

Material Safety Data Sheet

(Essentially Similar to U.S. Department of Labor Suggested
 Form For Hazard Communication Compliance)

I. Product Identification

Product Type MILD STEEL AND LOW ALLOY COVERED ELECTRODES

EMERGENCY NUMBER (CHEMTREC) 1-800-424-9300

Product Description: SMAW (shielded metal arc welding) electrodes are covered rods manufactured by concentrically extruding silicated chemical mixtures followed by an oven cure.

Process Description: The SMAW process uses an arc between a covered electrode and the weld pool. The arc and molten metal are shielded by the decomposition of the electrode covering. The SMAW electrode also supplies filler metal to the weld pool and to the weld metal. The extreme heat from the welding arc creates hazardous fumes and gases that emanate from the base plate, shielding gases, and the electrode.

II. Product Composition and Information on the Ingredients

APPROXIMATE COMPOSITION OF MILD STEEL AND LOW ALLOY COVERED ELECTRODES (Wt %)

Notes	①	①	①	①	①	①	①	①	①	③
Carbon	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Chromium & Cmpds	--	--	--	--	--	--	--	--	--	--
Manganese	0.5-1.5	1-2	1-2	1-2	1-2	1-2	1-2	1.5-2.5	2-3	1-2
Molybdenum	--	--	--	--	--	--	--	--	--	<0.5
Nickel-	--	--	--	--	--	--	--	--	--	<0.5
Silicon	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Mineral Silicates:	--	0.5-2.5	0-1.5	--	--	0.5-2.5	2.5-4	1-2.5	1-2.5	0.2-1
Other Silicates:	--	--	--	--	--	--	--	--	--	--
Kaolinite Clay	--	--	--	--	--	0.3-2	--	0.3-2	0.3-2	0.3-2
Mica	--	--	--	--	--	0.3-2	0.3-2	--	0.3-2	--
Sodium Silicate Powder	0.3-2	--	--	--	--	--	--	--	--	--
Talc-	--	--	--	0.3-2	--	--	--	--	--	--
Aluminum Oxide	0.1-1	--	--	0.1-1	--	--	--	--	0.1-1	--
Calcium Carbonate	<0.5	<0.5	1-2.5	<0.5	<0.5	1-2.5	<0.5	1-2.5	1-2.5	<0.5
Calcium Oxide	<0.5	--	--	<0.5	--	--	--	--	--	--
Cellulose	2-6	2-6	2-6	2-6	2-6	0.5-2.5	0.5-2.5	0.5-2.5	0.5-2.5	2-6
Fluorspar-	--	--	--	--	--	--	--	--	--	--
Graphite	--	<0.3	<0.3	--	--	--	--	--	--	--
Iron Carbonate	--	--	--	--	--	--	--	--	--	--
Magnesite	0.3-1.5	0.3-1.5	--	0.3-1.5	0.3-1.5	--	0.3-1.5	--	--	0.3-1.5
Mi I I Scale	0.05-1	0.05-	0.05-1	0.05-1	0.05-1	0.05-1	0.05-1	0.05-1	0.05-1	0.05-1
Potassium Titanate	--	--	--	--	2-3	--	--	--	--	--
Silica	0.05-1	0.05-1	0.05-1	0.05-1	0.05-1	0.05-1	0.05-1	0.05-1	0.05-1	0.05-1
Silicate Binder (cured)	1-4.5	1-4.5	1-4.5	1-4.5	1-4.5	1-4.5	1-4.5	1-4.5	1-4.5	1-4.5
Titanium Dioxide	1-3	1-3	1-3	1-3	1-3	6-10	4-7	8-12	8-12	1-3
Iron	Bal >80	Bal >80	Bal >80	Bal >80	Bal >80	Bal >75	Bal >75	Bal >75	Bal >70	Bal >80
AWS Classification*	A5.1	A5.1	A5.1	A5.1	A5.1	A5.1	A5.1	A5.1	A5.1	A5.5
	E6010	E6010	E6010	E6010	E6011	E6012	E6013	E6013	E6013	E7010-P1

NOTE: ① See Note in Section XV

③ See Note in Section XV

APPROXIMATE COMPOSITION OF MILD STEEL AND LOW ALLOY COVERED ELECTRODES (Wt %)

