FROM:
Lake Welding
363 Ottawa
Muskegon, MI 49442-1207

04/18/2013

TO:
ATTN: MSDS DEPT
COOPERSVILLE AREA PUBLIC SCHOOLS
198 EAST ST

COOPERSVILLE, MI 494041290

Dear COOPERSVILLE AREA PUBLIC SCHOOLS:

Our records indicate that Lake Welding recently sold products to you/your company which require that Material Safety Data Sheets be forwarded for your files for compliance under the Right-to-Know Act. Please insure these MSDSs are forwarded to the appropriate personnel in your company.

Enclosed is MSDS # 678 which belongs to
Item #SIL 7SSF / 7 OZ STAY SILV WHITE FLUX

ADDITIONAL MSDSs MAY ALSO BE ENCLOSED

Please refer to the MSDS referance number if you have any questions.

If you find you have a need for any additional sheets for products not enclosed, please contact us.

PHONE: (231) 720-3306
FAX: (231) 220-0269
E-mail: bjordan@lakewelding.com

If you would like to receive MSDSs via e-mail send a message to the e-mail address listed above.

Thank you for your compliance.

Contact Name: Brenda Jordan
Lake Welding Supply Co.
MSDS Coordinator

#678

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.DS.). 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@jwharris.com 513-754-2000 www.harrisproductsgroup.com

STATEMENT OF LIABILITY-DISCLAIMER

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 prepared. 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 are contained in this and other publications, or that other or additional measures may not be required under particular or exceptional conditions or circumstances . Data may be changed from time to time.

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

1. PRODUCT IDENTIFICATION

TRADE NAME (AS LABELED):	**STAY-SILV®WHITE BRAZING FLUX DYNAFLOW® FLUX; STAY-SILV® BLACK BRAZING FLUX; STAY-SILV®#99 POWDER BRAZING FLUX; STAY-SILV® WHITE POWDER BRAZING FLUX; DYNAFLOW HI-TEMP.**
SYNONYMS:	**STAY-SILV® BRAZING FLUXES**
CHEMICAL NAME/CLASS:	Mixture of Potassium Borate & Fluoride Compounds
PRODUCT USE:	Metal Brazing Operations
DOCUMENT NUMBER:	0134
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

CHEMICAL NAME	CAS #	%w/w	EXPOSURE LIMITS IN AIR					
			ACGIH		OSHA			
			TLV mg/m^3	STEL mg/m^3	PEL mg/m^3	STEL mg/m^3	IDLH mg/m^3	OTHER mg/m^3
STAY-SILV® WHITE BRAZING FLUX; DYNAFLOW FLUX								
Boric Acid (exposure limits are for Particulates Not Otherwise Classified)	10043-35-3	30-70%	10 (Inhalable (Particulates) 3 (Respirable Particulates)	NE	15 (Total Dust) 5 (Respirable Fraction)	NE	NE	NE
Potassium Fluorides (exposure limits are for fluorides, as fluorine)	Proprietary	10-50%	2.5, A4 (Not Classifiable as a Human Carcinogen)	NE	2.5	NE	NE	NIOSH REL: 2.5 DFG MAK: 2.5
Water	7732-18-5	Balance	NE	NE	NE	NE	NE	NE

NE = Not Established C = Ceiling Limit See Section 16 for Definitions of Terms Used
NOTE: All WHMIS required information is included. It is located in appropriate sections based on the ANSI Z400.1-1993 format.

2. COMPOSITION and INFORMATION ON INGREDIENTS (Continued)

CHEMICAL NAME	CAS #	%w/w	EXPOSURE LIMITS IN AIR					
			ACGIH		OSHA			
			TLV mg/m^3	STEL mg/m^3	PEL mg/m^3	STEL mg/m^3	IDLH mg/m^3	OTHER mg/m^3
STAY-SILV® BLACK BRAZING FLUX—DYNAFLOW HI-TEMP								
Potassium Borates (exposure limits are for Particulates Not Otherwise Classified)		50-75%	10 (Inhalable (Particulates) 3 (Respirable Particulates)	NE	15 (Total Dust) 5 (Respirable Fraction)	NE	NE	NE
Potassium Fluorides (exposure limits are for fluorides, as fluorine)		10-40%	2.5, A4 (Not Classifiable as a Human Carcinogen)	NE	2.5	NE	NE	NIOSH REL: 2.5 DFG MAK: 2.5
Boric Acid (exposure limits are for Particulates Not Otherwise Classified)	10043-35-3	1-40%	10 (Inhalable (Particulates) 3 (Respirable Particulates)	NE	15 (Total Dust) 5 (Respirable Fraction)	NE	NE	NE
Boron (exposure limits are for boron oxide)	7440-42-8	1-10%	10	NE	15 (Total dust) 10 (vacated 1989 PEL)	NE	2000	NIOSH REL: 10 DFG MAK: 15
Water	7732-18-5	Balance	NE	NE	NE	NE	NE	NE
STAY-SILV® #99 POWDER BRAZING FLUX								
Potassium Borates (exposure limits are for Particulates Not Otherwise Classified)		30-90%	10 (Inhalable (Particulates) 3 (Respirable Particulates)	NE	15 (Total Dust) 5 (Respirable Fraction)	NE	NE	NE
Boric Acid (exposure limits are for Particulates Not Otherwise Classified)	10043-35-3	Balance	10 (Inhalable (Particulates) 3 (Respirable Particulates)	NE	15 (Total Dust) 5 (Respirable Fraction)	NE	NE	NE
STAY-SILV® WHITE POWDER BRAZING FLUX								
Potassium Borates (exposure limits are for Particulates Not Otherwise Classified)		30-80%	10 (Inhalable (Particulates) 3 (Respirable Particulates)	NE	15 (Total Dust) 5 (Respirable Fraction)	NE	NE	NE
Boric Acid (exposure limits are for Particulates Not Otherwise Classified)	10043-35-3	1-3%	10 (Inhalable (Particulates) 3 (Respirable Particulates)	NE	15 (Total Dust) 5 (Respirable Fraction)	NE	NE	NE
Copper Wetting Agent		Balance	NE	NE	NE	NE	NE	NE

NE = Not Established C = Ceiling Limit See Section 16 for Definitions of Terms Used
NOTE: 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 fluxes have the following characteristics: STAY-SILV® WHITE BRAZING FLUX/DYNAFLOW® FLUX - white, odorless paste; STAY-SILV® BLACK BRAZING FLUX - smooth, black, odorless paste; STAY-SILV® #99 POWDER BRAZING FLUX - fine, white powder with no odor; STAY-SILV® WHITE POWDER BRAZING FLUX - fine, white, odorless powder. These fluxes and their decomposition products can moderately to severely irritate the skin, eyes, and any other contaminated tissue. These fluxes are neither flammable nor reactive under normal circumstances. If involved in a fire, the components of these products can decompose to release toxic gases. Emergency responders must wear the proper personal protective equipment suitable for the situation to which they are responding.

3. HAZARD IDENTIFICATION (Continued)

SYMPTOMS OF OVER-EXPOSURE BY ROUTE OF EXPOSURE: The most significant routes of over-exposure for these fluxes are by contact with skin, eye contact, or inhalation. The symptoms of overexposure to these fluxes , via route of entry, are as follows:

INHALATION: If particulates of these fluxes are inhaled, they can moderately to severely irritate the nose, throat, and respiratory system. Symptoms of inhalation over-exposure may include coughing, sneezing, and difficulty breathing.

