



MATERIAL SAFETY DATA SHEET

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

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

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

1. PRODUCT IDENTIFICATION

TRADE NAME (AS LABELED): E70S-2, E70S-3, E70S-6, and ER80S-D2
CHEMICAL NAME/CLASS: Metal Alloy
SYNONYMS: Not Applicable
PRODUCT USE: Metal Welding
DOCUMENT NUMBER: 0073
SUPPLIER/MANUFACTURER'S NAME: HARRIS WELCO DIVISION/
J.W. HARRIS CO, INC.
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DATE OF PREPARATION: March 7, 2002

2. COMPOSITION and INFORMATION ON INGREDIENTS

Class	C	Mn	Si	P	S	Cu	Mo	Fe
ER70S-2 (a)	0.07	0.90-1.40	0.40-0.70	0.025	0.035	0.50	(e)	Balance
ER70S-3	0.06-0.15	0.90-1.40	0.45-0.75	0.025	0.035	0.50	(e)	Balance
ER70S-6	0.06-0.15	1.40-1.85	0.80-1.15	0.025	0.035	0.50	(e)	Balance
ER80S-D2(c)	0.07-0.12	1.60-2.10	0.50-0.80	0.025	0.025	0.50	0.40-0.60	Balance

Single values are maximums. (a) Ti=0.05-0.15, Zr=0.02-0.12, Al=0.05-0.15 (e) Ni, Cr, Mo, V = Residual elements shall not exceed 0.50% in total
(c)=Ni 0.15% maximum, Other totals =0.50%

2. COMPOSITION and INFORMATION ON INGREDIENTS (Continued)

CHEMICAL NAME	CAS #	EXPOSURE LIMITS IN AIR					
		ACGIH		OSHA			OTHER mg/m ³
		TLV mg/m ³	STEL mg/m ³	PEL mg/m ³	STEL mg/m ³	IDLH mg/m ³	
Iron (exposure limits are for iron oxide dust and fume [Fe ₂ O ₃], as Fe)	7439-89-6	5, A4 (Not Classifiable as a Human Carcinogen)	NE	10	NE	2500	NIOSH REL: 5 DFG MAK: 6
Aluminum (exposure limits are for Aluminum, welding fumes, as Aluminum)	7429-90-5	5	NE	5 (vacated 1989 PEL)	NE	NE	NIOSH REL: 5
Carbon (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)
Copper (exposure limits are for Copper fume, as Copper)	7440-50-8	0.2	NE	0.1	NE	100	NIOSH REL: 0.1 DFG MAK: 0.1 (Respirable fraction)
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
Phosphorus	7723-14-0	0.1	NE	0.1	NE	5	NIOSH REL: TWA = 0.1 DFG MAK: TWA = 01 (respirable fraction) PEAK = 2•MAK, 5 min., momentary value DFG MAK Pregnancy Risk Classification: D Carcinogen: EPA-D
Sulfur	7704-34-9	NE	NE	NE	NE	NE	NE
Molybdenum	7439-98-7	10	NE	15 10(vacated 1989 PEL)	NE	5000	NE
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)
Titanium	7440-32-6	NE	NE	NE	NE	NE	NE
Zirconium	7440-67-7	5, A4 (Not Classifiable as a Human Carcinogen)	10, A4	5	10 (vacated 1989 PEL)	50	NIOSH REL: TWA = 5 STEL: 10 DFG MAK = 5 (Total dust)

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

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

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

3. HAZARD IDENTIFICATION

EMERGENCY OVERVIEW: These products consist of solid wire or rods, which are odorless and may be copper coated. 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 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: The most significant routes of over-exposure for these products are by skin or eye contact. 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 the wire or rod form 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.

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: Ingestion is not a likely route of exposure for this product. 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.

4. FIRST-AID MEASURES (Continued)

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

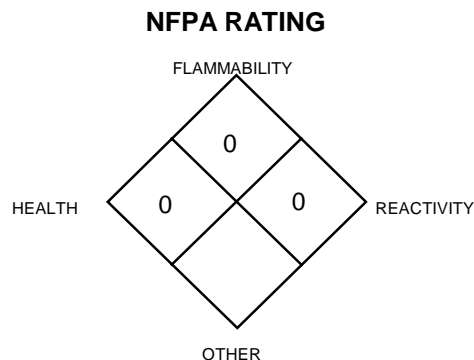
Other: Any "ABC" Class

UNUSUAL FIRE AND EXPLOSION HAZARDS When involved in a fire, 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



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: 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).

