRATIONS IN AIR:

Up to 10 mg/m³: Dust and mist respirator.

Up to 20 mg/m³: Dust and mist respirator except single-use and quarter-mask respirator; or Supplied Air Respirator (SAR).

Up to 50 mg/m³: SAR operated in a continuous-flow mode; or powered air-purifying respirator with dust and mist filter(s).

Up to 100 mg/m³: Full-facepiece respirator with high-efficiency particulate filter(s); or full-facepiece Self-Contained Breathing Apparatus (SCBA); or 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.

ESCAPE: Full-facepiece respirator with high-efficiency particulate filter(s); or escape-type SCBA.

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

HAND PROTECTION: Wear gloves for routine industrial use. Use gloves for spill response, as stated in Section 6 (Accidental Release Measures) of this MSDS. When these products are used in conjunction with soldering, wear gloves that protect from sparks and flame (per ANSI Z49.1-1988, "Safety in Welding and Cutting"), as necessary.

BODY PROTECTION: Use body protection appropriate for task (i.e. leather apron).

9. PHYSICAL and CHEMICAL PROPERTIES

The following information is for Tin, the main component of these products:

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

SPECIFIC GRAVITY (water = 1): 7.28

SOLUBILITY IN WATER: Insoluble.

VAPOR PRESSURE, mm Hg @ 20 °C: Approximately 0.

ODOR THRESHOLD: Not applicable.

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

EVAPORATION RATE (nBuAc = 1): Not applicable.

FREEZING/MELTING POINT: 232° C (450° F)

BOILING POINT: 2270° C (4118° F)

pH: Not applicable.

The following information is for the product:

APPEARANCE AND COLOR: These products are a gray to silver, odorless metal wires, which may have a plastic core running through the middle.

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

10. STABILITY and REACTIVITY

STABILITY: Stable.

DECOMPOSITION PRODUCTS: A tin and zinc compounds and a variety of metal oxides.

MATERIALS WITH WHICH SUBSTANCE IS INCOMPATIBLE: These products are not compatible with strong acids (i.e. nitric acid), strong bases (i.e. sodium hydroxide), sulfur, and strong oxidizers (i.e. hydrogen peroxide).

HAZARDOUS POLYMERIZATION: Will not occur.

CONDITIONS TO AVOID: Avoid uncontrolled exposure to extreme temperatures and incompatible chemicals.

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

11. TOXICOLOGICAL INFORMATION

TOXICITY DATA: The following human toxicological data are available for the components of these products. Other data for animals are available but are not presented in this Material Safety Data Sheet.

SILVER:

TCLo (inhalation, human) = 1 mg/m³.

COPPER:

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

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

COPPER:

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

NICKEL:

EPA-D (Not Classifiable as to Human Carcinogenicity - inadequate human and animal evidence of carcinogenicity or no data available). IARC Group 2B, (Possibly Carcinogenic to Humans - limited evidence in humans in the absence of sufficient evidence in experimental animals). MAK-A1 (Capable of inducing malignancy tumors as shown by experience with humans). NIOSH-X (Carcinogen defined with no further categorization). NTP-2B (Reasonably anticipated to be a carcinogen - sufficient evidence of carcinogenicity from studies in experimental animals). ACGIH TLV-A5 (Not Suspected as a Human Carcinogen).

SILVER:

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

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, CAL/OSHA, IARC, and therefore are not considered to be, nor suspected to be cancer-causing agents by these agencies.

IRRITANCY OF PRODUCT: The fumes of these products, generated during soldering operations, can be irritating to contaminated skin and eyes.

SENSITIZATION TO THE PRODUCT: Some of these products contain Rosin, which is an allergen and can cause respiratory and skin reactions (i.e. asthma, rashes, and welts). Rare cases of allergic contact dermatitis have been reported in people working with copper dust. Nickel is also in some of these product, and has been reported to cause sensitization effects in sensitive individuals, however due to the low concentration in the product, this is not anticipated to be a significant hazard.

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 Nickel (a component of these products); these data were obtained during clinical studies on specific animal tissues exposed to high doses of this compound.