CONTACT WITH SKIN or EYES: Depending on the duration and concentration of over-exposure, skin contact with these fluxes can moderately to severely irritate the skin. Repeated or prolonged skin over-exposure to these fluxes may result in dermatitis (red, dry, itchy skin). Depending on the duration and concentration of over-exposure, eye contact with these fluxes can irritate the eyes. Eye over-exposure can cause tearing, redness, and tissue damage.

SKIN ABSORPTION: Hydrogen fluoride, a possible decomposition product of Stay-Silv® White Brazing Flux/Dynaflow® Flux And Stay-Silv® Black Brazing Flux, is extremely corrosive and a poison by all routes of entry. Hydrogen fluoride can penetrate the skin and produce burns, which may not be immediately painful or visible; the burns impact the lower layers of skin and bone tissue. Hydrogen fluoride exposures involving 20 percent of the body or more can be fatal through systemic fluoride poisoning.

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.

HAZARDOUS MATERIAL INFORMATION SYSTEM

HEALTH	(BLUE)	2
FLAMMABILITY	(RED)	0
REACTIVITY	(YELLOW)	0
PROTECTIVE EQUIPMENT		X

EYES	RESPIRATORY	HANDS	BODY
	SEE SECTION 8		

For routine applications.

See Section 16 for Definition of Ratings

INJECTION: Though not anticipated to be a likely route of occupational exposure for these fluxes, injection (via punctures or lacerations by a contaminated object) may cause local reddening, tissue swelling, and discomfort in addition to the wound.

HEALTH EFFECTS OR RISKS FROM OVER-EXPOSURE: An Explanation in Lay Terms. Symptoms associated with over-exposure to these fluxes are as follows:

ACUTE: Symptoms of inhalation over-exposure may include coughing, sneezing, and difficulty breathing. Depending on the duration and concentration of over-exposure, skin contact with these fluxes can severely irritate the skin. Depending on the duration and concentration of over-exposure, eye contact with these fluxes can irritate the eyes. Severe ingestion over-exposure may be fatal.

CHRONIC: Repeated or prolonged skin over-exposure to these fluxes may result in dermatitis (red, dry, itchy skin). Chronic over-exposure to hydrogen fluoride (a possible decomposition product of Stay-Silv® White Brazing Flux/Dynaflow ® Flux And Stay-Silv® Black Brazing Flux) can cause fluorosis (weakening and degeneration of bone structure and possible heart, nerve, and intestinal problems). Chronic ingestion over-exposure may to these fluoride-containing fluxes cause mottling of tooth enamel and hardening or abnormal density of the bones. Refer to Section 11 (Toxicological Information) for additional information regarding these fluxes and their components.

TARGET ORGANS: Skin, eyes, respiratory system.

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

4. FIRST-AID MEASURES

SKIN EXPOSURE: If these fluxes or their decomposition products irritate the skin, begin decontamination with running water. Minimum flushing is for 15 minutes. Do not interrupt flushing. For Stay-Silv® White Brazing Flux/Dynaflow® Flux and Stay-Silv® Black Brazing Flux: If necessary, apply calcium gluconate gel (2.5% concentration) after flushing is complete.

4. FIRST-AID MEASURES (Continued)

SKIN EXPOSURE (continued): See Section 11 (Toxicological Information, Recommendations to Physicians) for more information on the use of *calcium gluconate* gel. Remove exposed or contaminated clothing, taking care not to contaminate eyes. Victim must seek medical attention if any adverse reaction occurs.

EYE EXPOSURE: If these fluxes 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. Do not interrupt flushing. Victim must seek immediate medical attention.

INHALATION: If particulates of these fluxes are inhaled, remove victim to fresh air. If necessary, use artificial respiration to support vital functions. Victim must seek medical attention if any adverse reaction occurs.

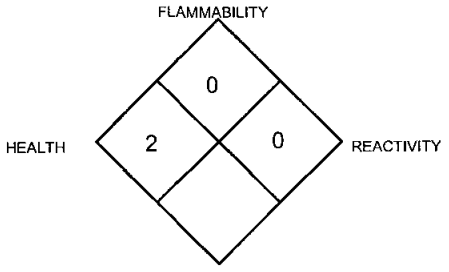
INGESTION: If swallowed call physician immediately! Do not induce vomiting unless directed by medical personnel. Rinse mouth with water if person is conscious. Never give fluids or induce vomiting if person is unconscious, having convulsions, or not breathing.

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. Medical professionals should refer to See Section 11 (Toxicological Information, Recommendations to Physicians) for more information.

5. FIRE-FIGHTING MEASURES

FLASH POINT: Not flammable.
AUTOIGNITION TEMPERATURE: Not applicable.
FLAMMABLE LIMITS (in air by volume, %): Lower (LEL): Not applicable.
Upper (UEL): Not applicable

NFPA RATING



See Section 16 for Definition of Ratings

FIRE EXTINGUISHING MATERIALS: These fluxes are not flammable. Use extinguishing media appropriate for surrounding fire.

Water Spray: YES (for cooling)
Halon: YES
Dry Chemical: YES
Carbon Dioxide: YES
Foam: YES
Other: Any "ABC" Class.

UNUSUAL FIRE AND EXPLOSION HAZARDS: This product can moderately to severely irritate contaminated skin, and presents a potential contact hazard to firefighters. During a fire, irritating and toxic gases (e.g., hydrogen fluoride, potassium oxides, fluorine, and boron compounds) may be generated.

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 firefighters must wear Self-Contained Breathing Apparatus and full protective equipment. Move containers from fire area if it can be done without risk to personnel. If possible, prevent runoff water from entering storm drains, bodies of water, or other environmentally sensitive areas.

6. ACCIDENTAL RELEASE MEASURES

SPILL AND LEAK RESPONSE: Uncontrolled releases should be responded to by trained personnel using pre-planned procedures. Proper protective equipment should be used. In case of a spill, clear the affected area, protect people, and respond with trained personnel.

In the event of an incidental release of these fluxes, personnel should wear gloves, safety glasses (or goggles), and face shield during clean up. In the event of a non-incidental release, minimum Personal Protective Equipment should be **Level B: triple-gloves (rubber gloves and nitrile gloves over latex gloves), chemical resistant suit and boots, hard-hat, and Self-Contained Breathing Apparatus.** Wipe-up or sweep-up spilled material carefully, avoiding the generation of airborne dust. Decontaminate the area thoroughly. Place all spilled residues in a suitable container and seal. Dispose of in accordance with applicable U.S. Federal, State, or local procedures and appropriate Canadian standards (see Section 13, Disposal Considerations).

For Stay-Silv® White Brazing Flux/Dynaflow® Flux and Stay-Silv® Black Brazing Flux: DUE TO THE PRESENCE OF FLUORIDE COMPONENTS, DO NOT STORE RESIDUE IN GLASS. ALSO, AVOID THE USE OF CLAY OR OTHER SILICATE-BASED ABSORBENTS.

