



MATERIAL SAFETY DATA SHEET

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

WARNING: PRODUCT COMPONENTS PRESENT HEALTH AND SAFETY HAZARDS. READ AND UNDERSTAND THIS MATERIAL SAFETY DATA SHEET (M.S.D.S.). ALSO, FOLLOW YOUR EMPLOYER'S SAFETY PRACTICES. The information contained herein relates only to the specific product. If the product is combined with other materials, all component properties must be considered. **BE SURE TO CONSULT THE LATEST VERSION OF THE MSDS. MATERIAL SAFETY DATA SHEETS ARE AVAILABLE FROM J.W. HARRIS CO., INC.**

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STATEMENT OF LIABILITY-DISCLAIMER

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

1. PRODUCT IDENTIFICATION

TRADE NAME (AS LABELED):	LISTED IN SECTION 2 UNDER CLASS
CHEMICAL NAME/CLASS:	Metal Alloy
SYNONYMS:	LOW-ALLOY STEELS AND TOOL STEELS
PRODUCT USE:	Metal Welding
DOCUMENT NUMBER:	0057
SUPPLIER/MANUFACTURER'S NAME:	HARRIS PRODUCTS GROUP
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DATE OF PREPARATION:	September 24, 2010

2. COMPOSITION and INFORMATION ON INGREDIENTS

Class	C	Mn	Si	V	W	Cr	Mo	Fe
4130	0.28-0.33	0.40-0.60	0.15-0.60			0.8-1.1	0.15-0.25	Balance
ER80S-B2	0.07-0.12	0.40-0.70	0.40-0.70	(a)	(C)	1.20-1.50	0.40-0.65	Balance
ER80S-B6	0.10	0.40-0.70	0.50	(a)	(C)	4.50-6.00	0.45-0.65	Balance
ER90S-B3	0.07-0.12	0.40-0.70	0.40-0.70	(a)	(C)	2.30-2.70	0.90-1.20	Balance
3OH	1.00	1.20	0.30	0.10	0.50	0.50		Balance
3HW	0.30-0.450	0.20-0.50	0.80-1.20	0.50	1.00-1.80	4.75-5.50	1.25-1.80	Balance
3HSS	0.90	0.30	0.30	2.00	6.50		5.00	Balance
3FH	0.30	0.50	0.50			1.00	0.20	Balance
3AH	0.95-1.05	1.00	0.50	0.15-0.50		4.75-5.50	0.90-1.40	Balance
3WH	1.05	0.20	0.20	0.20		(a)		Balance
COATED ELECTRODES (Flux Coating listed in the next table)								
4WH	0.50-1.00	0.25-0.75	0.20-0.50	0.25-0.50		1.00-1.50	1.50-2.00	Balance
4HSS	0.70-1.00	0.75	1.00	1.00-2.50	5.00-7.00	3.00-5.00	4.00-6.00	Balance
4AH	0.70-1.00	0.25-0.50	0.25-0.50	0.75-1.00	1.00-1.25	4.75-5.25	1.75-2.25	Balance
4HW	0.25-0.50	0.50-1.00	0.50-1.00	0.25-0.50	1.00-1.50	4.75-5.50	1.50-2.00	Balance

4OH	0.75	1.00	0.50	0.50	0.50	1.50	1.50	Balance
4FH	0.25-0.35	0.40-0.60	0.15-0.30			0.80-1.10	0.15-0.25	Balance
Single values are maximums., S and P = 0.40% max., (a) :Cu=0.50,(C):Ni=0.6								

