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.**

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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): **SUPER MISSILEWELD**
CHEMICAL NAME/CLASS: Coated Metal Alloys
SYNONYMS: Not Applicable
PRODUCT USE: Metal Welding
DOCUMENT NUMBER: 0093
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 13, 2007

2. COMPOSITION and INFORMATION ON INGREDIENTS

CHEMICAL NAME	CAS #	% w/w	EXPOSURE LIMITS IN AIR					
			ACGIH-TLV		OSHA-PEL		NIOSH	OTHER
			TWA mg/m^3	STEL mg/m^3	TWA mg/m^3	STEL mg/m^3	IDLH mg/m^3	mg/m^3
Iron (exposure limits are for iron oxide dust and	7439-89-6	31–65	5	NE	10	NE	2500	NIOSH REL: TWA = 5 DFG MAK: TWA = 1.5 (respirable fraction) Carcinogen: IARC-3, TLV-A4
Chromium	7440-47-3	11–30	0.5 0.5 (Cr. III)* 0.05 (Cr. VI,)*	NE	1.0 0.5 (Cr. III)*	NE 0.1(Ceiling on Cr. VI As CrO_3)*	250	NIOSH REL : TWA = 0.5 Carcinogen: EPA-D, EPA-CBD, IARC-3, TLV-A4 NIOSH REL : 0.5(Cr. III)* 0.001(Cr. VI)*
Calcium Carbonate	1317-65-3	1–10	10	NE	15 (Total Dust) 5 (Respirable fraction)	NE	NE	NIOSH REL: TWA = 10 (total Dust), 5 (respirable fraction)

NE = Not Established. NIC = Notice of Intended Change mppcf = Millions of Particles Per Cubic Foot * Compounds as Cr. & Cr. VI Water Soluble 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/m^3. NIOSH classifies welding fumes as carcinogens. Single values shown are maximum, unless otherwise noted.

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

2. COMPOSITION and INFORMATION ON INGREDIENTS (Continued)

CHEMICAL NAME	CAS #	% w/w	EXPOSURE LIMITS IN AIR					
			ACGIH-TLV		OSHA-PEL		NIOSH	OTHER
			TWA mg/m^3	STEL mg/m^3	TWA mg/m^3	STEL mg/m^3	IDLH mg/m^3	mg/m^3
Manganese (exposure limits are for Manganese, elemental, inorganic compounds, and fume, as manganese)	7439-96-5	1–10	0.2	NE	1 (vacated 1989 PEL)	5 (ceiling) 3 (vacated 1989 PEL)	500	NIOSH REL: TWA = 1 STEL = 3 DFG MAKs: TWA = 0.5 (inhalable fraction) PEAK = 10•MAK 30 min., average value Carcinogen: EPA-D
Sodium Aluminum Fluoride (exposure limits are for inorganic, solid Fluoride compounds, as F)	15096-52-3	1–10	2.5	NE	2.5	NE	250	NIOSH REL: TWA = 2.5 DFG MAKs: TWA = 2.5 PEAK = 5•MAK 30 min., average value Carcinogen: IARC-3, TLV-A4
Nickel (exposure limits are for Nickel, elemental metal)	7440-02-0	1–10	1.5 (inhalable fraction)	NE	1	NE	10	NIOSH REL: TWA = 0.015 Carcinogen: IARC-2B, MAK-1, NIOSH-Ca, NTP-R, TLV-A5
Calcium Fluoride (exposure limits are for inorganic, solid Fluoride compounds, as F)	7789-75-5	0.1	2.5	NE	2.5	NE	250	NIOSH REL: TWA = 2.5 DFG MAKs: TWA = 2.5 PEAK = 5•MAK 30 min., average value Carcinogen: IARC-3, TLV-A4
Barium Carbonate (exposure limits are for Barium soluble compounds, as Ba)	513-77-9	0.1	0.5	NE	0.5	NE	NE	NIOSH REL: TWA = 0.5 DFG MAKs: TWA = 0.5 (inhalable fraction) PEAK = 2•MAK 30 min., average value Carcinogen: EPA-D, EPA-NL, TLV-A4
Cobalt (exposure limits are for Cobalt, elemental and inorganic compounds, as Cobalt)	7440-48-4	0.1	0.02	NE	0.1 (for metal dust and fume, as Cobalt) 0.05 (vacated 1989 PEL)	NE	20	NIOSH REL: TWA = 0.05 (for metal dust and fume, as Cobalt) Carcinogen: IARC-2B, MAK-2, TLV-A3
Molybdenum (exposure limits are for Molybdenum, as Mo, insoluble compounds)	7439-98-7	0.1	10 NIC-10 (inhalable fraction) NIC-3 (respirable fraction)	NE	15 10 (vacated 1989 PEL)	NE	5000	DFG MAK: TWA = 4 (inhalable fraction)