7. HANDLING and STORAGE

WORK PRACTICES AND HYGIENE PRACTICES: As with all chemicals, avoid getting this product ON YOU or IN YOU. Wash thoroughly after handling this product. Do not eat, drink, smoke, or apply cosmetics while handling this product. Avoid breathing particulates generated by this product. *Remove contaminated clothing immediately.*

STORAGE AND HANDLING PRACTICES: All employees who handle this material should be trained to handle it safely. Empty containers may contain residual material; therefore, empty containers should be handled with care.

Store these fluxes in a cool, dry location, away from direct sunlight, sources of intense heat. Store away from incompatible chemicals (see Section 10, Stability and Reactivity). Material should be stored in secondary containers or in a diked area, as appropriate. Storage and use areas should be covered with impervious materials. Keep container tightly closed when not in use. Inspect all incoming containers before storage to ensure they *are properly labeled and not damaged.* For Stay-Silv® White Brazing Flux/Dynaflow® Flux And Stay-Silv® Black Brazing Flux: Do not store in glass, or permit material to be stored in silicate-based material.

PROTECTIVE PRACTICES DURING MAINTENANCE OF CONTAMINATED EQUIPMENT: Follow practices indicated in Section 6 (Accidental Release Measures). Make certain that application equipment is locked and tagged-out safely. Collect all rinsates and dispose of according to applicable U.S. Federal, State, or local procedures, and appropriate Canadian standards.

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). Exhaust directly to the outside, taking necessary precautions for environmental protection. Prudent practice is to ensure eyewash/safety shower stations are available near areas where these fluxes are used.

RESPIRATORY PROTECTION: Maintain airborne contaminant concentrations below guidelines listed in Section 2 (Composition and Information on Ingredients) if applicable. If respiratory protection is needed, use only protection authorized in 29 CFR 1910.134 or applicable State regulations. Use supplied air respiration protection if oxygen levels are below 19.5% or are unknown. The following respiratory protection guidelines are provided for Fluorides (e.g., Potassium Fluorides, components of these fluxes):

CONCENTRATION	RESPIRATORY PROTECTION
UP TO 12.5 mg/m^3:	Dust and mist respirator.
UP TO 25 mg/m^3:	Dust and mist respirator except single-use and quarter-mask respirator* or Supplied Air Respirator (SAR)*.
UP TO 62.5 mg/m^3:	SAR operated in a continuous-flow mode* or powered air-purifying respirator with dust and mist filter(s)*++.
UP TO 125 mg/m^3:	Full-facepiece respirator with high-efficiency particulate filter(s)++, full-facepiece Self-Contained Breathing Apparatus, or full-facepiece SAR.
UP TO 250 mg/m^3:	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.
ESCAPE:	Full-facepiece respirator with high-efficiency particulate filter(s)++ or escape-type SCBA.
*NOTE:	Substance reported to cause eye irritation or damage; may require eye protection.
++NOTE:	May need acid gas sorbent.

EYE PROTECTION: Safety glasses or goggles.

HAND PROTECTION: Wear natural rubber, neoprene, or nitrile rubber gloves for routine industrial use.

BODY PROTECTION: *None needed* for normal circumstances of use. Use body protection appropriate for task (i.e., apron, coveralls, and chemical resistant boots).

9. PHYSICAL and CHEMICAL PROPERTIES

RELATIVE VAPOR DENSITY (air = 1): Not applicable.
SPECIFIC GRAVITY (water = 1) : 1.5-1.7.
SOLUBILITY IN WATER: *Moderately soluble.*
EVAPORATION RATE (nBuAc = 1): Not applicable.
FREEZING/MELTING POINT: Not applicable.
BOILING POINT: Not applicable.

9. PHYSICAL and CHEMICAL PROPERTIES (Continued)

VAPOR PRESSURE, mm Hg @ 24°C: Not established. **pH:** Not applicable.
ODOR THRESHOLD: Not applicable.
COEFFICIENT OF OIL/WATER DISTRIBUTION (PARTITION COEFFICIENT): Not established.

APPEARANCE AND COLOR: STAY-SILV® WHITE BRAZING FLUX/DYNAFLOW® FLUX - white, odorless paste; STAY-SILV® BLACK BRAZING FLUX - smooth, black, odorless paste; STAY-SILV® #99 POWDER BRAZING FLUX - fine, white powder with no odor; STAY-SILV® WHITE POWDER BRAZING FLUX - fine, white, odorless powder.
HOW TO DETECT THESE SUBSTANCES (warning properties): The appearance may act as a distinguishing characteristic of these fluxes.

10. STABILITY and REACTIVITY

STABILITY: Stable.

DECOMPOSITION PRODUCTS: Hydrogen fluoride, fluorine, and boron and potassium compounds.

MATERIALS WITH WHICH SUBSTANCE IS INCOMPATIBLE: Strong oxidizers, strong acids, and reactive interhalogens. For Stay-Silv® White Brazing Flux/Dynaflow® Flux And Stay-Silv® Black Brazing Flux: Due to the presence of fluoride components, avoid contact with silicate-based materials.

HAZARDOUS POLYMERIZATION: Will not occur.

CONDITIONS TO AVOID: Extreme temperatures, moisture, and 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 fluxes 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.

BORIC ACID:
Skin Irritancy (human) = 15 mg/ 3 days/ intermittent; mild
LD (oral, human) = 37 mg/kg/ boron as boric acid
LD (skin, infant) = 210 mg/kg/ boron as boric acid
TDLo (oral, child) = 500 mg/kg; gastrointestinal effects
LDLo (oral, man) = 429 mg/kg; cardiovascular, systemic effects
LDLo (oral, woman) = 200 mg/kg
TDLo (oral, infant) = 800 mg/kg/ 4 weeks/ intermittent
LDLo (oral, infant) = 934 mg/kg

BORIC ACID (continued):
LDLo (skin, infant) = 1200 mg/kg
LDLo (skin, child) = 4000 mg/kg/ 4 days
LDLo (skin, man) = 2430 mg/kg
LDLo (skin, child) = 1500 mg/kg
LDLo (subcutaneous, infant) = 1100 mg/kg
TDLo (unreported, man) = 170 mg/kg; gastrointestinal effects
LDLo (unreported, man) = 147 mg/kg

SUSPECTED CANCER AGENT: The components of these fluxes 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 fluxes can moderately to severely irritate contaminated tissue.

SENSITIZATION TO THE PRODUCT: No component of these fluxes is known to be a sensitizer with prolonged or repeated use.

REPRODUCTIVE TOXICITY INFORMATION: Listed below is information concerning the effects of these fluxes on the human reproductive system.

Mutagenicity: These fluxes are not reported to produce mutagenic effects in humans. Animal mutation data are available for Boric Acid (a component of these fluxes); these data were obtained during clinical studies on specific animal tissues exposed to high doses of this compound.
Embryotoxicity These fluxes are not reported to produce embryotoxic effects in humans.
Teratogenicity: These fluxes are not reported to cause teratogenic effects in humans
Reproductive Toxicity: These fluxes are not reported to cause reproductive effects in humans. Clinical studies on test animals exposed to relatively high doses of Boric Acid (a component of these fluxes) 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: Currently, there are Biological Exposure Indices (BEIs) associated with Potassium Fluorides (a component of these fluxes), as a fluoride.