2. COMPOSITION and INFORMATION ON INGREDIENTS (FOR COATING ON ELECTRODES)

CHEMICAL NAME	CAS #	% w/w	EXPOSURE LIMITS IN AIR					
			ACGIH-TLV		OSHA-PEL			OTHER mg/m ³
			TWA mg/m ³	STEL mg/m ³	TWA mg/m ³	STEL mg/m ³	IDLH mg/m ³	
Potassium Oxalate	6487-48-5	1.50	NE	NE	NE	NE	NE	NE
Potassium Silicate	1312-76-1	10.00	NE	NE	NE	NE	NE	NE
Potassium Titanate	12056-51-8	10.00	NE	NE	NE	NE	NE	Carcinogen: MAK-A2 (fibrous dust)
Quartz	14808-60-7	5.00	0.1 (Respirable particulate fraction)	NE	<u>30 mg/m³ (Total dust)</u> % SiO ₂ + 2 <u>250 mppcf (Respirable dust)</u> % SiO ₂ +5 or <u>10 mg/m³ (Respirable dust)</u> % SiO ₂ + 2 0.1 (vacated 1989 PEL)			25 NIOSH REL: 0.05 (Respirable dust) DFG MAK: 0.15 (Respirable fraction) Carcinogen: IARC-A2, NIOSH-X, NTP-A2
Bentonite	70131-50-9	6.00	NE	NE	NE	NE	NE	NE
Calcium Carbonate	1317-65-3	50.00	10	2.0	15 (Total Dust) 5 (Respirable fraction)	NE	NE	NIOSH REL: 10 (Total Dust) 5 (Respirable fraction)
Calcium Fluoride (exposure limits are for Fluoride, F)	14542-24-5	20.00	2.5, A4 (Not Classifiable as a Human Carcinogen)	NE	2.5	NE	NE	NIOSH REL: 2.5 DFG MAK: 2.5
Sodium Carboxymethyl Cellulose	9004-32-4	5.00	NE	NE	NE	NE	NE	NE
Sodium Silicate	1344-09-8	11.00	NE	NE	NE	NE	NE	NE
Talc (containing no asbestos fibers)	14807-96-6	5.00	2, A4 (Not Classifiable as a Human Carcinogen)	NE	20 mppcf (containing < 1% quartz) 2 (Respirable dust) (vacated 1989 PEL)		1000	NIOSH REL: 2 (Respirable dust) DFG MAK: 2 (Respirable fraction) Carcinogen: IARC-3
Graphite (neutral)	7782-42-5	1.60	2	NE	15 mppcf	NE	1250	NIOSH REL: 2.5 (Respirable dust) DFG MAK: 6 (Respirable fraction)

NE = Not Established. See Section 16 for Definitions of Terms Used. Single values shown are maximum, unless otherwise noted.
 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.
 NOTE (2): ALL WHMIS required information is included in appropriate sections based on the ANSI Z400.1-1998 format. These products have 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) (for solid wire or rods)

CHEMICAL NAME	CAS #	EXPOSURE LIMITS IN AIR		
		ACGIH-TLV	OSHA-PEL	OTHER

		TWA mg/m ³	STEL mg/m ³	TWA mg/m ³	STEL mg/m ³	IDLH mg/m ³	mg/m ³
Chromium	7440-47-3	0.5 0.5 (Cr. III)* 0.05 (Cr. VI.)*	NE	0.5 (Cr. III)*	NE 0.01(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)*
Iron (exposure limits are for iron oxide dust and fume [Fe ₂ O ₃], as Fe)	1309-37-1	5, A4 (Not Classifiable as a Human Carcinogen)	NE	10	NE	2500	NIOSH REL: 5 DFG MAK: 6
Manganese (exposure limits are for Manganese, elemental, inorganic compounds, and fume, as Mn)	7439-96-5	0.2	NE	1 (Vacated 1989 PEL)	5 C 3 (Vacated 1989 PEL)	500	NIOSH REL: TWA: 1 STEL: 3 DFG MAK: 0.5 Carcinogen: EPA-D
Molybdenum	7439-98-7	0.5 3 10	NE	15 10(vacated 1989 PEL)	NE	5000	NE
Graphite Synthetic (exposure limits are for Particles Not Otherwise Specified)	7440-44-0	10 (Inhalable) 3 (Respirable)	NE	50 mppcf or 15 (Total Dust) 15 mppcf or 5 (Respirable Fraction)	NE	NE	DFG MAKs: TWA = 4 (Inhalable fraction); 1.5 (Respirable Fraction)
Silicon	7440-21-3	10	NE	15 (Total dust) 5 (Respirable fraction) 10 (Total dust) (vacated 1989 PEL)	NE	NE	NIOSH REL: 10 (Total dust) 5 (Respirable fraction)
Tungsten	7440-33-7	5	10	NE	NE	NE	NIOSH REL: TWA = 5 STEL = 10
Vanadium (exposure limits are for vanadium pentoxide, as V ₂ O ₅ , respirable dust of fume)	1314-62-1	0.05, A4 (Not Classifiable as a Human Carcinogen)	NE	NE	0.5 C (Respirable dust) 0.1 C (fume) 0.05 C (vacated 1989 PEL)	35	NIOSH REL: STEL = 0.05 C (15 minutes, total dust, as vanadium) DFG MAK: TWA = 0.05
Low Hazard constituents each present in less than 1 percent		NE	NE	NE	NE	NE	NE