NOTES	①	①	①	①	①	①	①	①	②
Carbon	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Chromium & Cmpds	--	--	--	--	--	--	--	--	0.03-0.10
Manganese	1-2	2-3	1.5-2.5	1-2	1-2	1-2	2.5-3.5	3-4	1-2
Molybdenum	0.3-0.7	--	--	--	--	--	--	--	<0.5
Nickel	--	--	--	--	--	--	--	--	0.5-1
Silicon	<0.2	<0.2	<0.5	0.5-1.5	0.5-1.5	0.5-1.5	<0.5	<0.5	<0.2
Mineral Silicates:	--	1-2.5	1-2.5	0.5-2	0.5-2	2-3.5	0.5-2.5	1-2.5	0.5-2
Other Silicates:	--	--	--	--	--	--	--	--	--
Kaolinite Clay	--	0.5-1.5	--	--	--	--	--	0.2-1.5	--
Mica	--	--	2-4	--	--	--	0.5-1.5	--	0.2-1.5
Sodium Silicate Powder	--	--	--	--	--	--	--	--	--
Talc	0.5-1.5	0.5-1.5	--	--	--	--	--	--	--
Aluminum Oxide	-	<0.3	<0.3	0.3-1.5	0.3-1.5	-	0.3-1.5	0.3-1.4	--
Calcium Carbonate	--	1.5-3	0.5-1.5	6-9	6-9	7-11	0.5-1.5	0.5-1.5	--
Calcium Oxide	--	--	--	--	--	--	--	--	--
Cellulose	2-4	1-3	1-3	<0.5	<0.5	<0.5	1-3	1-3	3-6
Fluorspar	--	--	--	3-6	3-6	9-13	--	--	--
Graphite	--	--	--	--	--	--	--	--	--
Iron Carbonate	--	--	--	--	--	--	--	0.5-1.5	--
Magnesite	0.3-1.5	-	-	-	-	--	0.3-1.5	0.3-1.5	0.3-1.5
Mill Scale	0.3-1.5	<0.3	<0.3	<0.3	<0.3	<0.3	0.3-1.5	0.3-1.5	0.3-1.5
Potassium Titanate	--	--	--	--	--	--	--	--	--
Silica	0.05-1	0.05-1	0.05-1	0.05-1	0.05-1	0.05-1	0.5-3	0.05-1	0.05-1
Silicate Binder (cured)	1-4.5	1-4.5	1-4.5	1-4.5	1-4.5	1-4.5	1-4.5	1-4.5	1-4.5
Titanium Dioxide	1-3	9-13	9-13	5-8	5-8	<0.5	9-13	9-13	1-3
Iron	Bal >80	Bal >70	Bal >70	Bal >70	Bal >70	Bal >65	Bal >70	Bal >70	Bal >80
AWS Classification*	A5.5 E7010-A1	A5.5 NONE	A5.1 E7014	A5.1 E7016	A5.1 E7016	A5.1 E7018	A5.1 E7024	A5.1 E7024	A5.5 E8010-P1

NOTE: ① See Note in Section XV

② See Note in Section XV

Hazardous Ingredients

IMPORTANT: This section covers the materials from which these products are manufactured. The term **HAZARDOUS** should be interpreted as a term required and defined by Laws, Statutes, or Regulations. Under the OSHA Hazard Communication Standard, these products are considered hazardous.

