

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 AUFHAUSER CORPORATION.**

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): ALUMINUM WELDING WIRES AND RODS
CHEMICAL NAME/CLASS: Metal Alloy
SYNONYMS: Not applicable
PRODUCT USE: Metal Welding
SUPPLIER/MANUFACTURER'S NAME: Aufhauser Corporation
ADDRESS: 39 West Mall
EMERGENCY PHONE: (516) 694-8696
BUSINESS PHONE: 1-800-645-9486
DATE OF PREPARATION: 6 - 1 - 2005

2. COMPOSITION and INFORMATION ON INGREDIENTS

NOMINAL COMPOSITION WEIGHT % BARE ROD or WIRE									
Trade Name	Si	Fe	Cu	Mn	Mg	Cr	Zn	Ti	Al
1100	a	A	0.05-0.20	0.05			0.10		99.0 min
1188(d)	0.06	0.06	0.005	0.01	0.01		0.03	0.01	99.88 min
2319(b)	0.20	0.30	5.80-6.80	0.20-0.40	0.02		0.10	0.10-0.12	Rem.
4043	4.5-6.0	0.80	0.30	0.05	0.05		0.10	0.20	Rem.
5154	0.25	0.40	0.10	0.10	3.10-3.90	0.15-0.35	0.20	0.20	Rem.
5183	0.40	0.40	0.10	0.50-1.0	4.30-5.20	0.05-0.25	0.25	0.15	Rem.
5356	0.25	0.40	0.10	0.05-0.20	4.50-5.50	0.05-0.20	0.10	0.06-0.20	Rem.
5554	0.25	0.40	0.10	0.50-1.0	2.40-3.0	0.05-0.20	0.25	0.05-0.20	Rem.
5556	0.25	0.40	0.10	0.50-1.0	4.70-5.50	0.05-0.20	0.25	0.05-0.20	Rem.
5654	c	C	0.05	0.01	3.10-3.90	0.15-0.35	0.20	0.05-0.15	Rem.
718 (4047)	11.0-13.0	0.80	0.30	0.15	0.10		0.20		Rem.

Single figures are Maximum A: Si + Fe = 0.95 max B: Vanadium: 0.05-0.15, Zirconium 0.10-0.25
D: Vanadium 0.05 max. , Gallium 0.03 max. c: Si + Fe = 0.45 max

2. COMPOSITION AND INFORMATION ON INGREDIENTS (CONTINUED)

CHEMICAL NAME	CAS #	% W/W	EXPOSURE LIMITS IN AIR					
			ACGIH – TLV		OHSА – PEL		NIOSH IDLH MG/M ³	OTHER MG/M ³
			TWA MG/M ³	STEL MG/M ³	TWA MG/M ³	STEL MG/M ³		
ALUMINUM (EXPOSURE LIMITS ARE FOR ALUMINUM, METAL DUST AND ALUMINUM, WELDING FUME, AS ALUMINUM)	7429-90-5	SEE TABLE PREV. PAGE	10 (DUST) 5 (FUMES)	NE	15 (TOTAL DUST) 5 (RESPIRABLE FRACTION) 5 (FUME) (VACATED 1989 PEL)	NE	NE	NIOSH REL: TWA = 10 (TOTAL DUST); 5 (RESPIRABLE FRACTION); 5 (FUMES) DFG MAK: TWA = 1.5 (DUST-RESPIRABLE FRACTION)
CHROMIUM METAL	7440-47-3	SEE TABLE PREV. PAGE	0.5	NE	0.5	NE	250	NIOSH REL: TWA = 0.5 CARCINOGEN: EPA-D, E[A-CBD, IARC-3, TLV-A4
COPPER (EXPOSURE LIMITS ARE FOR COPPER FUME, AS CU AND DUSTS & MISTS, AS CU)	7440-50-8	SEE TABLE PREV. PAGE	0.2 (FUME) 1 (DUSTS & MISTS)	NE	0.1 (FUME) 1 (DUSTS & MISTS)	NE	100	NIOSH REL: TWA = 1 (DUST); 0.1 (FUME) DFG MAKs: TWA = 0.1 (FUME-RESPIRABLE FRACTION); 1 (DUSTS & MISTS-INHALABLE FRACTION) PEAK = 2 MAK, 30 MIN., AVG VALUE CARCINOGEN: EPA-D (DUSTS & MISTS)
IRON (EXPOSURE LIMITS ARE FOR IRON OXIDE DUST AND FUME [FE ₂ O ₃], AS FE)	7439-89-6	SEE TABLE PREV. PAGE	5	NE	10	NE	2500	NIOSH REL: TWA = 5 DFG MAK: TWA = 1.5 (RESPIRABLE FRACTION) CARCINOGEN: IARC-3, TLV-A4
MAGNESIUM (EXPOSURE LIMITS ARE FOR MAGNESIUM OXIDE FUME)	7439-95-4	SEE TABLE PREV. PAGE	10	NE	15 (TOTAL PARTICULATE) 10 (VACATED 1989 PEL)	NE	750	NE
MANGANESE (EXPOSURE LIMITS ARE FOR MANGANESE, ELEMENTAL, INORGANIC COMPOUNDS, AND FUME, AS MANGANESE)	7439-96-5	SEE TABLE PREV. PAGE	0.2	NE	1 (VACATED IN 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., AVG VALUE CARCINOGEN: EPA-D
SILICON	7440-21-3	SEE TABLE PREV. PAGE	10	NE	15 (TOTAL DUST) 5 (RESPIRABLE FRACTION) 10 (TOTAL DUST) (VACATED 1989 PEL)	NE	NE	NIOSH REL: TWA = 10 (TOTAL DUST); 5 (RESPIRABLE FRACTION)