NE = Not Established. See Section 16 for Definitions of Terms Used. Single values shown are maximum, unless otherwise noted.

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. * Compounds as Cr. & Cr. VI Water Soluble

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

3. HAZARD IDENTIFICATION

EMERGENCY OVERVIEW: These products consist of solid wire or rods, which are odorless and may be copper coated or flux coated rods that are odorless. Chromium and Quartz (components of this product) are possible carcinogens. There are no immediate health hazards associated with the wire or rod form of this product. These products are not reactive. If

involved in a fire, these products may generate irritating iron fumes and a variety of iron compounds. 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 wire or rods. Inhalation of large amounts of particulates generated by these products 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 these products may have adverse effects on the lungs with possible pulmonary edema and emphysema (life-threatening lung injuries). Refer to Section 10 (Stability and Reactivity) for information on the specific composition of welding fumes and gases.

CONTACT WITH SKIN or EYES: Contact of these products with the skin is not anticipated to be irritating. Contact with the wire or rod form of these products can be physically damaging to the eye. Fumes generated during welding operations can 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 wire or rods will burn contaminated skin or eyes.

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



INGESTION: Ingestion is not anticipated to be a route of occupational exposure for these products.

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

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

ACUTE: The chief acute health hazard associated with these products would be the potential for irritation of contaminated skin and eyes when exposed to fumes during welding operations. Inhalation of large amounts of particulates generated by these products during metal processing operations can result in pneumoconiosis (a disease of the lungs). Contact with the molten material will burn contaminated skin or eyes.

CHRONIC: Chronic skin over-exposure to the fumes of these products during welding operations may produce dermatitis (red, inflamed skin). 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). 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.

HAZARDOUS MATERIAL INFORMATION 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			

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

4. FIRST-AID MEASURES

SKIN EXPOSURE: If fumes generated by welding 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.

4. FIRST-AID MEASURES (Continued)

EYE EXPOSURE: If fumes generated by welding 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 fumes generated by welding 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.

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.

5. FIRE-FIGHTING MEASURES

FLASH POINT, °C (method): Not flammable.

AUTOIGNITION TEMPERATURE, °C: Not flammable.

FLAMMABLE LIMITS (in air by volume, %):

Lower (LEL): Not applicable.

Upper (UEL): Not applicable.

FIRE EXTINGUISHING MATERIALS:

Water Spray: YES

Halon: YES

Dry Chemical: YES

Carbon Dioxide: YES

Foam: YES

Other: Any "ABC" Class

UNUSUAL FIRE AND EXPLOSION HAZARDS If melted

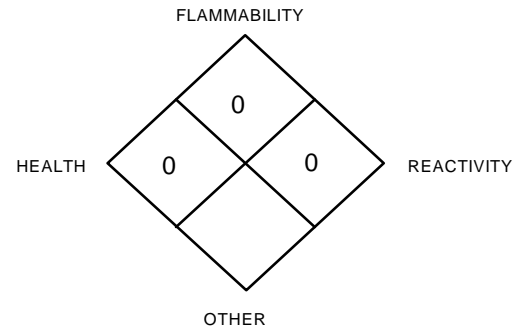
these products may decompose and produce irritating fumes containing iron compounds and metal oxides. The molten material can present a significant thermal hazard to firefighters.