Embryotoxicity: These products are not reported to produce embryotoxic effects in humans.

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 Nickel (a component of these products) indicate 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 Copper (a component 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.

BIOLOGICAL EXPOSURE INDICES: Currently, Biological Exposure Indices (BEIs) are not applicable to components of these products.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Skin disorders may be aggravated by prolonged over-exposures to these products.

RECOMMENDATIONS TO PHYSICIANS: Treat symptoms and eliminate over-exposure.

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12. ECOLOGICAL INFORMATION

ALL WORK PRACTICES MUST BE AIMED AT ELIMINATING ENVIRONMENTAL CONTAMINATION.

ENVIRONMENTAL STABILITY: These products, if released into the environment, may cause local heavy metal contamination with potential impact on plant, animal, and aquatic life. The metal is not biodegradable, and will persist in the environment for an extended period of time. The following environmental data are available for the components of these products.

SILVER: Solubility: Insoluble in water. Many silver salts are only slightly soluble and so silver cations will rapidly be reduced to lower levels. The Biological Half-Life for silver is a few days for animals and up to 50 days for humans.

TIN: Solubility: Insoluble in water.

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

ANTIMONY: Solubility: Insoluble in water. Antimony tends to hydrolyze and precipitate out as an oxide. In experiments the approximate half-life for antimony initial phase was 40 hour for antimony trioxide and 30 hour for antimony dust, for the second phase half-lives of 20-40 days for antimony trioxide and antimony dust were observed. Antimony can be accumulated to toxic levels by marine life.

EFFECT OF MATERIAL ON PLANTS or ANIMALS: Heavy metal toxicity effects on plants may result in poor plant growth, poor appearance, and loss of plant vitality. This material may be harmful to 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: Discharge of these products into water may cause local heavy metal contamination, and may cause permanent contamination of the bottom of the affected body of water. All work practices must minimize potential or actual releases to the environment. The following aquatic toxicity data are available for the components of these products.

SILVER:
0.1 ppm is toxic to bacteria and aquatic life. Discharge into marine waters should not exceed 1/20 of 96 hour LC50, 0.25-0.025 mg/kg/day.

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 these products should be analyzed for Toxicity Characteristic Leach Procedure chemicals, as follows: Silver: D011, Regulated Level: 5.0 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, 1996: Not applicable.

MARINE POLLUTANT: These products do not contain any components which are designated by the Department of Transportation to be Marine Pollutants (49 CFR 172.101, Appendix B).

TRANSPORT CANADA TRANSPORTATION OF DANGEROUS GOODS REGULATIONS: THIS MATERIAL IS NOT CONSIDERED AS DANGEROUS GOODS.

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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)
Silver	No	Yes	Yes
Tin	No	No	No
Zinc	No	Yes	Yes (fume or dust)
Nickel	No	Yes	Yes
Antimony	No	Yes	Yes
Copper	No	Yes	Yes

U.S. SARA THRESHOLD PLANNING QUANTITY: Not applicable.

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

U.S. CERCLA REPORTABLE QUANTITY (RQ): Silver = 1,000 lbs., Copper = 5000 lbs., Nickel = 100 lbs. Zinc = 1000 lbs., Antimony = 5000 lbs. (Note: No reporting is required if the diameter of the metal equals or exceeds 100 micrometers).

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, Nickel, Tin, Antimony compounds, Silver metal soluble compounds.

California-Permissible Exposure Limits for Chemical Contaminants: Copper, Nickel, Tin, Antimony, and Silver.

Florida-Substance List: Copper Fume, Dust, & Mist, Nickel, Tin, Zinc, Antimony, Silver.

Illinois-Toxic Substance List: Copper, Nickel, Zinc, Antimony, and Silver.

Kansas-Section 302/313 List: Copper, Nickel, Zinc, Antimony and compounds.

Massachusetts-Substance List: Copper, Nickel, Tin, Zinc, Antimony, and Silver.

Michigan Critical Materials Register: Copper, Nickel, Antimony, Silver, and Zinc.