NE = NOT ESTABLISHED.

SEE SECTION 16 FOR DEFINITIONS OF TERMS USED.

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

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

2. COMPOSITION and INFORMATION ON INGREDIENTS (continued)

CHEMICAL NAME	CAS #	% W/W	EXPOSURE LIMITS IN AIR					
			ACGIH – TLV		OHSA – PEL		NIOSH IDLH MG/M ³	OTHER MG/M ³
			TWA MG/M ³	STEL MG/M ³	TWA MG/M ³	STEL MG/M ³		
TITANIUM	7440-32-6	SEE TABLE PAGE 1	NE	NE	NE	NE	NE	NE
ZINC (EXPOSURE LIMITS GIVEN ARE FOR ZINC OXIDE, FUME & DUST)	7440-66-6	SEE TABLE PAGE 1	5 (FUME) 10 (DUST)	10 (FUME)	5 (FUME) 5 (TOTAL DUST) 15 (DUST, RESPIRABLE DUST) 5 (DUST, RESPIRABLE DUST, VACATED 1989 PEL)	10 (FUME, VACATED 1989 PEL)	500	NIOSH REL: TWA = 5 (FUME & DUST) STEL = 10 (FUME); 15 (CEILING, 15 MINUTES, DUST) DFG MAKs: TWA = 1.5 (RESPIRABLE FRACTION, FUME) CARCINOGEN: EPA-D

COMPONENT 2: FLUX COATING ON RODS

	CAS NUMBER	Percent Ingredients	OSHA PEL	ACGIH-TLV
Aluminum Fluoride	7784-18-1	1-5	2.5 (as F)	2.5 (as F)
Lithium Fluoride	7789-24-4	1-5	2.5 (as F)	2.5 (as F)
Potassium Hexafluoroaluminate	133775-52-5	1-5	2.5 (as F)	2.5 (as F)
Potassium Chloride	7447-40-7	10-30	N/A	N/A
Sodium Chloride	7647-14-5	10-30	N/A	N/A
Sodium Hexafluoroaluminate	15096-52-3	1-5	2.5 (as F)	2.5 (as F)
Lithium Hexafluoroaluminate	13821-20-0	5-10	2.5 (as F)	2.5 (as F)

NE = NOT ESTABLISHED.

SEE SECTION 16 FOR DEFINITIONS OF TERMS USED.

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

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

3. HAZARD IDENTIFICATION

EMERGENCY OVERVIEW: These products consist of odorless, solid rods, which have a metallic luster. There are no immediate health hazards associated with these products. These products are not reactive. If involved in a fire, these products may generate irritating aluminum 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 welding or brazing operations, the most significant route of over-exposure is via inhalation of fumes.

INHALATION: Inhalation of large amounts of particulates generated by these products during welding or brazing operations may be physically irritating and cause deposits of dust in nasal passages. Inhalation of dusts and fumes of Copper and Magnesium (components of these products) can cause metal fume fever. Repeated or prolonged over-exposures, via inhalation, to the dusts generated by these products may cause pulmonary fibrosis (scarring of lung tissue). Asthma-like symptoms have been reported in association with refining aluminum material and fumes from aluminum soldering. 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. Fumes generated during welding or brazing 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: Not applicable.

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 overexposure to these products and the fumes generated during welding or brazing operations are as follows:

ACUTE: 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 and Magnesium (components of these products) can cause metal fume fever. Contact with the molten material will burn contaminated skin or eyes.