WHMIS Classification: Class D, Division 2, Subdivision A

Material	(CAS No.)	SARA	ACGIH TLV		OSHA-PEL	
			TWA (mg/m3)		TWA (mg/m3)	STEL (mg/m3)
Aluminum Oxide (Al ₂ O ₃)	(1344-28-1)		10		5 (Respirable)	--
Calcium Carbonate (CaCO ₃)	(1317-65-3)		10		5 (Respirable Fraction)	--
Calcium Oxide (CaO)	(1305-78-8)		2		5	
Cellulose	(9004-34-6)		10		5 (Respirable Fraction)	--
Chromium Compounds	(7440-47-3)		0.5 (Metal) 0.05 (Water Soluble Cr(VI)) 0.01 (Insoluble Cr(VI))		SEE NOTE (4) BELOW 1 (Metal) C 0.1 (as Chromate)	--
Fluorspar (CaF ₂)	(7789-75-5)		2.5 (as F)		2.5 (as F)	
Graphite (C)	(7782-42-5)		2 (Respirable Dust)		2.5 (Respirable Fraction)	--
Iron (Fe)	(7439-89-6)		5 (Oxide Fume)		10 (Total Particulate)	--
Iron Carbonate (FeCO ₃)	(Not Est.)		5 (Oxide Fume)		10 (Total Particulate)	--
Magnesite (MgCO ₃)	(546-93-0)		10		5 (Respirable Fraction)	--
Manganese (Mn)	(7439-96-5)		0.2 (Fume)	C 5 (STEL)	1 (Fume)	3
Mill Scale (Ferrous metal)	(65996-74-9)		5 (Iron Oxide Fume)		10 (Total Particulate)	--
Mineral Silicates,			SEE NOTE (5) BELOW			
Bentonite Clays	(1302-78-9)					
Chlorite	(14808-60-7)					
Feldspar	(14808-60-7)					
Hectorite	(14808-60-7)					
Pyrrhopolite	(14808-60-7)					
Wollanstanite	(14808-60-7)					
Zircon	(14808-60-7)					
Molybdenum (Mo),	(7439-98-7)		10 (Inhalable Fraction)		Not listed	Not listed
Insoluble Compounds as Mo			3 (Respirable Fraction)		0.1 (Soluble)	
Soluble Compounds as Mo			0.5 (Respirable Fraction)			
Nickel (Ni)	(7440-02-0)		1.5 (Inhalable Fraction, elemental) 0.2 (Inhalable insoluble inorganic compounds) 0.1 (Inhalable soluble inorganic compounds)		5 (Respirable Fraction)	
Potassium Titanate (K ₂ TiO ₃)	(12030-97-6)		10 (Nuisance Particulate)		0.05 (Respirable Dust)	
Silica, Use Quartz Formula (SiO ₂)	(14808-60-7)		0.1		5 (Respirable)	
Silicate Binder (Na ₂ [SiO ₂]a)aq (K ₂ [SiO ₂]q)aq	(1344-09-8) (1312-76-1)		10		5 (Respirable)	
Silicon (Si)	(7440-21-3)		10 (Dust)			
Titanium Dioxide (TiO ₂)	(13463-67-7)		10 (Dust)		5 (Respirable)	

NOTE: (1) Some of these products may not contain all of the materials listed. For details of composition, refer to the COMPOSITION TABLES.

(2) In the ingredients table, an asterisk (*) after the CAS number indicates a toxic chemical subject to the reporting requirements of Section 313 of the Emergency Planning and Community Right-To-Know Act of 1986 (SARA) and 40 CFR Part 372.

(3) In the table above, when "C" appears with an exposure number, the "C" indicates a "Ceiling Limit"; the number is the concentration that should not be exceeded during any part of the working exposure.

(4) CHROMIUM: OSHA on Oct. 4 2004 issued a Fact Sheet of proposed standards for occupational exposure to Hexavalent Chromium that include the following: PEL 1 µg/m³; Action Level 0.5 µg/m³; Exposure Monitoring- an initial test and further testing pending outcome of initial PEL; Establish Regulated Areas where Cr (VI) exposure greater than PEL; REQUIRES ENGINEERING

AND WORK PRACTICE CONTROLS if an employee is exposed above the PEL for 30 or more days during a continuous period of 12 months. Consult OSHA FACT SHEET on Hexavalent Chromium.

(5) These mineral silicates do not have a specific TLV but they contain from 5% to 30% quartz. The OSHA PEL formula is 10 mg/m³ (%S102+2). The quartz (silica) exposure limits are found in the Table above.

This section covers some of the additional hazardous ingredients that may be generated by the SMAW welding process.

See Section V.

	<u>ACGIH TLV</u>	<u>OSHA PEL</u>
Ozone	0.1 ppm (ceiling)	0.1 ppm
Nitric oxide	25 ppm	25 ppm
Nitrogen dioxide	3 ppm, 5ppm (STEL)	5 ppm (ceiling)
Welding fumes	5 mg/m ³	--
Carbon monoxide	25 ppm	50 ppm
Hydrogen Fluoride	0.5 ppm, 2 ppm (ceiling)	3 ppm
Phosgene gas	0.1 ppm	0.1 ppm

III. Hazards Identification

SUREWELD COVERED ELECTRODES:

OVERVIEW: As shipped, these products are not flammable, combustible, or explosive. They pose little or no hazard to humans. When consumed during SMAW, the process poses very severe health and physical hazards.