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NOTE (1): The ACGIH has an established exposure limit for Welding Fumes, Not Otherwise Classified. The Threshold Limit Value is 5 mg/m^3. NIOSH classifies welding fumes as carcinogens. Single values shown are maximum, unless otherwise noted.

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

2. COMPOSITION and INFORMATION ON INGREDIENTS (Continued)

CHEMICAL NAME	CAS #	% w/w	EXPOSURE LIMITS IN AIR					
			ACGIH-TLV		OSHA-PEL		NIOSH	OTHER
			TWA mg/m^3	STEL mg/m^3	TWA mg/m^3	STEL mg/m^3	IDLH mg/m^3	mg/m^3
Copper (exposure limits are for copper fume, as Copper)	7440-50-8	0.1	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)
Silicon Dioxide (For Silica-Amorphous; Diatomaceous. earth)	7631-86-9	1–10	10 (inhalable fraction) 3 (respirable fraction)	NE	20 mppcf or $\frac{80\ mg/m^3}{\%\ SiO2}$ 6 (vacated 1989 PEL)		3000	NIOSH REL: TWA = 6 DFG MAK: TWA = 4 (inhalable fraction) DFG MAK Pregnancy Risk Classification: C Carcinogen: IARC-3
Titanium Dioxide	13463-67-7	1–10	10	NE	15 (Total dust) 10 (vacated 1989 PEL)	NE	5000	NIOSH REL: Lowest feasible concentration DFG MAK: 6 (Respirable fraction) Carcinogen: IARC-3, NIOSH-Ca, TLV-A4

NE = Not Established. mppcf = Millions of Particles Per Cubic Foot 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/m^3. NIOSH classifies welding fumes as carcinogens. Single values shown are maximum, unless otherwise noted.
NOTE (2): ALL WHMIS required information is included in appropriate sections based on the ANSI Z400.1-1998 format. This product has been classified in accordance with the hazard criteria of the CPR and the MSDS contains all the information required by the CPR.

3. HAZARD IDENTIFICATION

EMERGENCY OVERVIEW: This product consists of coated rods, which are odorless electrodes. There are no immediate health hazards associated with this product. This product is not reactive. If involved in a fire, this product may generate irritating iron fumes, a variety of iron, nickel, chromium, and silicon compounds, and metal oxides. Nickel and Chromium , components of this product is possibly carcinogenic to humans. Emergency responders must wear personal protective equipment suitable for the situation to which they are responding.

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

INHALATION: Inhalation is not anticipated to be a significant route of over-exposure to the coated rods. Inhalation of large amounts of particulates generated by this product during metal processing operations may result in pneumoconiosis (a disease of the lungs). Repeated over-exposures, via inhalation, to the dusts or fumes generated by this product during welding operations may have adverse effects on the lungs with possible pulmonary edema and emphysema (life-threatening lung injuries). Nickel (a component of this product) can cause pulmonary asthma in hypersensitive individuals. Damage to lungs can occur. Inhalation of dusts and fumes of Iron can also cause metal fume fever. Symptoms of metal fume fever can be delayed 24-48 hours. Refer to Section 10 (Stability and Reactivity) for information on the specific composition of welding fumes and gases.