Minnesota-List of Hazardous Substances: Copper Dust & Mists, Nickel, Tin, Antimony and compounds, Silver.

Missouri-Employer Information/Toxic Substance List: Copper, Nickel, Tin, Antimony, and Silver.

New Jersey-Right to Know Hazardous Substance List: Copper, Nickel, Tin, Zinc, Antimony, and Silver.

North Dakota-List of Hazardous Chemicals, Reportable Quantities: Copper, Nickel, Zinc, Antimony, and Silver.

Pennsylvania-Hazardous Substance List: Copper, Nickel, Tin, Zinc, Antimony, and Silver.

Rhode Island-Hazardous Substance List: Copper Fume, Dust, & Mist, Nickel, Tin, Zinc, Antimony and compounds, Silver.

Texas-Hazardous Substance List: Copper Fume, Nickel, and Antimony, Silver metal and soluble compounds.

West Virginia-Hazardous Substance List: Copper Fume, Nickel, and Antimony, Silver metal and soluble compounds.

Wisconsin-Toxic and Hazardous Substances: Copper Fume, Nickel, and Antimony, Silver metal and soluble compounds.

CALIFORNIA PROPOSITION 65: Nickel is a component of some of these products. Nickel is on the California Proposition 65 lists. **WARNING:** Some of these products contain chemical(s) known to the State of California to cause cancer.

LABELING (Precautionary Statements): CAUTION! FUMES MAY BE HARMFUL IF INHALED. FUMES CAN CAUSE SKIN AND EYE IRRITATION. FUMES OR CONTACT WITH PLASTIC CORE MAY CAUSE ALLERGIC RESPIRATORY AND SKIN REACTIONS. MOLTEN SOLDER CAN CAUSE THERMAL BURNS. CANCER HAZARD. CONTAINS MATERIAL WHICH CAN CAUSE CANCER. Avoid inhalation of fumes. Avoid contact with skin, eyes, and clothing. Wash thoroughly after handling. Use in well-ventilated area. Wear gloves, safety glasses (or colored-absorptive lens), body protection and respiratory protection, as appropriate, for welding or soldering operations. **FIRST-AID:** In case of skin or eye contact with fumes, flush skin with copious amounts of water. In case of thermal burn, flush area with water for 15 minutes. Remove contaminated clothing and shoes. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. If ingested, do not induce vomiting. Seek medical attention if adverse reaction occurs, or in the event of a thermal burn. **IN CASE OF FIRE:** Use water spray, foam, dry chemical or CO₂. **IN CASE OF SPILL:** Sweep-up or vacuum spilled material, absorb spilled liquid with inert materials. If molten material is released, allow it to cool before clean-up. Place in a suitable container. Consult Material Safety Data Sheet before use.

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15 REGULATORY INFORMATION (Continued)

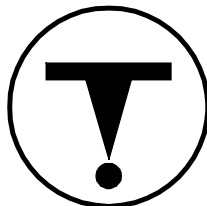
ADDITIONAL CANADIAN REGULATIONS:

CANADIAN DSL/NDSL 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.

WHMIS SYMBOLS: For plastic core: **D2B:** Poisonous and Infectious Material/Other Toxic Effects.



16. OTHER INFORMATION

PREPARED BY:

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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 J.W. Harris Company, Inc.'s 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 J.W. Harris Co., Inc. as to the absolute correctness or sufficiency of any representation contained in this and other publications; J.W. Harris Co., Inc. 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.

LEAD FREE SOLDERS

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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. It is used as a unique identifier for the chemical.

EXPOSURE LIMITS IN AIR:

ACGIH - American Conference of Governmental Industrial Hygienists, a professional association that 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, **NE** is made for reference.

HAZARD RATINGS:

HAZARDOUS MATERIALS IDENTIFICATION SYSTEM: This rating system was developed by the National Paint and Coating Association and has been adopted by industry to identify the degree of chemical hazards. **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). PPE Rating X: Special attention should be given to PPE selection.

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. **TL_m** = median threshold limit; 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.