CHEMICAL DETERMINANT	SAMPLING TIME	BEI
FLUORIDES		
Fluorides in urine	Prior to shift	3 mg/g creatinine
	End of shift	10 mg/g creatinine

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Dermatitis, other skin disorders, and respiratory conditions may be aggravated by over-exposure to these fluxes.

RECOMMENDATIONS TO PHYSICIANS: Treat symptoms and eliminate over-exposure. For Stay-Silv® White Brazing Flux/Dynaflow® Flux And Stay-Silv® Black Brazing Flux: In the event of over-exposure to these fluxes, all personnel providing treatment must be gloved. If there are indications that a victim is suffering from the effects of fluoride over-exposure, the treatment recommendations for contamination are as follows:

SKIN CONTACT: After 15 minute water flush (if flush has not yet been done), apply calcium gluconate gel (2.5% concentration) until pain has subsided, but not longer than 30 minutes. If pain lasts longer than 15 minutes, proceed with calcium gluconate injections.

EYE CONTACT: After 15 minutes water flush (if flush has not been done), flush eyes with 1% calcium gluconate gel in normal, sterile saline.

INHALATION: Provide 100% oxygen, followed by inhalation of a mist containing 2.5% calcium gluconate in saline solution. Watch for pulmonary edema.

INGESTION: Gastric lavage with lime water or milk.

12. ECOLOGICAL INFORMATION

ALL WORK PRACTICES MUST BE AIMED AT ELIMINATING ENVIRONMENTAL CONTAMINATION.

ENVIRONMENTAL STABILITY: The components of these fluxes will slowly decompose under normal environmental conditions into a variety of inorganic compounds.

EFFECT OF MATERIAL ON PLANTS or ANIMALS: These fluxes can be harmful to plant and 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: Large releases of these fluxes may be harmful or fatal to exposed aquatic life. The following aquatic toxicity data are available.

BORIC ACID:
LC_{50} (trout eggs) = 100 ppm/ soft
LC_{50} (trout eggs) = 79 ppm/ hard
LC_{50} (catfish eggs) = 155 ppm/ soft
LC_{50} (catfish eggs) = 22 ppm/ hard

BORIC ACID (continued):
LC_{50} (goldfish eggs) = 46 ppm/ soft
LC_{50} (goldfish eggs) = 75 ppm/ hard
LC_{50} (*Daphnia magna*) = 133 mg/L/ 48 hours

13. DISPOSAL CONSIDERATIONS

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

U.S. EPA WASTE NUMBER: Not applicable.

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.

14. TRANSPORTATION INFORMATION (Continued)

NORTH AMERICAN EMERGENCY RESPONSE GUIDEBOOK NUMBER (1996): Not applicable.

MARINE POLLUTANT: The components of these fluxes are not 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 CONSIDERED AS DANGEROUS GOODS. Refer to above information for Canadian shipments.

15. REGULATORY INFORMATION

ADDITIONAL U.S. REGULATIONS:

U.S. SARA REPORTING REQUIREMENTS: The components of these fluxes are not subject to the reporting requirements of Sections 302, 304, and 313 of Title III of the Superfund Amendments and Reauthorization Act.

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

U.S. CERCLA REPORTABLE QUANTITY (RQ) : Not applicable.

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

U.S. STATE REGULATORY INFORMATION: Components of these fluxes are covered under specific State regulations, as denoted below:

Alaska - Designated Toxic and Hazardous Substances: No.
California - Permissible Exposure Limits for Chemical Contaminants: No.
Florida - Substance List: No.
Illinois - Toxic Substance List: No.
Kansas - Section 302/313 List: No.
Massachusetts - Substance List: No.
Michigan - Critical Materials Register: No.
Minnesota - List of Hazardous Substances: No.
Missouri - Employer Information/Toxic Substance List: Potassium Fluorides.
New Jersey - Right to Know Hazardous Substance List: Potassium Fluorides.
North Dakota - List of Hazardous Chemicals, Reportable Quantities: No.
Pennsylvania - Hazardous Substance List: No.
Rhode Island - Hazardous Substance List: No.
Texas - Hazardous Substance List: No.
West Virginia - Hazardous Substance List: No.
Wisconsin - Toxic and Hazardous Substances: No.

CALIFORNIA SAFE DRINKING WATER AND TOXIC ENFORCEMENT ACT (PROPOSITION 65): No component of these products is on the California Proposition 65 List. **WARNING: These products 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.)**

ANSI LABELING (Z129.1): **WARNING!** MAY BE HARMFUL OR FATAL IF SWALLOWED. IRRITATING IF INHALED. CAUSES SKIN AND EYE IRRITATION. MAY CONTAIN FLUORIDES. PROTECT YOURSELF AND OTHERS. KEEP AWAY FROM GLASS AND SILICATES. FUMES AND GASES CAN BE HAZARDOUS TO HEALTH AND CAN BURN EYES AND SKIN ON CONTACT. Keep out of reach of children. Do not taste or swallow. Do not get on skin or in eyes. Avoid breathing fumes or particulates. Keep head away from fumes. Use enough ventilation, exhaust or arc, or both, to keep fumes and gases from breathing zone and general area. Keep container closed when not in use. Avoid contact with glass and silicate compounds. Wash thoroughly after handling. Wear gloves, goggles, face-shields, suitable body protection, and NIOSH/MSHA-approved respiratory protection, as appropriate. For maximum safety, be certified for and wear a respirator at all times when brazing. See American National Standard Z49.1, Safety in Welding, Cutting, and Allied Processes, published by the American Welding Society, 550 NW LeJeune Rd., Miami, FL 33126. Also see OSHA Safety and Health Standards, 29 CFR 1910, available from the US Government Printing Office, Washington DC, 20402. FIRST-AID: In case of contact, immediately flush skin or eyes with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. If inhaled, remove to fresh air. If ingested, do not induce vomiting. Get medical attention. IN CASE OF FIRE: Use water fog, dry chemical, CO_2, or "alcohol" foam. IN CASE OF SPILL: Wipe-up or sweep-up spilled powder carefully. Place residue in suitable container and seal. Avoid contact with silicate-based material. Consult Material Safety Data Sheet for additional information.

15. REGULATORY INFORMATION (Continued)

WARNING:

PROTECT yourself and others. Read and understand this information.

FUMES AND GASES can be hazardous to your health.

ARC RAYS can injure your eyes and burn skin.

ELECTRIC SHOCK can kill.

HEAT RAYS (INFRARED RADIATION) from flame or hot metal can injure eyes.

- 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.
- FOR MAXIMUM SAFETY, BE CERTIFIED FOR AND WEAR A RESPIRATOR AT ALL TIMES WHEN WELDING OR BRAZING
- 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, *29 CFR 1910*, available from the U.S. Government Printing Office, Superintendent office, P.O. Box 371954, Pittsburgh, PA 15250-7954.

DO NOT REMOVE THIS INFORMATION

ADDITIONAL CANADIAN REGULATIONS:

CANADIAN DSL/NDSL INVENTORY STATUS: The components of these fluxes are listed on the NDSL/DSL Inventory.

OTHER CANADIAN REGULATIONS: Not applicable.