3. HAZARD IDENTIFICATION (Continued)

CONTACT WITH SKIN or EYES: : Contact of the rod form of this product with the skin is not anticipated to be irritating. Contact with the rod form of this product can be physically damaging to the eye. Fumes generated during welding operations can be irritating to the skin and eyes. This product also contains Calcium Fluoride, a fluoride compound. Thermal decomposition of this compound can generate fluoride compounds, which are toxic and can cause burns in extreme cases. Burns from fluoride compounds can be delayed. Due to the presence of Nickel, prolonged exposure of the eyes may result in sensitization resulting in conjunctivitis (inflammation of the mucous membranes of the eyes). Symptoms of skin over-exposure may include irritation and redness; prolonged or repeated skin over-exposures may lead to allergic contact dermatitis. Contact with the hot electrodes will burn contaminated skin or eyes.

SKIN ABSORPTION: Skin absorption is not anticipated to be a significant route of over-exposure to the components of this product; however, thermal decomposition of this product can result in the production of fluoride compounds, which can penetrate intact skin. In cases of serious contamination with residue from thermal decomposition, burns that penetrate to the bone can occur.

INGESTION: Ingestion is not anticipated to be a route of occupational exposure for this product.

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

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

HAZARDOUS MATERIAL IDENTIFICATION SYSTEM

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

EYES	RESPIRATORY	HANDS	BODY
	See Section 8		See Section 8

For routine industrial applications for the electrodes.

See Section 16 for Definition of Ratings

ACUTE: The chief acute health hazard associated with this product would be the potential for irritation of contaminated skin and eyes when exposed to fumes during welding operations. Inhalation of large amounts of particulates generated by this product during metal processing operations can result in pneumoconiosis (a disease of the lungs). Contact with the molten material will burn contaminated skin or eyes. In extreme cases, burns may occur from contact with fluoride compounds that are generated during thermal decomposition.

CHRONIC: Chronic skin over-exposure to the fumes generated during welding operations may produce dermatitis (red, inflamed skin). Repeated over-exposures to the fumes generated by this product via inhalation can have adverse effects on the lungs (e.g., pulmonary edema and emphysema). Repeated or prolonged ingestion exposures to > 50–100 mg of Iron per day can result in deposition of iron in the body tissues, which can cause disease. Hypersensitivity to Nickel is common and can cause allergic contact dermatitis, pulmonary asthma, conjunctivitis and inflammatory reactions. Repeated over-exposures to the fumes generated by these products via inhalation can have adverse effects on the lungs (e.g., pulmonary edema and emphysema). Refer to Section 11 (Toxicological Information) for further information.

TARGET ORGANS: For fumes: ACUTE: Skin, eyes, respiratory system. CHRONIC: Skin, respiratory system, pancreas and liver.

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

4. FIRST-AID MEASURES

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

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

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

4. FIRST-AID MEASURES (Continued)

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

INGESTION: 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, pancreas, and liver disorders may be aggravated by prolonged over-exposures to the dusts or fumes generated by this product.

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: This product is not flammable; use fire-extinguishing agents appropriate for surrounding materials.

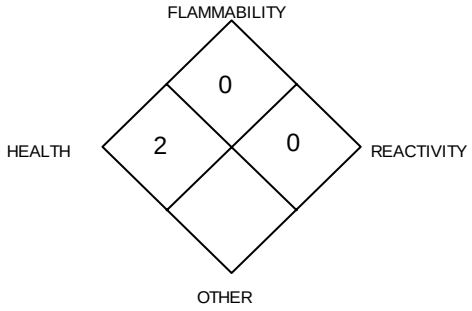
Water Spray: YES	Carbon Dioxide: YES
Halon: YES	Foam: YES
Dry Chemical: YES	Other: Any "ABC" Class

UNUSUAL FIRE AND EXPLOSION HAZARDS When involved in a fire, this product may decompose and produce iron fumes, a variety of nickel, iron and a variety of metal compounds and metal oxides. The hot material can present a significant thermal hazard to firefighters.