PHYSICAL HAZARDS: SKIN AND EYE CONTACT

Shipping conditions may cause excessive impact between electrodes that may generate coating dust and chips. Do not use pressurized air to clean the containers.

FIRE & EXPLOSION HAZARD:

Flammable/Explosive: NO (X) YES ()

Under what conditions: Only the packaging for this product will burn.

Fire Hazard: When involved in a fire, these products may emit toxic and irritating fumes of the metals, metal oxides, metal fluorides and their compounds.

HEALTH HAZARDS: SKIN CONTACT

The electrodes covering may have a dust from abrasion during shipping; the covering may react with sweat. Avoid direct and prolonged skin/eye contact.

SHIELDED METAL ARC WELDING PROCESS:

Health Hazards: Inhalation/Ingestion of Fumes and Gases; Skin and Eye Contact with Fume, Gases, and Residue

The Shielded Metal Arc Welding process uses electrical circuits that sustain a welding arc between the consumable electrode and the base plate. The welding arc converts the electrical energy into a localized, concentrated heat source. The tremendously high temperatures of the arc cause the covered electrodes (or Filler Metal, when used as such) to decompose. Electric arc working may create one or more of the following health hazards. Fumes and gases can be dangerous to your health. Fumes and gases containing fluoride burn eyes and skin on contact and can be fatal if swallowed. Noise can damage hearing. See American National Standard Z-49.1, "Safety in Welding and Cutting," published by the American Welding Society, P. O. Box 351040, Miami, FL 33135

Hazardous decomposition products: Welding fumes and gases cannot be classified simply. The composition and quantity of both are dependent upon the material being worked, the process, procedures, and consumables used. Other conditions which also influence the composition and quantity of the fumes and gases to which workers may be exposed include: coatings on the material being worked (such as paint, plating or galvanizing), the number of welding operations and the volume of the work area, the quality and amount of ventilation, the position of the workers head with respect to the fume plume, as well as the presence of contaminants in the atmosphere (such as chlorinated hydrocarbon vapors from cleaning or painting activities). Vapors of chlorinated hydrocarbon solvents will decompose in the presence of heat and ultraviolet radiation and may form highly toxic phosgene gas. When the materials are consumed, the fume and gas decomposition products generated are different in percent and form from the ingredients

listed in Section II. Decomposition products of normal operation include those originating from the volatilization, reaction or oxidation of the ingredients, plus those from the material being worked and the coatings etc. noted above.

Reasonably expected decomposition products from normal use of these products include a complex of the oxides and fluorides of the materials listed in Section II, as well as carbon monoxide, carbon dioxide and nitrogen oxides (refer to "Characterization of Arc Welding Fume" available from the American Welding Society). THE TLV FOR MANGANESE, CHROMIUM AND NICKEL WILL BE REACHED BEFORE THE GENERAL LIMIT FOR WELDING FUMES OF 5 mg/m³ IS REACHED. MEASURE THE FUME FOR MANGANESE, CHROMIUM AND NICKEL. The only way to determine the true identity of the decomposition products is by sampling and analysis. The composition and quantity of the fumes and gases to which a worker may be overexposed can be determined from a sample obtained from inside the welders helmet, if worn, or in the workers breathing zone. See ANSI/AWS F1.5, "Methods for Sampling and Analyzing Gases from Welding and Allied Processes," and ANSI/AWS F1.1 "Method for Sampling Airborne Particles Generated by Welding and Allied Processes," available from the American Welding Society.

Note: The proposed OSHA standards for exposure to Hexavalent Chromium require an initial measurement of the PEL for Cr(VI).

Cancer: Nickel and Chromium compounds are carcinogenic to humans; overexposure to respirable crystalline silica is a known cause of carcinogenicity in humans; vanadium oxide and welding fume not otherwise classified may be carcinogenic.