CANADIAN ENVIRONMENTAL PROTECTION ACT (CEPA) PRIORITIES SUBSTANCES LISTS: The components of these fluxes are not on the CEPA Priorities Substances Lists, as follows: Potassium Fluoride (as Inorganic Fluoride) Priority List 1, Toxic Material.

CANADIAN WHMIS SYMBOLS: D2B Materials Causing Other Toxic Effects.

16. OTHER INFORMATION

DATE OF PRINTING: August 25, 2010

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 fluxes. 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 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.

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 which establishes exposure limits. **IARC**-International Agency for Research on Cancer **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. **NTP**- National Toxicology Program

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: **LD_{50}** - Lethal Dose (solids & liquids) which kills 50% of the exposed animals; **LC_{50}** - 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/m^3** 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/NDSL** are the Canadian Domestic/Non-Domestic Substances Lists.

#688

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.DS.). 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@jwharris.com 513-754-2000 **www.harrisproductsgroup.com**

STATEMENT OF LIABILITY-DISCLAIMER

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 prepared. 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 are contained in this and other publications, or that other or additional measures may not be required under particular or exceptional conditions or circumstances . Data may be changed from time to time.

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

1. PRODUCT IDENTIFICATION

TRADE NAME (AS LABELED):	**HIGH SILVER BRAZING ALLOYS (Bare & Flux-Coated Wire or Rods)**
CHEMICAL NAME/CLASS:	Metal Alloy
SYNONYMS:	Not Applicable
PRODUCT USE:	Metal Brazing
DOCUMENT NUMBER:	0127
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:	July 30, 2010 **Effective Date:** November 11, 2004

2. NOMINAL COMPOSITION and INFORMATION ON INGREDIENTS

PRODUCT NAME	Ag	Cu	Zn	Ni	Sn	Other
SAFETY-SILV® 25	25	43	30		2	
SAFETY-SILV® 30	30	38	32			
SAFETY-SILV® 35	35	32	33			
SAFETY-SILV® 38T	38	32	28		2	
SAFETY-SILV® 40	40	30.5	29.5			
SAFETY-SILV® 40 Ni2	40	30	28	2		
SAFETY-SILV® 40 Ni5	40	30	25	5		
SAFETY-SILV® 40T	40	30	28		2	
SAFETY-SILV® 45	45	30	25			
SAFETY-SILV® 45T	45	27	25		3	
SAFETY-SILV® 50	50	34	16			
SAFETY-SILV® 50N	50	20	28	2		
SAFETY-SILV® 54	54	40	5	1		
SAFETY-SILV® 56	56	22	17		5	
SAFETY-SILV® 58	57.5	32.5		7		3 Mn

SAFETY-SILV® 60	60	25	15			
SAFETY-SILV® 60T	60	30			10	
SAFETY-SILV® 72	72	28				
Ag Clad 40 Ni2	See Safety-Silv® 40 Ni2 Composition. A clad strip (alloy-copper-alloy) in a 1-2-1 ratio.					

2. NOMINAL COMPOSITION and INFORMATION ON INGREDIENTS (Continued)

These products consist of metal wire or rods, some with a thin coating of flux on them. The exact amount of coating on each rod may vary. It can be reasonably estimated that there is less than 1% of each of the flux constituents present on any given rod when compared to the mass of the rod itself. The composition values given for the flux coating are the composition of the flux when the rods are flux-coated.

CHEMICAL NAME	CAS #	EXPOSURE LIMITS IN AIR					
		ACGIH-TLV		OSHA-PEL			OTHER
		TLV mg/m³	STEL mg/m³	PEL mg/m³	STEL mg/m³	IDLH mg/m³	mg/m³
COMPONENT 1: METAL WIRE or RODS							
Copper (*exposure limits are for copper fume, dusts, and mists*)	7440-50-8	0.2 (fume) 1 (*dusts & mists*)	NE	0.1 (fume) 1 (*dusts & 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)
Lithium	7439-93-2	NE	NE	NE	NE	NE	NE
Manganese (*exposure limits are for Manganese, elemental, inorganic compounds, and fume, as Manganese*)	7439-96-5	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
Nickel, Elemental metal	7440-02-0	1.5, A5 (Inhalable Fraction) (Not Suspected as a Human Carcinogen)	NE	1	NE	10	NIOSH REL: TWA = 0.015 Carcinogen: IARC-2B, MAK-1, NIOSH-X, NTP-R, TLV-A5
Silver	7440-22-4	0.01	NE	0.01	NE	10	NIOSH REL TWA = 0.01 (dust) DFG MAKs: TWA = 0.01 (Inhalable Fraction) PEAK = 2•MAK, 5 min., momentary *value (Inhalable Fraction)* Carcinogen: EPA-D
Tin	7440-31-5	2	NE	2	NE	100	NIOSH REL: TWA = 2

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. NOMINAL COMPOSITION and INFORMATION ON INGREDIENTS (Continued)

CHEMICAL NAME	CAS #	EXPOSURE LIMITS IN AIR					
		ACGIH-TLV		OSHA-PEL			OTHER
		TLV mg/m^3	STEL mg/m^3	PEL mg/m^3	STEL mg/m^3	IDLH mg/m^3	mg/m^3
COMPONENT 1 (continued): METAL WIRE or RODS							
Zinc (exposure limits are for zinc oxide, fume)	7440-66-6	5 (fume) 10 (dust)	10 (fume)	5 (fume) 5 (total dust) 15 (dust, respirable dust) 5 (dust, respirable dust, Vacated 1989 PEL)	10 (fume, Vacated 1989 PEL)	NE	NIOSH RELs: TWA = 5 (dust & fume) STEL = 10 (fume), 15 (ceiling, 15 min., dust) DFG MAK: TWA = 1.5 (Respirable Fraction) Carcinogen: EPA-D

COMPONENT 2: FLUX COATING ON RODS

CHEMICAL NAME	CAS #	% w/w	EXPOSURE LIMITS IN AIR					
			ACGIH-TLV		OSHA-PEL			OTHER
			TLV mg/m^3	STEL mg/m^3	PEL mg/m^3	STEL mg/m^3	IDLH mg/m^3	mg/m^3
Boric Acid	10043-35-3	10–35	NE	NE	NE	NE	NE	NE
Proprietary Fluoride Compound (exposure limits are for inorganic, solid Fluoride compounds, as F; 7789-75-5)	Proprietary	30-50	2.5, A4 (Not Classifiable as a human carcinogen)	NE	2.5	NE	NE	DFG MAKs: TWA = 2.5 (Inhalable Fraction) PEAK = 5•MAK 30 min., average value Carcinogen: IARC-3, TLV-A4
Methacrylate/Aliphatic & Naphthenic Hydrocarbon Compound	Proprietary		NE	NE	NE	NE	NE	NE
Water	7732-18-5	Balance	NE	NE	NE	NE	NE	NE

NE = Not Established. C = Ceiling Limit. See Section 16 for Definitions of Terms Used.

NOTE (1): The ACGIH has an established exposure limit for Brazing Fumes, Not Otherwise Classified. The Threshold Limit Value is 5 mg/m^3. NIOSH classifies brazing fumes as carcinogens.