CHRONIC: Chronic skin over-exposure to the fumes of these products during welding or brazing operations may produce dermatitis (red, inflamed skin). Repeated or prolonged over-exposures, via inhalation, to the dusts generated by these products may cause pulmonary fibrosis (scarring of lung tissue). Asthma-like symptoms have been reported in association with refining aluminum material and fumes from aluminum soldering.

Bones: Overexposure to fluorides can cause serious bone erosion.

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 or 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 fumes generated by welding or 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 medical attention.

4. FIRST-AID MEASURES (continued)

INHALATION: If fumes generated by welding or 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 disorders, 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.

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, this material may decompose and produce irritating fumes containing aluminum compounds and metal oxides. The molten material can present a significant thermal hazard to firefighters. Aluminum (a component of these products) can react with many alcohols or sodium hydroxide and produce flammable hydrogen gas.

Explosion Sensitivity to Mechanical Impact: Not sensitive.

Explosion Sensitivity to Static Discharge: Not sensitive.

SPECIAL FIRE-FIGHTING PROCEDURES: Not applicable.

6. ACCIDENTAL RELEASE MEASURES

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

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

7. HANDLING and STORAGE

WORK PRACTICES AND HYGIENE PRACTICES: 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 this material should be trained to handle it safely. Use in a properly ventilated location. Avoid breathing fumes of these products during welding or brazing operations. When these products are used during welding or 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).

8. EXPOSURE CONTROLS - PERSONAL PROTECTION

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

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

EYE PROTECTION: Safety glasses. When these products are used in conjunction with welding or 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"). 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 welding gloves for routine industrial use. When these products are used in conjunction with welding or brazing, 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 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 aluminum:

RELATIVE VAPOR DENSITY (air = 1): N/A

SPECIFIC GRAVITY @ 20°C (water = 1): 2.70

SOLUBILITY IN WATER: Insoluble

VAPOR PRESSURE, mm Hg @ 1284°C: 1

ODOR THRESHOLD: Not Applicable

COEFFICIENT OF OIL/WATER DISTRIBUTION (PARTITION COEFFICIENT): Not Applicable

The following information is for the products:

APPEARANCE, ODOR AND COLOR: These odorless products consist of solid rods, which have a metallic luster.

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

EVAPORATION RATE (nBuAc = 1): N/A

FREEZING/MELTING POINT: 660°C (1220°F)

pH: Not Applicable

BOILING POINT @ 24 mm Hg: 2494°C (4521°F)

10. STABILITY and REACTIVITY

STABILITY: Stable.

DECOMPOSITION PRODUCTS: Aluminum 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 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 bases, strong oxidizers, metal oxides, alcohols, halogenated hydrocarbons, 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.

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

MANGANESE:
TCLo (inhalation, man) = 2300 μ g/m³;
BRN, central nervous system effects

ZINC:
Skin Irritancy (human) = 300 mg/ 3 days/
intermittent; mild

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

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

11. TOXICOLOGICAL INFORMATION (continued)

SUSPECTED CANCER AGENT: Components of this product are listed as follows:

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

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

IRRITANCY OF PRODUCT: Dusts or fumes from 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 skin or respiratory sensitizers.

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

Mutagenicity: These products are not reported to produce mutagenic effects in humans.

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

Teratogenicity: These products are not reported to cause teratogenic effects in humans. Clinical studies on test animals exposed to relatively high doses of the Copper component of some 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 the Copper and Titanium components of some 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 no Biological Exposure Indices (BEIs) determined for the 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. Components of these products will react with water and air to form a variety of stable metal 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.

- **COPPER:** 6 mg/day is harmful to rats. 1 g/day can be fatal to dogs. 18 g to sheep was fatal to all test subjects. 500 mg/kg to chicks is the maximum toxic level. Copper may concentrate to toxic level in the food chain

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

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

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: D007 (Chromium) 5.0 mg/L (Regulated Level).

14. TRANSPORTATION INFORMATION

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)
Aluminum (fume or dust)	No	No	Yes
Chromium	No	Yes	Yes
Copper	No	Yes	Yes
Manganese	No	No	Yes
Zinc	No	Yes	Yes (fume or dust)

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): Chromium = 5000 lbs (2270 kg); Copper = 5000 lbs (2270 kg); Zinc = 1000 lbs (454 kg).

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: Aluminum, Chromium, Copper, Fume, Manganese.

California-Permissible Exposure Limits for

Chemical Contaminants: Aluminum, Chromium, Copper, Manganese, Silicon.