PROCESS PHYSICAL HAZARDS: SKIN AND EYE CONTACT, LETHAL ELECTRIC SHOCK, ARC RADIATION

Electric arc working may create one or more of the following physical hazards. Electric shock can kill you. Arc rays can injure eyes and burn skin. Heat rays from arc or hot metal can injure eyes. Innocent contact with hot base plate/weld and recently extinguished SMAW electrode can cause severe skin burns. Weld spatter, ejected metal droplets from the arc-weld pool region, can cause skin burns and pose a fire hazard to the surroundings. Slag removal from the weld can create airborne particles and dusts. Electrode holders stowed with a covered electrode create an unreasonable risk for electric shock. See AWS "Safety and Health Fact Sheet No. X". Series available at no cost at: www.aws.org (www.aws.org/technical/facts/index.html); and American National Standard Z-49.1, "Safety in Welding and Cutting," published by the American Welding Society, P. O. Box 351040, Miami, FL 33135.

IV. First Aid Measures

Emergency First Aid Measures: In case of emergency, call for medical aid. Employ first aid technique recommended by the Red Cross. **IF BREATHING IS DIFFICULT**, give oxygen and call for a physician. **FOR ELECTRIC SHOCK**, disconnect and turn off the power. Use a nonconducting material to pull victim away from contact with live parts or wires. If not breathing, begin artificial respiration, preferably mouth-to-mouth. If no detectable pulse, begin Cardio Pulmonary Resuscitation (CPR). Immediately call a physician. **FOR ARC BURN**, apply cold, clean compresses and call a physician.

Eye Contact: Flush with water for at least fifteen minutes to remove all residue. If irritation persists, obtain medical assistance.

Skin Contact: Promptly flush with soap and water, rinsing till clean. Get medical attention for irritation or burns.

Inhalation: Remove to fresh air. If breathing has stopped, perform artificial respiration and obtain medical assistance immediately!

Ingestion: Call a physician or your Poison Control Center IMMEDIATELY! Advise of Section II.

Note: Fluorides can reduce serum calcium levels resulting in potentially fatal hypocalcemia.

V. Fire-Fighting Measures

Conditions Of Flammability: This product will not burn.

Extinguishing Media: Welding arcs and sparks can ignite combustible and flammable materials. Use the extinguishing media recommended for the burning materials and fire situation. See ANSI Z49.1 "Safety in Welding, Cutting and Allied Processes" and the AWS publication, "Safe Practices", both published by the American Welding Society, P. O. Box 351040, Miami, FL 33135, and NFPA 51B "Standard for Fire Prevention During Welding, Cutting and Other Hot Work" published by the National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02169, for additional fire prevention and protection information.

FLAMMABLE PROPERTIES:

Flash Point: Not applicable.

Flash Point Method: Not applicable.

Upper Flame Limit (volume % in air): Not applicable.

Lower Flame Limit (volume % in air): Not applicable.

Auto Ignition Temperature: Not applicable.

Hazardous Combustion Products: When involved in a fire, these products may emit toxic and irritating fumes of the metals, metal oxides, metal fluorides and their compounds.

Explosion Data- Mechanical Impact: Not applicable.

<u>Explosion Data- Static Discharge:</u>	Not applicable.
<u>Flame Propagation Rate (solids):</u>	Not applicable.
<u>OSHA Flammability Class:</u>	Not applicable.
<u>Unusual Fire and Explosion Hazards:</u>	None anticipated.
<u>Special Fire Fighting Procedures:</u>	Full protective equipment required. Wear self contained breathing apparatus.

VI. Accidental Release Measures

Personal Precaution: Wear safety glasses and gloves. Gather the loose covered electrodes.

Environmental Impact: Not known. Prevent product and process waste from contaminating surrounding environment.

Method For Cleaning Up: Place waste in containers for recovery or disposal.

VII. Handling and Storage

Storage Precaution: No unusual methods are required. Keep product contained and retain all warning and identity labels. Preferred storage is a sheltered warm area with temperature and humidity control to prevent high humidity and "going through the dew point".

Preferred Storage for Product Performance: Depending on the classification, covered electrodes vary in moisture content and final bake temperature. Optimum storage and reconditioning instructions for covered electrodes to achieve the best welding performance are available directly from Weldcote Metals.