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 are odorless, solid rods that have a metallic luster which may have a flux coating. These products are neither flammable nor reactive. If involved in a fire, these products may generate irritating fumes and a variety of metal oxides. 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 brazing operations, the most significant route of over-exposure is via inhalation of fumes.

INHALATION: Inhalation is not anticipated to be a significant route of over-exposure to the rod form of this product. Inhalation of large amounts of particulates generated by the rods during metal processing operations may be physically irritating and cause deposits of dust in nasal passages. Inhalation of dusts of Silver (a constituent of these products) can cause discoloration of eyes, nasal septum, throat, and skin. Inhalation of dusts and fumes of Copper, Manganese, and Zinc (constituents of these products) 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. If dusts or particulates generated by the flux coating on the flux coated products are inhaled, they will irritate the nose, throat, and lungs. Dusts and particulates of the flux coating on the flux coated products may destroy mucous membranes and may cause pneumonitis.

3. HAZARD IDENTIFICATION (Continued)

CONTACT WITH SKIN or EYES: Contact of the rod form of these products with the skin is not anticipated to be irritating. Contact with the rod form of these products can be physically damaging to the eye (i.e., foreign object). Fumes generated during brazing operations may be irritating to the skin and eyes. Symptoms of skin over-exposure may include irritation and redness; prolonged or repeated skin over-exposures may lead to dermatitis. Contact with the molten core rods will burn contaminated skin or eyes. Eye contact with dusts or particulates generated by the flux coating on the flux coated products will cause irritation, pain, tearing, and reddening. Brief contact may cause eye damage and prolonged contact may cause permanent damage. Depending on the duration of over-exposure, skin contact with dusts or particulates generated by the flux coating on the flux coated products may cause irritation and burns. Chronic over-exposure to dusts or particulates generated by the flux coating on the flux coated products may cause borism (dry skin, eruptions, and gastrointestinal disturbances) or pustular dermatitis (visible collections of pus).

SKIN ABSORPTION: In some situations, one of the decomposition products of the flux coating may be hydrogen fluoride. Hydrogen fluoride can penetrate the skin and produce burns that may not be immediately painful or visible; the burns impact the lower layers of skin and bone tissue. Hydrogen fluoride exposures involving 20 percent of the body or more can be fatal through systemic fluoride poisoning.

INGESTION: Ingestion of rods is not a likely route of exposure.

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

HAZARDOUS MATERIAL IDENTIFICATION SYSTEM

HEALTH	(BLUE)	0
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 rods

See Section 16 for Definition of Ratings

HEALTH EFFECTS OR RISKS FROM EXPOSURE: An Explanation in Lay Terms. Symptoms associated with over-exposure to these products and the fumes generated during brazing 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 brazing operations. Inhalation of large amounts of particulates generated by these products during metal processing operations may be physically irritating and cause deposits of dust in nasal passages. Inhalation of dusts and fumes of Copper, Manganese, and Zinc (constituents of these products) 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. Contact with the molten material will burn contaminated skin or eyes. If particulates or fumes, generated during brazing operations, are ingested (i.e., through poor hygiene practices), nausea, vomiting, diarrhea, stomach ache, degeneration of blood and liver cells, gastro-intestinal bleeding, decreased urine output, listlessness, rapid heartbeat, convulsions, and coma may occur. Severe ingestion over-exposure may be fatal. Depending on the duration of over-exposure, dusts or particulates generated by the flux coating on the flux coated products may be irritating or damaging to the entire respiratory tract, eyes, and skin. In some situations, one of the flux coating's decomposition products may be hydrogen fluoride. Hydrogen fluoride can penetrate the skin and produce burns that may not be immediately painful or visible; the burns impact the lower layers of skin and bone tissue. If dusts or particulates generated by the flux coating on the flux coated products are swallowed, they may burn the mouth, throat, esophagus, and other tissues of the digestive system.

3. HAZARD IDENTIFICATION (Continued)

CHRONIC: Chronic skin over-exposure to the fumes of these products during brazing operations may produce dermatitis (red, inflamed skin). Chronic skin over-exposure to dusts or particulates generated by the flux coating on the flux coated products may cause borism (dry skin, eruptions, and gastrointestinal disturbances) or pustular dermatitis (visible collections of pus). Chronic ingestion of the fluoride component of the flux coating may cause osseous fluorosis (increased radiographic density of the bones). Symptoms of chronic ingestion of dusts or particulates generated by the flux coating on the flux coated products may include kidney damage, asthma, and pain in the joints and muscles.
TARGET ORGANS: For fumes: Skin, eyes, respiratory system.

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 dusts or particulates generated by the flux coating on the flux coated products or fumes generated by brazing operations involving these products 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 dusts or particulates generated by the flux coating on the flux coated products or fumes generated by brazing operations involving these products 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.

INHALATION: If dusts or particulates generated by the flux coating on the flux coated products or fumes generated by brazing operations involving 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.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Skin, respiratory, and kidney disorders may be aggravated by prolonged over-exposures to the dusts or fumes generated by these products.

RECOMMENDATIONS TO PHYSICIANS: Treat symptoms and eliminate overexposure.

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.

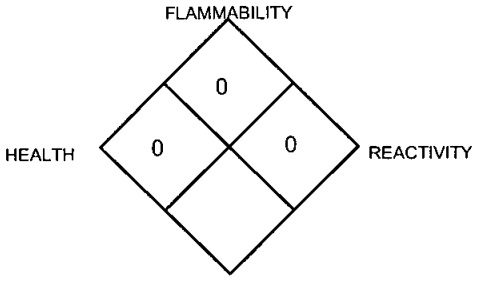
FIRE EXTINGUISHING MATERIALS:

Water Spray: YES	Carbon Dioxide: YES
Halon: YES	Foam: YES
Dry Chemical: 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 metal oxides. If involved in a fire, the flux coating on the flux coated products may decompose to release fluoride compounds, boric anhydride, and hydrogen fluoride. The molten rods can present significant thermal hazards to firefighters.

Explosion Sensitivity to Mechanical Impact: Not sensitive.
Explosion Sensitivity to Static Discharge: Not sensitive.

NFPA RATING



See Section 16 for Definition of Ratings

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

6. ACCIDENTAL RELEASE MEASURES

SPILL AND LEAK RESPONSE: Not applicable.

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 these products. Use ventilation and other engineering controls to minimize potential exposure to these products.

STORAGE AND HANDLING PRACTICES: All employees who handle these products should be trained to handle them safely. Use in a properly ventilated location. Avoid breathing fumes of these products during brazing operations. Open containers on a stable surface. Packages of these products must be properly labeled.

When these products are used during brazing 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).

PROTECTIVE PRACTICES DURING MAINTENANCE OF CONTAMINATED EQUIPMENT: Not applicable.

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), use only protection authorized in 29 CFR 1910.134 or applicable State regulations. 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). Respiratory protection guidelines for Copper and Silver dusts (as may be generated during metal processing) and Zinc Oxide (as may be generated during brazing) are provided as follows:

COPPER

CONCENTRATION	**RESPIRATORY PROTECTION**
Up to 5 mg/m^3:	Dust and mist respirator.
Up to 10 mg/m^3:	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/m^3:	Powered air-purifying respirator with dust and mist filter(s); or SAR operated in a continuous-flow mode.
Up to 50 mg/m^3:	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/m^3:	Positive pressure, full-facepiece SAR. (continued on next page)
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.