8. EXPOSURE CONTROLS - PERSONAL PROTECTION

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

RESPIRATORY PROTECTION: Maintain airborne contaminant concentrations below guidelines listed in Section 2 (Composition and Information on Ingredients). If respiratory protection is needed (i.e., a Weld Fume Respirator, or Air-Line Respirator for welding in confined spaces), use only protection authorized in 29 CFR 1910.134 or applicable State regulations. Respiratory Protection is recommended to be worn during welding operations. Use supplied air respiration protection if oxygen levels are below 19.5% or are unknown.

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

HAND PROTECTION: Wear gloves for routine industrial use. When these products are used in conjunction with 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 copper coated.

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 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: Uncontrolled exposure to extreme temperatures, Incompatible materials.

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

11. TOXICOLOGICAL INFORMATION

TOXICITY DATA: Presented below are human toxicological data available for the 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) = 120 µg/kg; gastrointestinal tract effects

IRON:

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

MANGANESE:

TCLo (inhalation, man) = 2300 µg/m³; BRN, central nervous system effects

SUSPECTED CANCER AGENT: Carbon (a component of these products) is on the following lists:

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

NIOSH-X, Carcinogen defined with no further categorization.

Manganese (a component of these products) is on the following list:

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 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.

11. TOXICOLOGICAL INFORMATION (Continued)

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 Carbon and Molybdenum (components of these products); these data were obtained during clinical studies on specific animal tissues exposed to high doses of this compound.

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

Teratogenicity: These products are not reported to cause teratogenic effects in humans. Clinical studies on test animals exposed to relatively high doses of Copper and Molybdenum (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 Copper, Molybdenum, and Titanium (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 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. 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.

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: Not applicable to wastes consisting of only this product.

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
Aluminum (fume or dust)	No	No	Yes
Copper	No	Yes	Yes
Manganese	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): Copper = 5000 lbs. (for particulates less than 100 micrometers in size).

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: Aluminum Welding Fumes, Carbon Black, Manganese, and Molybdenum.

California-Permissible Exposure Limits for Chemical Contaminants: Aluminum, Carbon Black, Copper, Manganese, and Silicon.

Florida-Substance List: Aluminum, Manganese, Molybdenum, and Zirconium.

Illinois-Toxic Substance List: Aluminum, Carbon Black, Copper, Manganese, Molybdenum, and Silicon.

Kansas-Section 302/313 List: Aluminum, Copper, and Manganese.

Massachusetts-Substance List: Aluminum, Carbon Black, Copper, Manganese, Molybdenum, and Zirconium.

Michigan - Critical Materials Register: Copper.

Minnesota-List of Hazardous Substances: Aluminum Welding Fumes, Carbon Black, Manganese, and Silicon.

Missouri-Employer Information/Toxic Substance List: Aluminum, Carbon Black, Copper, Manganese, Molybdenum, Silicon, and Zirconium.

New Jersey-Right to Know Hazardous Substance List: Aluminum, Carbon Black, Copper, Manganese, Molybdenum, Titanium, and Zirconium.

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

Pennsylvania-Hazardous Substance List: Aluminum, Carbon Black, Copper, Manganese, Molybdenum, Silicon, and Zirconium.

Rhode Island-Hazardous Substance List: Aluminum Welding Fumes, Carbon Black, Manganese, Molybdenum, Silicon, and Zirconium.

Texas-Hazardous Substance List: Carbon Black, Manganese, and Molybdenum.

West Virginia-Hazardous Substance List: Carbon Black, Manganese, and Molybdenum.

Wisconsin-Toxic and Hazardous Substances: Carbon Black, Manganese, and Molybdenum.

CALIFORNIA PROPOSITION 65: No component of these products 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 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 practices.
- 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

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

WHMIS SYMBOLS: Not applicable.

16. OTHER INFORMATION

DATE OF PRINTING:

April 29, 2002

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DEFINITIONS OF TERMS

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

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

FLAMMABILITY LIMITS IN AIR: Much of the information related to fire and explosion is derived from the **National Fire Protection Association (NFPA)**. **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

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. Data from several sources are used to evaluate the cancer-causing potential of the material. 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 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 death. **BEI** - 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.

REGULATORY INFORMATION

This section explains the impact of various laws and regulations on the material. The acronyms used are: **EPA** is the U.S. Environmental Protection Agency. **WHMIS** is the Canadian Workplace Hazardous Materials Information System. **DOT** and **TC** are the U.S. Department of Transportation and Transport Canada, respectively. **Superfund Amendments and Reauthorization Act (SARA)**; the **Toxic Substance Control Act (TSCA)**; Marine Pollutant status according to the **DOT**; California's Safe Drinking Water Act (**Proposition 65**); the **Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA or Superfund)**; and various state regulations. This section also includes information on the precautionary warnings, which appear, on the materials package label.