Handling Precaution: Read and understand the manufacturer's instructions and the precautionary label on this product. It is highly recommended that the person that controls the welding area and the welder read and understand American National Standard Z-49.1, "Safety in Welding and Cutting," published by the American Welding Society, P. O. Box 351040, Miami, FL 33135 and OSHA Publication 2206 (29 C.F.R. 1910), U.S. Government Printing Office, Superintendent of Documents, P.O. Box 371954, Pittsburgh, PA 15250-7954 for more detail on many of the following:

Exposure to Fumes and Gases: Keep your head out of the fumes. Do not breathe the fumes. Use enough ventilation to keep the exposure within legal limits. In the worker's breathing zone and the general area, the fumes and gases must be kept below the TLVs and the *equivalent exposure* must compute to less than one. Keep exposure as low as possible.

Confined Spaces: Test confined space atmosphere for (1) suitable oxygen content, (2) no combustibles or reactives, (3) no toxins. Continuously ventilate and monitor confined spaces to ensure that fumes and gases do not exceed safe exposure limits.

Special Precaution: Use industrial hygiene monitoring equipment to ensure that exposure does not exceed threshold limit values.

Eye Protection: Wear helmet or use face shield with filter lens according to ANSI Z87.1. Provide protective screens and flash goggles, if necessary, to shield others. Wear safety glasses with UV protective side shields or goggles. Wear contact lenses in combination with safety eyewear, except where the contact lenses create a likelihood of injury from intense heat, highly particulate atmosphere, or where their use is prohibited.

Protective Clothing: Wear head, hand and body protection that help to prevent injury from radiation, sparks and electrical shock. Wear flame resistant ear plugs to keep sparks out of ears. See ANSI Z-49.1.

Avoid Fire and Explosion: Remove any combustible material from the work area; if relocation is not possible, protect with a cover of fire-resistant material. Sparks can travel horizontally throughout an area within a 10 meter radius.

Protect Against Noise: Reduce the intensity of the sound; the TLV for noise is 85 dBA for an eight hour duration. Wear approved ear plugs or ear muffs.

Protect Against Electric Shock: Do not touch live electrical parts. Wear dry, insulating gloves (in good condition) and clothing. Insulate yourself from the workpiece and ground (wear rubber soled shoes, stand on dry insulating mat or platform). Do not dip the electrode holder (gun) in water to cool it; do not lay it on a conductive surface or the work surface. Do not stow electrode holders with a covered electrode or an electrode stub.

Heart Pacemakers: Warn wearers of heart pacemakers or other electronic equipment vital to life that the welding operation may impede the function of the device. Consult a physician and the manufacturer of the device.

VIII. Exposure Controls/Personal Protection

ENGINEERING CONTROLS:

Ventilation: Clean air for welding operations is provided by ventilation systems. Ventilation systems consist of local exhaust and general ventilation supply. The most efficient method of contaminant control in the occupied zone of the welding shop, particularly in the breathing zone of the welder, is local exhaust which captures the contaminants at or near their source.

Consult AWSF3.2M/F3.2 "Ventilation Guide for Weld Fume" published by the American Welding Society, P. O. Box 351040, Miami, FL 33135 for the design of ventilation and exhaust systems. Use enough ventilation, local exhaust at the arc, or both, to keep the exposure within legal limits. In the worker's breathing zone and the general area, the fumes and gases must be kept below the TLVs and the *equivalent exposure* must compute to less than one.

Note: OSHA proposed FACT Sheet on Exposure to Hexavalent Chromium Areas where airborne concentrations are or are expected to be higher than PEL must be regulated. If a worker is exposed to 30 days in a 12 consecutive month period, engineering and work practice controls are required.

PERSONAL PROTECTIVE EQUIPMENT:

Respiratory Protection: Use respirable fume respirator or air supplied respirator when welding in confined space or where local exhaust or ventilation does not keep exposure below TLV. Where respiratory protection is necessary, NIOSH approved respiratory protection should be used. The selection of the appropriate respiratory protection (dust respirator, etc.) should be based on the actual or potential airborne contaminants and their concentrations present. However, at least a NIOSH approved type TC-21-C dust mask is recommended.