8. EXPOSURE CONTROLS - PERSONAL PROTECTION (Continued)

RESPIRATORY PROTECTION (continued):

SILVER (METAL DUST AND SOLUBLE COMPOUNDS, AS SILVER)

CONCENTRATION	RESPIRATORY PROTECTION
Up to 0.25 mg/m^3:	Supplied Air Respirator (SAR) operated in a continuous-flow mode or powered air-purifying respirator with high-efficiency particulate filter.
Up to 0.5 mg/m^3:	Full-facepiece respirator with high-efficiency particulate filter(s), full-facepiece Self-Contained Breathing Apparatus (SCBA), or full-facepiece SAR.
Up to 10 mg/m^3:	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.
Escape:	Full-facepiece respirator with high-efficiency particulate filter(s) or escape-type SCBA.

ZINC OXIDE

CONCENTRATION	RESPIRATORY PROTECTION
Up to 50 mg/m^3:	Dust, mist, and fume respirator or SAR.
Up to 125 mg/m^3:	Powered air-purifying respirators with dust, mist, and fume filter(s) or SAR operated in a continuous flow mode.
Up to 250 mg/m^3:	Full-facepiece air-purifying respirator with high-efficiency particulate filter(s), powered air-purifying respirator with tight-fitting facepiece and high-efficiency particulate filter(s), SAR with a tight-fitting facepiece operated in a continuous flow mode, full-facepiece SCBA, or full-facepiece SAR.
Up to 500 mg/m^3:	Positive pressure 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 air-purifying respirator with high-efficiency particulate filter(s) or escape-type SCBA.

EYE PROTECTION: Safety glasses. When these products are used in conjunction with brazing, 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 brazing, 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 elemental copper:

RELATIVE VAPOR DENSITY (air = 1): Not applicable.
SPECIFIC GRAVITY @ 20°C (water = 1): 8.94
SOLUBILITY IN WATER: Insoluble.
VAPOR PRESSURE: Approximately zero.
ODOR THRESHOLD: Not applicable.
EVAPORATION RATE (nBuAc = 1): Not applicable.
FREEZING/MELTING POINT: 1083°C (1981°F)
pH: Not applicable.
BOILING POINT: 2595°C (4703°F)
COEFFICIENT OF OIL/WATER DISTRIBUTION (PARTITION COEFFICIENT): Not applicable.

The following information is for elemental silver:

RELATIVE VAPOR DENSITY (air = 1): Not applicable.
SPECIFIC GRAVITY @ 20°C (water = 1): 10.49
SOLUBILITY IN WATER: Insoluble.
VAPOR PRESSURE, mm Hg @ 1284°C: Approximately zero.
ODOR THRESHOLD: Not applicable.
EVAPORATION RATE (nBuAc = 1): Not applicable.
FREEZING/MELTING POINT: 960.5°C (1760.9°F)
pH: Not applicable.
BOILING POINT @ 24 mm Hg: Approx. 2212°C (4014°F)
COEFFICIENT OF OIL/WATER DISTRIBUTION (PARTITION COEFFICIENT): Not applicable.

The following information is for elemental zinc:

RELATIVE VAPOR DENSITY (air = 1): Not applicable.
SPECIFIC GRAVITY @ 20°C (water = 1): 7.14
SOLUBILITY IN WATER: Insoluble.
VAPOR PRESSURE, mm Hg @ 487°C: 1
ODOR THRESHOLD: Not applicable.
EVAPORATION RATE (nBuAc = 1): Not applicable.
FREEZING/MELTING POINT: 419°C (786°F)
pH: Not applicable.
BOILING POINT: 907°C (1665°F)
COEFFICIENT OF OIL/WATER DISTRIBUTION (PARTITION COEFFICIENT): Not applicable.

9. PHYSICAL and CHEMICAL PROPERTIES (Continued)

The following information is for the products:

APPEARANCE, ODOR AND COLOR: These products are odorless, solid rods that have a metallic luster , which may have a flux coating.

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

10. STABILITY and REACTIVITY

STABILITY: Stable.

DECOMPOSITION PRODUCTS:

BARE RODS: Metal oxides.

COATED RODS: Metal oxides, boric anhydride, fluoride compounds, and hydrogen fluoride.

MATERIALS WITH WHICH SUBSTANCE IS INCOMPATIBLE: Strong acids, strong oxidizers, acetylene, halogenated hydrocarbons, halogens, ammonium nitrate, sulfur, potassium, alkali carbonates, alkali hydroxides, glass, other silica-based compounds.

HAZARDOUS POLYMERIZATION: Will not occur.

CONDITIONS TO AVOID: 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 constituents of these products present in concentration greater than 1%. Other data for animals are available for the constituents of these products, but are not presented in this Material Safety Data Sheet.

BORIC ACID:

Skin Irritancy (human) = 15 mg/ 3 days/ intermittent; mild
LD (oral, human) = 37 mg/kg/ boron as boric acid
LD (skin, infant) = 210 mg/kg/ boron as boric acid
TDLo (oral, rat) = 45000 mg/kg/ 90 days/ male; reproductive effects
TDLo (oral, child) = 500 mg/kg; gastrointestinal effects
LDLo (oral, man) = 429 mg/kg; cardiovascular, systemic effects
LDLo (oral, woman) = 200 mg/kg
TDLo (oral, infant) = 800 mg/kg/ 4 weeks/ intermittent

BORIC ACID (continued):

LDLo (oral, infant) = 934 mg/kg
LDLo (skin, infant) = 1200 mg/kg
LDLo (skin, child) = 4000 mg/kg/ 4 days
LDLo (skin, man) = 2430 mg/kg
LDLo (skin, child) = 1500 mg/kg
LDLo (subcutaneous, infant) = 1100 mg/kg
TDLo (unreported, man) = 170 mg/kg; gastrointestinal effects
LDLo (unreported, man) = 147 mg/kg

COPPER:

TDLo (oral-human) = 0.12 mg/kg; gastrointestinal effects

MANGANESE:

TCLo (inhalation-man) = 2300 $\mu g/m^3$; BRN, central nervous system effects

SILVER:

TCLo (inhalation-human) = 1 mg/m^3; skin effects

ZINC:

Skin Irritancy (human) = 300 mg/ 3 days/ intermittent; mild
TCLo (inhalation-human) = 124 mg/m^3/ 50 minutes; pulmonary system effects, skin

SUSPECTED CANCER AGENT: Components of these products are listed as follows:

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

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

PROPRIETARY FLUORIDE COMPOUND (as a Fluoride Compound): IARC-3 (Unclassifiable as to Carcinogenicity in Humans), ACGIH TLV-A4 (Not Classifiable as a Human Carcinogen)

NICKEL, ELEMENTAL, METAL: IARC-2B (Possibly Carcinogenic to Humans), MAK-1 (Substances which Cause Cancer in Man), NIOSH-X, (Carcinogen Defined with no Further Categorization); NTP-R (Reasonably Anticipated to be a Human Carcinogen), ACGIH TLV-A5 (Not Suspected as a Human Carcinogen)

SILVER: 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 constituents 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: The dusts or fumes of these products may be irritating to contaminated skin, eyes, respiratory system, and other tissues.