Florida-Substance List: Aluminum, Chromium, Copper, Fume, Magnesium, Manganese, Zinc

Illinois-Toxic Substance List:

Aluminum, Chromium, Copper, Manganese, Silicon, Zinc.

Kansas-Section 302/313 List:

Aluminum, Chromium, Copper, Manganese, Zinc.

Massachusetts-Substance List:

Aluminum, Chromium, Copper, Magnesium, Manganese, Zinc.

Michigan - Critical Materials Register:

Chromium, Copper, Zinc

Minnesota-List of Hazardous

Substances:

Aluminum Welding Fumes, Chromium, Copper, Fume, Manganese, Silicon.

Missouri-Employer Information/Toxic

Substance List: Aluminum, Chromium, Copper, Manganese, Silicon.

New Jersey-Right to Know Hazardous

Substance List: Aluminum, Chromium, Copper, Magnesium, Manganese, Titanium, Zinc.

North Dakota-List of Hazardous Chemicals,

Reportable Quantities: Chromium, Copper, Zinc.

Pennsylvania-Hazardous Substance List:

Aluminum, Chromium, Copper, Magnesium, Manganese, Silicon, Zinc.

Rhode Island-Hazardous Substance List:

Aluminum, Chromium, Copper, Fume, Magnesium, Manganese, Silicon, Zinc.

Texas-Hazardous Substance List:

Chromium, Copper, Fume, Manganese.

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

Wisconsin-Toxic and Hazardous

Substances: Chromium, Copper, Fume, Manganese.

CALIFORNIA SAFE DRINKING WATER AND TOXIC ENFORCEMENT ACT (PROPOSITION 65): The Chromium component of this product is 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.

- Before Use, read and understand the manufacturer's instructions. Material Safety Data Sheets (MSDSs), and your employer's safety policies.
- Keep your head out of the fumes.
- Use enough ventilation, exhaust at the arc, or both, to keep fumes and gases from your breathing zone and the general area.
- Wear correct eye, ear, and body protection.
- Do not touch live electrical parts

See American National Standard Z49.1 *Safety in Welding, Cutting, and Allied Processes*, published by the American Welding Society, 550 N.W. LeJeune Road, Miami, Florida 33126. OSHA Safety and Health Standards, available from the U.S.

Government Printing Office, Washington, DC 20402

DO NOT REMOVE THIS INFORMATION.

ADDITIONAL CANADIAN REGULATIONS:

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

OTHER CANADIAN REGULATIONS: Not applicable.

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

CANADIAN WHMIS SYMBOLS: Not applicable

16. OTHER INFORMATION

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

DEFINITIONS OF TERMS

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

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

EXPOSURE LIMITS IN AIR:

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

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

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

HAZARD RATINGS:

HAZARDOUS MATERIALS IDENTIFICATION SYSTEM:

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

NATIONAL FIRE PROTECTION ASSOCIATION: Health Hazard: **0** (material that on exposure under fire conditions would offer no hazard beyond that of ordinary combustible materials); **1** (materials that on exposure under fire conditions could cause irritation or minor residual injury); **2** (materials that on intense or continued exposure under fire conditions could cause temporary

FLAMMABILITY LIMITS IN AIR:

Much of the information related to fire and explosion is derived from the National Fire Protection Association (**NFPA**). Flash Point - Minimum temperature at which a liquid gives off sufficient vapors to form an ignitable mixture with air.

Autoignition Temperature: The minimum temperature required to initiate combustion in air with no other source of ignition. LEL - the lowest percent of vapor in air, by volume, that will explode or ignite in the presence of an ignition source. UEL - the highest percent of vapor in air, by volume, that will explode or ignite in the presence of an ignition source.

TOXICOLOGICAL INFORMATION:

Human and Animal Toxicology: Possible health hazards as derived from human data, animal studies, or from the results of studies with similar compounds are presented. Definitions of some terms used in this section are: **LD₅₀** - Lethal Dose (solids & liquids) which kills 50% of the exposed animals; **LC₅₀** - Lethal Concentration (gases) which kills 50% of the exposed animals; **ppm** concentration expressed in parts of material per million parts of air or water; **mg/m³** concentration expressed in weight of substance per volume of air; **mg/kg** quantity of material, by weight, administered to a test subject, based on their body weight in kg. Other measures of toxicity include **TDL_o**, the lowest dose to cause a symptom and **TCL_o** the lowest concentration to cause a symptom; **TD_o**, **LDL_o**, and **LD_o**, or **TC**, **TC_o**, **LCL_o**, 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

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".

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.