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

SPECIAL FIRE-FIGHTING PROCEDURES: Not applicable.

NFPA RATING



See Section 16 for Definition of Ratings

6. ACCIDENTAL RELEASE MEASURES

SPILL AND LEAK RESPONSE: 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 this product ON YOU or IN YOU. Wash thoroughly after handling this product. Do not eat or drink while handling this product. Use ventilation and other engineering controls to minimize potential exposure to this product.

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

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

(continued on following page)

8. EXPOSURE CONTROLS - PERSONAL PROTECTION (Continued)

RESPIRATORY PROTECTION (continued): The following are NIOSH recommendations for respirator selection for Welding fumes, based on NIOSH REL:

CONCENTRATION	RESPIRATORY EQUIPMENT FOR WELDING FUMES
At Concentrations above the NIOSH REL, or where there is no REL, at any Detectable Concentration:	Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode; or any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive-pressure mode.
Escape:	Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister having a high-efficiency particulate filter; or any appropriate escape-type, self-contained breathing apparatus
NOTE:	IDLH Concentration: Potential NIOSH carcinogen. [Not determined yet].

EYE PROTECTION: Safety glasses. When this product is used in conjunction with welding, wear safety glasses, goggles, welding helmet or face-shield with filter lens of appropriate shade number (per ANSI Z49.1-1988, "Safety in Welding and Cutting"). If necessary, refer to U.S. OSHA 29 CFR 1910.133, or appropriate Canadian Standards. If necessary, refer to U.S. OSHA 29 CFR 1910.138, or appropriate Standards of Canada.

HAND PROTECTION: Wear gloves for routine industrial use. When this product is used in conjunction with welding, wear gloves that protect from sparks and flame (per ANSI Z49.1-1988, "Safety in Welding and Cutting"). If necessary, refer to U.S. OSHA 29 CFR 1910.138, or appropriate Standards of Canada.

BODY PROTECTION: None normally needed for normal circumstances of use. Use body protection appropriate for task (i.e. apron, coveralls, chemically resistant boots). If a hazard of injury to the feet exists due to falling objects, rolling objects, where objects may pierce the soles of the feet or where employee's feet may be exposed to electrical hazards, use foot protection, as described in U.S. OSHA 29 CFR 1910.136.

9. PHYSICAL and CHEMICAL PROPERTIES

The following information is for elemental iron:

RELATIVE VAPOR DENSITY (air = 1): Not applicable.
SPECIFIC GRAVITY (water = 1): 7.87
SOLUBILITY IN WATER: Insoluble.
VAPOR PRESSURE, mm Hg @ 20°C: Not applicable.
ODOR THRESHOLD: Not applicable.
EVAPORATION RATE (nBuAc = 1): Not applicable.
FREEZING/MELTING POINT: 1535°C (2795°F)
pH: Not applicable.
BOILING POINT: 3000°C (5432°F)
COEFFICIENT OF OIL/WATER DISTRIBUTION (PARTITION COEFFICIENT): Not applicable.

The following information is for this product:

APPEARANCE AND COLOR: This product consists of coated rods, which are odorless electrodes.
HOW TO DETECT THIS SUBSTANCE (warning properties): The appearance is a distinctive characteristic of this product.

10. STABILITY and REACTIVITY

STABILITY: Stable.

DECOMPOSITION PRODUCTS: Products of thermal decomposition can include iron, nickel, chromium, and silicon compounds and metal oxides.