SENSITIZATION TO THE PRODUCT: Rare cases of allergic contact dermatitis have been reported in people working with copper dust. Nickel has been reported to cause sensitization effects in sensitive individuals.

11. TOXICOLOGICAL INFORMATION (Continued)

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

Mutagenicity: These components are not reported to produce mutagenic effects in humans. Animal mutation data are available for Boric Acid and Nickel (constituents of these products); these data were obtained during clinical studies on specific animal tissues exposed to high doses of this compound.

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

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

Reproductive Toxicity: These components are not reported to cause reproductive effects in humans. Clinical studies on test animals exposed to relatively high doses of Boric Acid and Copper (constituents 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, there are Biological Exposure Indices (BEIs) determined for the Fluoride Compound component of the Flux Coating (as a Fluoride).

BIOLOGICAL EXPOSURE INDICES (BEIs) for components of these products are as follows:

CHEMICAL: DETERMINANT	SAMPLING TIME	BEI
FLUORIDES:		
Fluorides in urine	Prior to shift	3 mg/g creatinine
	End of shift	10 mg/g creatinine

12. ECOLOGICAL INFORMATION

ALL WORK PRACTICES MUST BE AIMED AT ELIMINATING ENVIRONMENTAL CONTAMINATION.

ENVIRONMENTAL STABILITY: The metal components of these products occur naturally in the environment and are expected to persist in the environment for an extended period of time. Components of these products will react with water and air to form a variety of stable metal oxides and inorganic compounds. Additional environmental data are available as follows:

BORIC ACID: Water solubility = 1 g/ 18 mL (cold), 1 g/ 4 mL (boiling).

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).

NICKEL: Water solubility: Insoluble. Nickel is stable in air at ordinary temperature and is not affected by water. No data were found to suggest that nickel is involved in any biological transformation in the aquatic environment.

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.

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

EFFECT OF MATERIAL ON PLANTS or ANIMALS: The components of these products occur naturally in the environment and are essential for plant and animal life. This product is 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 are not expected to cause adverse effects on aquatic life. Additional aquatic toxicity data are available as follows:

BORIC ACID:
LC_{50} (trout eggs) = 100 ppm/ soft
LC_{50} (trout eggs) = 79 ppm/ hard
LC_{50} (catfish eggs) = 155 ppm/ soft
LC_{50} (catfish eggs) = 22 ppm/ hard
LC_{50} (goldfish eggs) = 46 ppm/ soft
LC_{50} (goldfish eggs) = 75 ppm/ hard
LC_{50} (*Daphnia magna*) = 133 mg/L/ 48 hours

COPPER: Copper is concentrated by plankton by 1000 or more. Copper may concentrate to toxic level in the food chain

SILVER: 0.1 ppm is toxic to bacteria and aquatic life. Discharge into marine waters should not exceed 1/20 of 96 hour LC_{50}, 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 tested per the Toxicity Characteristic Leaching Procedures requirements of RCRA to determine if such wastes meet the following characteristic: D011 (Silver) 5.0 mg/L (Regulated Level).

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.
MARINE POLLUTANT: No component of this product is designated as a marine pollutant by the Department of Transportation (49 CFR 172.101, Appendix B).
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 constituents 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)
Copper	No	Yes	Yes
Manganese	No	No	Yes
Nickel	No	Yes	Yes
Silver	No	Yes	Yes
Zinc	No	Yes	Yes (fume or dust)

U.S. SARA THRESHOLD PLANNING QUANTITY: There are no specific Threshold Planning Quantities for any component of this product. The default Federal MSDS submission and inventory requirement filing threshold of 10,000 lb (4,540 kg) may apply, per 40 CFR 370.20.

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

U.S. CERCLA REPORTABLE QUANTITY (RQ): Copper = 5000 lbs.; Nickel = 100 lbs.; Silver = 1000 lbs.: Zinc = 1000 lbs. RQs for Copper, Nickel, Silver, and Zinc are applicable to particles 100 micrometers or less in diameter.

OTHER U.S. FEDERAL REGULATIONS: Not applicable.

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, Nickel, Silver, and Tin.
California-Permissible Exposure Limits for Chemical Contaminants: Copper, Manganese, Nickel, Silver, Tin.
Florida-Substance List: Copper, Fume, Lithium, Manganese, Nickel, Silver, Tin, and Zinc.
Illinois-Toxic Substance List: Copper, Inorganic Fluoride Compounds, Manganese, Nickel, Silver, Zinc.
Kansas-Section 302/313 List: Copper, Manganese, Nickel, Silver, Zinc.
Massachusetts-Substance List: Copper, Lithium, Manganese, Nickel, Silver, Tin, Zinc.
Michigan - Critical Materials Register: Copper, Lithium, Nickel, Silver, and Zinc.
Minnesota-List of Hazardous Substances: Copper, Manganese, Nickel, Silver, Tin, Fume.
Missouri-Employer Information/Toxic Substance List: Copper, Manganese, and Nickel. Fluoride Compound, Silver, Tin.
New Jersey-Right to Know Hazardous Substance List: Copper, Lithium, Manganese, Nickel. Fluoride Compound, Silver, Tin, Zinc.
North Dakota-List of Hazardous Chemicals, Reportable Quantities: Copper, Nickel, Silver, and Zinc.
Pennsylvania-Hazardous Substance List: Copper, Lithium, Manganese, Nickel, Silver, Tin, Zinc.
Rhode Island-Hazardous Substance List: Copper, Fume, Lithium, Manganese, Nickel, Silver, Tin, and Zinc.
Texas-Hazardous Substance List: Copper, Fume, Manganese, Nickel, and Silver.
West Virginia-Hazardous Substance List: Copper, Fume, Manganese, Nickel, and Silver.
Wisconsin-Toxic and Hazardous Substances: Copper, Fume, Manganese, Nickel, and Silver.

15. REGULATORY INFORMATION (Continued)

CALIFORNIA PROPOSITION 65: Nickel (a constituent of some of these products) is on the California Proposition 65 List. The following statement pertains to products containing nickel. WARNING! Some of these products contain a chemical known to the state of California to cause cancer.

LABELING (Precautionary Statements):

FOR BARE WIRE:

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

FUMES AND GASES can be hazardous to your health.

HEAT RAYS (INFRARED RADIATION) from flame or hot metal can injure your eyes.

- 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 flame, or both, to keep fumes and gases from your breathing zone and the general area.
- Wear correct eye, ear, and body protection.
- 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.

FOR FLUX-COATED RODS:

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

FUMES AND GASES CAN BE HAZARDOUS TO YOUR HEALTH. CAN BE FATAL IF SWALLOWED.

- 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 flame, or both, to keep fumes and gases from your breathing zone and the general area.
- Avoid contact of flux with the eyes and skin.
- Do not take internally.
- Keep children away when using.
- 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/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.

CANADIAN WHMIS SYMBOLS: Not applicable.

16. OTHER INFORMATION

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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.

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: **LD_{50}** - Lethal Dose (solids & liquids) which kills 50% of the exposed animals; **LC_{50}** - 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/m^3** 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/NDSL** 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..