Explosion Sensitivity to Mechanical Impact: Not sensitive.

Explosion Sensitivity to Static Discharge: Not sensitive.

SPECIAL FIRE-FIGHTING PROCEDURES: N/A

NFPA RATING



**See Section 16 for
Definition of Ratings**

6. ACCIDENTAL RELEASE MEASURES

SPILL AND LEAK RESPONSE: N/A

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 it safely. Use in a well-ventilated location. Avoid breathing fumes of these products during welding operations. Open containers on a stable surface. Packages of these products must be properly labeled.

When these products are used during welding operations, follow the requirements of the Federal Occupational Safety and Health Welding and Cutting Standard (29 CFR 1910 Subpart Q) and the safety standards of the American National Standards Institute for welding and cutting (ANSI Z49.1).

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

PROTECTIVE PRACTICES DURING MAINTENANCE OF CONTAMINATED EQUIPMENT: N/A

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 AirLine 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. Use supplied air respiration protection if oxygen levels are below 19.5% or are unknown.

EYE PROTECTION: When these products are 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").

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

BODY PROTECTION: Wear body protection appropriate for task.

9. PHYSICAL and CHEMICAL PROPERTIES

The following information is for elemental iron:

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

SPECIFIC GRAVITY (water = 1): 7.86

SOLUBILITY IN WATER: Insoluble.

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

ODOR THRESHOLD: Not applicable.

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

The following information is for the product:

APPEARANCE AND COLOR: These products consist of solid wire or rods, which are odorless and may be coated electrodes or copper coated rods.

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

EVAPORATION RATE (nBuAc = 1): Not applicable.

FREEZING/MELTING POINT: 1535°C (2795°F)

pH: Not applicable.

BOILING POINT: 3000°C (5432°F)

10. STABILITY and REACTIVITY

STABILITY: Stable.

DECOMPOSITION PRODUCTS: Iron compounds, carbon monoxide, carbon dioxide 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 contaminants 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, mineral acids, and halogens.

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

IRON: TDL _o (oral, child) = 77 mg/kg; BAH, gastrointestinal tract, blood effects	QUARTZ: TCL _o (inhalation, human) = 16 mppcf/ 8 hours/ 17.9 years/ intermittent; pulmonary system effects
MANGANESE: TCL _o (inhalation, man) = 2300 µg/m ³ ; BRN, central nervous system effects	LCL _o (inhalation, human) = 300 µg/m ³ / 10 years/ intermittent; systemic effects

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

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)

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

Quartz:IARC Group 2A, Probably Carcinogenic to Humans (limited human evidence, sufficient evidence in experimental animals).
NIOSH-X, Carcinogen defined with no further categorization.

NTP-2A, Reasonably anticipated to be a carcinogen (limited evidence of carcinogenicity from studies in humans, which indicates that causal relationship is credible).

Talc:IARC Group 3, Not Classifiable as to Carcinogenicity to Humans.

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

IRRITANCY OF PRODUCT: Dusts or fumes of these products may be irritating to contaminated skin and eyes. Fumes may be irritating to the respiratory system.

SENSITIZATION TO THE PRODUCT: The components of these products are not known to be sensitizers with repeated or prolonged use.

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

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

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

REPRODUCTIVE TOXICITY INFORMATION (continued):

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

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

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

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 these products.

RECOMMENDATIONS TO PHYSICIANS: Treat symptoms and eliminate overexposure.

BIOLOGICAL EXPOSURE INDICES: Currently, there are no Biological Exposure Indices (BEIs) associated with components of these products.

12. ECOLOGICAL INFORMATION

ALL WORK PRACTICES MUST BE AIMED AT ELIMINATING ENVIRONMENTAL CONTAMINATION.

ENVIRONMENTAL STABILITY: The components of these products occur naturally in the environment and are expected to persist in the environment for an extended period of time. Iron will react with water and air to form a variety of stable iron oxides.

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.

EFFECT OF CHEMICAL ON AQUATIC LIFE: These products are not expected to cause adverse effects on aquatic life.