NOTE: The composition and quality of welding fumes and gases are dependent upon the metal being welded, the process, the procedure, and the electrodes used. Other conditions that could also influence the composition and quantity of fumes and gases to which workers may be exposed include the following: any coatings on metal being welded (e.g., paint, plating, or galvanizing), the number of welders and the volume of the work area, the quality of ventilation, the position of the welder's head with respect to the fume plume, and the presence of other contaminates in the atmosphere. When the electrode is consumed, the fume and gas decomposition products generated are different in percent and form from the ingredients listed in Section 2 (Composition and Information on Ingredients). Fume and gas decomposition products, and not the ingredients in the electrode, are important. Concentration of the given fume or gas component may decrease or increase by many times the original concentration. New compounds in the electrode may form. Decomposition products of normal operations include not only those originating from volatilization, reaction, or oxidation of the product's components but also those from base metals and any coating (as noted previously). The best method to determine the actual composition of generated fumes and gases is to take an air sample from inside the welder's helmet if worn or in breathing zone. For additional information, refer to the American Welding Society Publication, "Fumes and Gases in the Welding Environment".

MATERIALS WITH WHICH SUBSTANCE IS INCOMPATIBLE: Strong acids, strong oxidizers, halogens, phosphorous.

HAZARDOUS POLYMERIZATION: Will not occur.

CONDITIONS TO AVOID: Avoid uncontrolled exposure to extreme temperatures 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 this product present in concentration greater than 1%. Other data for animals are available for the components of this product, but are not presented in this Material Safety Data Sheet.

BARIUM CARBONATE:
LDLo (Oral-Man) 800 mg/kg: Behavioral: convulsions or effect on seizure threshold; Cardiac: change in rate, other changes
TDLo (Oral-Woman) 800 mg/kg: Gastrointestinal: hypermotility, diarrhea, nausea or vomiting; Lungs, Thorax, or Respiration: other changes
TDLo (Oral-Human) 11 mg/kg: Gastrointestinal: ulceration or bleeding from stomach

BARIUM CARBONATE (continued):
TDLo (Oral-Human) 17 mg/kg
TDLo (Oral-Human) 29 mg/kg: Peripheral Nerve and Sensation: flaccid paralysis without anesthesia (usually neuromuscular blockage), paresthesis; Behavioral: muscle weakness

COPPER:
TDLo (oral, human) = 0.12 mg/kg; gastrointestinal effects

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

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

TITANIUM DIOXIDE:
Skin (human) = 300 µg/3 days intermittent; mild irritation effects.

SUSPECTED CANCER AGENT: The components of this product are listed as follows:

BARIUM CARBONATE: ACGIH TLV-A4 (Not Classifiable as a Human Carcinogen; agents which cause concern that they could be carcinogenic for humans but which cannot be assessed conclusively because of lack of data), EPA-D (Not Classifiable as to Human Carcinogenicity inadequate human and animal evidence of carcinogenicity or no data available), EPA-NL (Not Likely to be Carcinogenic in Humans)

CALCIUM FLUORIDE (as a Fluoride Compound): ACGIH TLV-A4 (Not Classifiable as a Human Carcinogen; agents which cause concern that they could be carcinogenic for humans but which cannot be assessed conclusively because of lack of data), IARC-3 (Unclassifiable as to Carcinogenicity in Humans)

CHROMIUM: ACGIH TLV-A4 (Not Classifiable as a Human Carcinogen; agents which cause concern that they could be carcinogenic for humans but which cannot be assessed conclusively because of lack of data), EPA-D (Not Classifiable as to Human Carcinogenicity (inadequate human and animal evidence of carcinogenicity or no data available), EPA-CBD (Cannot Be Determined); IARC-3 (Unclassifiable as to Carcinogenicity in Humans)

CHROMIUM VI: ACGIH TLV-A1 (Confirmed Human Carcinogen : Agent is carcinogenic to humans based epidemiologic studies of, or convincing clinical evidence in, exposed humans),EPA-A (Human Carcinogen: sufficient evidence from epidemiologic studies to support a causal association between exposure and cancer), IARC-1(Carcinogenic to Humans: sufficient evidence of carcinogenicity),NIOSH-X (Carcinogen defined with no further categorization),NTP-1(Known to be carcinogenic: sufficient evidence from human studies), MAK-1(Substances which are considered to be carcinogenic for man because adequate results of long-term animal studies or evidence from animal and epidemiological studies)