Eve Protection: Wear helmet or use face shield with filter lens. As a rule of thumb, start with a shade that is too dark to see the weld zone. Then go to the next lighter shade that gives sufficient view of the weld zone. Provide protective screens and flash goggles, if necessary, to shield others. Wear safety glasses with UV protective side shields or goggles to provide needed protection from reflected radiation and to prevent eye contact. Readily available eye baths are recommended in areas where operations may produce fumes and dusts.

Skin Protection: Wear head, hand and body protection that help to prevent injury from hot metal, sparks, slag, infrared radiation, UV radiation, abrasions, contusions and heat stress. Protective clothing will not generally prevent shock except for leather if kept dry. The clothing may include heat/fire resistant gloves, overalls, aprons, sleeves, footwear, welder's spats and head cover. Gloves made of leather with inside seams (or those that give equal performance) are preferred. Wear garments made of leather, heavyweight tightly woven wool or cotton. Keep clothing clean (free of oil, grease or solvents) and in good repair. Do not wear clothing with frayed edges, tears or holes. Do not roll up sleeves or trousers (pants should not be cuffed).

Hygienic Work Practices: Avoid contact to eyes, skin, and mucous membranes. Avoid inhalation of vapors, gases, fumes and dusts. Wash thoroughly after handling and use. Do not smoke, eat, drink, chew gum or tobacco, or apply cosmetics within the working area. Do not store or bring tobacco products, gum, food, drinks or cosmetics within the working area. Otherwise follow the standards of good industrial hygiene practices.

Note: OSHA pro^oposed FACT Sheet on Exposure to Hexavalent Chromium Areas where airborne concentrations are or are expected to be higher than PEL (1 pg/m³) must be regulated. An employer must provide respirators in accordance with 1910.134. If skin/eye contact is likely, provide, clean, and maintain PPE; provide a change room and washing facility. Medically monitor employees with symptoms of Cr(VI) overexposure and employees who are exposed above the PEL for 30, or more, days in a 12 consecutive month period. Employer must post warning signs, place warning labels on containers with Cr(VI) contaminated wastes and clothing/equipment; and train employees. The employer must maintain exposure records, medical records and training records.

IX. Physical and Chemical Properties

Physical State:	Solid.
Appearance:	Solid mild steel rod concentrically coated with minerals, chemicals, pigments and metal/alloy powders that are bonded by means of a cured silicate solution. Covering has various shades and colors.
Odor:	Generally odorless.
Odor Threshold:	Not applicable.
Specific Gravity:	7.8 core wire, (the major component); 1.6-3.3 covering
Vapor Pressure:	Not determined.
Vapor Density:	Not determined.
Density (g/cc):	7.8 core wire, (the major component); 1.6-3.3 covering
Evaporation Rate:	Not determined.
Percent Volatile by Wt:	Not determined.
Boiling Point:	Not determined.
Freezing Point:	Not determined.
Melting Point:	1515°C (2760°F) core wire, (the major component); >580°C (1050°F) covering
Solubility in Water:	Not determined. Not determined.
Thermal Decomposition:	Not determined.(calcium carbonate @ 1800°F ; Cellulose "browns" @ 390°F)
Volatile Organic Compounds (lbs/lb):	Not determined.
Coefficient of Water/Oil Distribution:	Not determined.
Other:	Covering can be crushed; exposed coverings can slowly absorb Carbon Dioxide.

X. Stability and Reactivity

Chemical Stability: Stable (X) Unstable () Polymerization will not occur.

Reacts With: Air ___ Water ___ Heat ___ Oxidizers X Acids X Alkalis ___ Metals ___ Other ___ None ___

Hazardous Reaction Products: Products that contain fluorides may evolve hydrogen, hydrogen fluoride and metal fluorides.

Comments: Review Section II.

XI. Toxicological Information

Introduction: Electric arc working creates health and physical hazards. Fumes and gases can be dangerous to your health. Fumes and gases containing fluoride burn eyes and skin on contact and can be fatal if swallowed. Electric shock can kill you. Arc rays can injure eyes and burn skin. Heat rays (infrared radiation) from flame or hot metal can injure eyes. Noise can damage hearing

Dust from impact and abrasion and from crushing of the Covering (Coating): will irritate the eyes and skin on contact; if inhaled will irritate the respiratory tract; if ingested, may irritate the mouth, esophagus and stomach.