13. DISPOSAL CONSIDERATIONS

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

EPA WASTE NUMBER: Wastes of this product should be tested per the Toxicity Characteristic Leaching Procedures requirements of RCRA to determine if such wastes meet the following characteristic: D007 (Chromium) 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, 1996: Not applicable.

MARINE POLLUTANT: No component of these products 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.

15. REGULATORY INFORMATION

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:

COMPONENT	SARA 302	SARA 304	SARA 313
Chromium	No	Yes	Yes
Chromium (III) Oxide (Chromium Compound Category)	No	Yes	Yes
Manganese	No	No	Yes
Vanadium (fume or dust)	No	No	Yes

SARA THRESHOLD PLANNING QUANTITY: Not applicable. **TSCA INVENTORY STATUS:** The components of these products are listed on the TSCA Inventory. **CERCLA REPORTABLE QUANTITY (RQ):** Chromium = 5000 lbs.

OTHER FEDERAL REGULATIONS: Not applicable.

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

Alaska-Designated Toxic and Hazardous Substances: Calcium Carbonate, Graphite, Chromium, Chromium (III) Compounds), Manganese, Molybdenum, and Tungsten, Vanadium (V₂O₅ fume or dust).

California-Permissible Exposure Limits for Chemical Contaminants: Calcium Carbonate, Graphite, Chromium, Manganese, Silicon, and Tungsten.

Florida-Substance List: Chromium, Graphite, Manganese, Molybdenum, and Tungsten.

Illinois-Toxic Substance List: Chromium, Graphite, Manganese, Molybdenum, Silicon, and Tungsten.

Kansas-Section 302/313 List: Chromium, Manganese, and Vanadium.

Massachusetts-Substance List: Calcium Carbonate, Graphite, Chromium, Chromium (III) Compounds), Manganese, Molybdenum, and Tungsten.

Michigan - Critical Materials Register: Chromium.

Minnesota-List of Hazardous Substances: Calcium Carbonate, Graphite, Chromium, Manganese, Silicon, and Tungsten.

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

New Jersey-Right to Know Hazardous Substance List: Chromium, Chromium (III) Compounds), Manganese, Molybdenum, Tungsten, and Vanadium.

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

Pennsylvania-Hazardous Substance List: Calcium Carbonate, Graphite, Chromium, Manganese, Molybdenum, Silicon, Tungsten, and Vanadium.

Rhode Island-Hazardous Substance List: Calcium Carbonate, Graphite, Chromium, Manganese, Molybdenum, Silicon, and Tungsten.

Texas-Hazardous Substance List: Graphite, Chromium, Manganese, and Molybdenum, Vanadium (V₂O₅ fume or dust).

West Virginia-Hazardous Substance List: Graphite, Chromium, Manganese, and Molybdenum, Vanadium (V₂O₅ fume or dust).

Wisconsin-Toxic and Hazardous Substances: Graphite, Chromium, Manganese, and Molybdenum, Vanadium (V₂O₅ fume or dust).

15. REGULATORY INFORMATION (Continued)

CALIFORNIA PROPOSITION 65: The Quartz (as silica, crystalline) and Chromium components of these products are 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.)**

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.

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

WHMIS SYMBOLS: Not applicable.

16. OTHER INFORMATION

DATE OF PRINTING:

September 24, 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 products. The information contained herein relates only to the specific product. If the product is combined with other materials, all component properties must be considered. To the best of the Harris Products Group knowledge, the information and recommendations contained in this publication are reliable and accurate as of the date of issue. However, accuracy, suitability, or completeness are not guaranteed, and no warranty, guarantee, or representation, expressed or implied, is made by Harris Products Group, as to the absolute correctness or sufficiency of any representation contained in this and other publications; Harris Products Group, assumes no responsibility in connection therewith; nor can it be assumed that all acceptable safety measures may not be required under particular or exceptional conditions or circumstances. Data may be changed from time to time. Be sure to consult the latest edition.

DEFINITIONS OF TERMS

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

CAS #: This is the Chemical Abstract Service Number, which uniquely identifies each constituent. It is used for computer-related searching.

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

REGULATORY INFORMATION:

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