COBALT: ACGIH TLV-A3 (Confirmed Animal Carcinogen), IARC-2B (Possibly Carcinogenic to Humans), MAK-2 (Substances That Are Considered to Be Carcinogenic for Man Because Sufficient Data From Long-Term Animal Studies or Limited Evidence from Animal Studies substantiated by evidence from epidemiological studies indicate that they can make a significant contribution to cancer risk)

IRON (as Iron Oxide): ACGIH TLV-A4 (Not Classifiable as a Human Carcinogen; agents which cause concern that they could be carcinogenic for humans but which cannot be assessed conclusively because of lack of data), IARC-3 (Unclassifiable as to Carcinogenicity in Humans)

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

NICKEL: ACGIH TLV-A5 (Not Suspected as a Human Carcinogen), IARC-2B (Possibly Carcinogenic to Humans), MAK-1(Substances That Cause Cancer in Man and Which Can Be Assumed to Make a Significant Contribution to Cancer Risk), NIOSH-Ca (Potential Occupational Carcinogen with No Further Categorization), NTP-R (Reasonably Anticipated to Be A Human Carcinogen)

SILICON DIOXIDE: ACGIH TLV-A4 (Not Classifiable as a Human Carcinogen; agents which cause concern that they could be carcinogenic for humans but which cannot be assessed conclusively because of lack of data)

SODIUM ALUMINUM FLUORIDE (as a Fluoride Compound): ACGIH TLV-A4 (Not Classifiable as a Human Carcinogen; agents which cause concern that they could be carcinogenic for humans but which cannot be assessed conclusively because of lack of data), IARC-3 (Unclassifiable as to Carcinogenicity in Humans)

TITANIUM DIOXIDE: ACGIH TLV-A4 (Not Classifiable as a Human Carcinogen; agents which cause concern that they could be carcinogenic for humans but which cannot be assessed conclusively because of lack of data), IARC-3 (Unclassifiable as to Carcinogenicity in Humans)

The remaining components of this product 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: Dusts or fumes of this product may be irritating to contaminated skin and eyes. Fumes may be irritating to the respiratory system.

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

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

Mutagenicity: This product is not reported to produce mutagenic effects in humans. Animal mutation data are reported for the Molybdenum and Nickel components of this product.

Embryotoxicity This product is not reported to produce embryotoxic effects in humans.

Teratogenicity: This product is not reported to cause teratogenic effects in humans. Animal teratogenic data are available for the Molybdenum, Copper, Nickel and Calcium Fluoride components of this product; these data were obtained during clinical studies on specific animal tissues exposed to high doses of these compounds.

Reproductive Toxicity: This product is not reported to cause reproductive effects in humans. Animal reproductive data are available for Molybdenum, Copper and Calcium Fluoride components of this product; these data were obtained during clinical studies on specific animal tissues exposed to high doses of these compounds.

11. TOXICOLOGICAL INFORMATION (Continued)

REPRODUCTIVE TOXICITY INFORMATION (continued): *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: The following BEIs are applicable to the Fluorides; Calcium Fluoride and Sodium Aluminum Fluoride components of this product.

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

12. ECOLOGICAL INFORMATION

ALL WORK PRACTICES MUST BE AIMED AT ELIMINATING ENVIRONMENTAL CONTAMINATION.

ENVIRONMENTAL STABILITY: The components of this product are expected to persist in the environment for an extended period of time. Iron, the major component in this product, will react with water and air to form a variety of stable iron oxides. The following environmental data are available for components of this product:

CHROMIUM: Chromium (metal) is insoluble in water, and is not oxidized by air, even in the presence of much moisture. The biological half-life of Chromium is listed as 0.5, 5.9, and 83.4 days, respectively, for three different components. Snails show a bioaccumulation factor of $1x10^6$ (total Chromium).

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.

EFFECT OF MATERIAL ON PLANTS or ANIMALS: This product is not expected to cause adverse effects on plant or animal life. Animal studies on copper, manganese, nickel, and silicon indicate various health effects after ingestion and exposures.

EFFECT OF CHEMICAL ON AQUATIC LIFE: This product may cause adverse effects on aquatic life, especially if large quantities are released into bodies of water. Low chronic aquatic limits indicate a high chronic hazard, it may be concentrated to toxic levels in food chain. The Nickel component of this product is toxic to aquatic life. Exposure of 0.095 ppm of Nickel for 3 weeks to Daphnid and Fathead minnows affected reproduction in these fish. The following aquatic toxicity data are available for the Copper component:

COPPER:
LC_{50} (fathead minnows) = 0.14 ppm in hard water

COPPER (continued):
LC_{50} (bluegill) = 0.02 ppm in soft water
LC_{50} (brook trout) = 0.09 ppm in soft water

13. DISPOSAL CONSIDERATIONS

PREPARING WASTES FOR DISPOSAL: Waste disposal must be in accordance with appropriate Federal, State, and local regulations. 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.

EPA WASTE NUMBER: Wastes of this product should be tested per the Toxicity Characteristic Leaching Procedures requirements of RCRA to determine if such wastes meet the following characteristics: D007 (Chromium) 5.0 mg/L (Regulated Level).

14. TRANSPORTATION INFORMATION

THIS PRODUCT 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 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)
Calcium Fluoride and Sodium Aluminum Fluoride (as fluoride compounds)	NO	NO	Yes; category code N040
Chromium	NO	YES	YES
Chromium (III) Oxide (Chromium Compound Category)	NO	Yes	Yes
Manganese	NO	NO	YES
Copper	NO	YES	YES
Nickel	NO	YES	YES

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

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

U.S. CERCLA REPORTABLE QUANTITY (RQ): Copper = 5000 lbs.; Nickel = 100 lbs.; Chromium = 5000 lbs (applicable to particles in which the diameter is 100 micrometers or less).

OTHER U.S. FEDERAL REGULATIONS: Not applicable.

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

Alaska-Designated Toxic and Hazardous Substances: Calcium Carbonate, Chromium, Chromium (III) Compounds), Manganese, Molybdenum, Silicon Dioxide, Titanium Dioxide, and Copper.

California-Permissible Exposure Limits for Chemical Contaminants: Calcium Carbonate, Chromium, Manganese, Molybdenum, Silicon Dioxide, Titanium Dioxide, and Copper.

Florida-Substance List: Chromium, Manganese, Molybdenum, Silicon Dioxide, and Copper.

Illinois-Toxic Substance List: Chromium, Manganese, Molybdenum, Silicon Dioxide, Titanium Dioxide, and Copper.

Kansas-Section 302/313 List: Chromium, Manganese, Titanium Dioxide, and Copper.

Massachusetts-Substance List: Chromium, Chromium (III) Compounds), Manganese, Molybdenum, and Silicon Dioxide.

Michigan - Critical Materials Register: Chromium, Cobalt, Copper, and Nickel.

Minnesota-List of Hazardous Substances: Calcium Carbonate, Chromium, Manganese, Molybdenum, Silicon Dioxide, Titanium Dioxide, and Copper.

Missouri-Employer Information/Toxic Substance List: Calcium Carbonate, Chromium, Chromium (III) Compounds), Manganese, Molybdenum, Silicon Dioxide, Titanium Dioxide, and Copper.

New Jersey-Right to Know Hazardous Substance List: Chromium, Chromium (III) Compounds),Manganese, Molybdenum, Silicon Dioxide, Titanium Dioxide, and Copper.

Pennsylvania-Hazardous Substance List: Calcium Carbonate, Chromium, Manganese, Molybdenum, Silicon Dioxide, Titanium Dioxide, and Copper.

Rhode Island-Hazardous Substance List: Calcium Carbonate, Chromium, Manganese, Molybdenum, Titanium Dioxide, and Copper.

Texas-Hazardous Substance List: Chromium, Manganese, Molybdenum, Titanium Dioxide, and Copper.

West Virginia-Hazardous Substance List: Chromium, Manganese, Molybdenum, Titanium Dioxide, and Copper.

Wisconsin-Toxic and Hazardous Substances: Chromium, Manganese, Molybdenum, Titanium Dioxide, and Copper.

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

CALIFORNIA SAFE DRINKING WATER AND TOXIC ENFORCEMENT ACT (PROPOSITION 65): The Chromium and Nickel components of this product are on the California Proposition 65 List. **WARNING: This product may contain chemicals, and when used for welding may produce fumes or gases containing chemicals, known to the State of California to cause cancer, and/or birth defects (or other reproductive harm.)**

LABELING (Precautionary Statements):

WARNING:

PROTECT yourself and others. Read and understand this information.

FUMES AND GASES can be hazardous to your health. **ARC RAYS** can injure your eyes and burn skin.

ELECTRIC SHOCK can kill.

- Before use, read and understand the manufacturer's instructions. Material Safety Data Sheets (MSDSs), and your employer's safety policies.
- Keep your head out of the fumes.
- Use enough ventilation, exhaust at the arc, or both, to keep fumes and gases from your breathing zone and the general area.
- Wear correct eye, ear, and body protection.
- 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, Washington, DC 20402.

DO NOT REMOVE THIS INFORMATION.

15. REGULATORY INFORMATION (Continued)

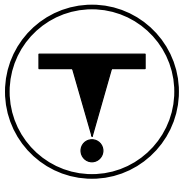
ADDITIONAL CANADIAN REGULATIONS:

CANADIAN DSL/NDSL INVENTORY STATUS: The components of this product are on the DSL Inventory.

OTHER CANADIAN REGULATIONS: Not applicable.

CANADIAN ENVIRONMENTAL PROTECTION ACT (CEPA) PRIORITIES SUBSTANCES LISTS: The Calcium Fluoride and Sodium Aluminum components of this product as an inorganic fluoride compound, are on the CEPA First Priority Substances List (PSL), and are considered "toxic".

CANADIAN WHMIS SYMBOLS: Class D2A/D2B: Materials Causing Other Toxic Effects-Contains Potential Sensitizer



16. OTHER INFORMATION

DATE OF PRINTING: July 13, 2007

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 this product. The information contained herein relates only to the specific product. If the product is combined with other materials, all component properties must be considered. To the best of the Harris Products Group knowledge, the information and recommendations contained in this publication are reliable and accurate as of the date of issue. However, accuracy, suitability, or completeness are not guaranteed, and no warranty, guarantee, or representation, expressed or implied, is made by Harris Products Group as to the absolute correctness or sufficiency of any representation contained in this and other publications; Harris Products Group assumes no responsibility in connection therewith; nor can it be assumed that all acceptable safety measures may not be required under particular or exceptional conditions or circumstances. Data may be changed from time to time. Be sure to consult the latest edition.

DEFINITIONS OF TERMS

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

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

EXPOSURE LIMITS IN AIR:

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

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

PEL - Permissible Exposure Limit - This exposure value means exactly the same as a TLV, except that it is enforceable by OSHA. The OSHA Permissible Exposure Limits are based in the 1989 PELs and the June, 1993 Air Contaminants Rule (Federal Register: 58: 35338-35351 and 58: 40191). Both the current PELs and the vacated PELs are indicated. The phrase, "Vacated 1989 PEL," is placed next to the PEL, which was vacated by Court Order. **IDLH -** Immediately Dangerous to Life and Health **-** This level represents a concentration from which one can escape within 30-minutes without suffering escape-preventing or permanent injury. **The DFG - MAK** is the Republic of Germany's Maximum Exposure Level, similar to the U.S. PEL. **NIOSH** is the National Institute of Occupational Safety and Health, which is the research arm of the U.S. Occupational Safety and Health Administration (**OSHA**). NIOSH issues exposure guidelines called Recommended Exposure Levels (**REL**s). 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 is 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.