Route of overexposure: The primary route of entry of the decomposition products is by inhalation. Skin contact, eye contact, and ingestion are possible. Absorption by skin contact is unlikely.

Effects of acute (short-term) overexposure to the gases, fumes and dusts may include irritation of the eyes, lungs, nose and throat. Some toxic gases associated with welding may cause pulmonary edema, asphyxiation, and death. Acute overexposure may include signs and symptoms such as watery eyes, nose and throat irritation, headache, dizziness, difficulty in breathing, fever, frequent coughing, or chest pain. The presence of chromium/chromate in fume can cause irritation of nasal membranes and skin. The presence of nickel compounds in fume can cause metallic taste, nausea, tightness of chest, fever, and allergic reaction. Exposure to the fluoride ion may cause hypocalcemia (calcium deficiency) in the blood that can result in muscle cramps and inflammation and necrosis of mucous membranes.

Pre-existing Medical Conditions Aggravated by Overexposure: Individuals with allergies or impaired respiratory function may have symptoms worsened by exposure to welding fumes; however, such reaction cannot be predicted due to the variation in the composition and in the quantity of the decomposition products.

Effects of chronic (long-term) overexposure to air contaminants may lead to their accumulation in the lungs, a condition which may be seen as dense areas on chest X-rays. The severity of the change is proportional to the length of the exposure. The changes seen are not necessarily associated with symptoms or signs of reduced lung function or disease. In addition, the changes on X-rays may be caused by non-work factors such as smoking, etc. Long term exposure to welding and allied processes gases, dusts and fumes may contribute to pulmonary irritation or pneumoconiosis. Nickel and chromium (in some forms) are considered carcinogenic. Long term overexposure to nickel fumes may also cause pulmonary fibrosis and edema. Chromium compounds have a corrosive action on the skin and mucous membranes; lesions form on exposed skin and the nasal septum. Liver damage and allergic skin rash have also been reported. Overexposure to manganese compounds may affect the central nervous system, symptoms of which are languor, sleepiness, muscular weakness, emotional disturbances, and spastic gait. The effect of manganese on the nervous system is irreversible. Inhalation of too much iron oxide fume over a long time can cause siderosis, sometimes called "iron pigmentation" of the lung, which can be seen on a chest x-ray but causes little or no disability. Chronic overexposure to iron (>50-100 mg Fe per day) can result in pathological deposition of iron in body tissues, symptoms of which are fibrosis of the pancreas, diabetes mellitus, and liver cirrhosis. Chronic fluoride absorption can result in osseous fluorosis, increased radiographic density of the bones and mottling of the teeth. Overexposure to respirable crystalline silica may result in silicosis, a disabling lung disease; overexposure to respirable crystalline silica is a known cause of carcinogenicity in humans. Welding fumes (not otherwise specified) are possibly carcinogenic to humans.

Exposure limits for the ingredients are listed in Section II. The 2003 ACGIH and the 1989 OSHA TWA for welding fume is 5 mg/m³. At times, the limit for a particular hazardous chemical is reached before the limit for welding fumes. TLV-TWAs should be used as a guide in the control of health hazards and not as firm lines between safe and excessive concentrations. As noted in Section V, the fume from welding, brazing, soldering and allied processes is a mixture of many components. Therefore, a statutory computation of the *equivalent exposure* is required. The *equivalent exposure* value for the fume mixture from the welding or from an allied process shall always be less than one. When these products are used as recommended by Weldcote Metals, and the preventive measures are strictly followed, overexposure to hazardous substances will not occur.

Carcinogenic Assessment (NTP Annual Report, IARC Monographs, Other):

Chromates, alkaline as Cr; Chromic Acid and chromates; and Chromite ore processing (Chromate) as Cr: TLV-A1, confirmed human carcinogen.

Chromium (III) inorganic compounds, as Cr: EPA-D not classified as to human carcinogenicity. IARC-3 unclassifiable as to carcinogenicity in humans. TLV-A4 not classified as a human carcinogen.

Chromium (VI) inorganic compounds, as Cr, water-soluble: EPA-A human carcinogen, studies support a causal association between exposure and cancer; EPA-K known human carcinogen; IARC-1 carcinogenic to humans; TLV-A1 confirmed human carcinogen; NTP-K known to be a human carcinogen.

Chromium (VI) inorganic compounds, as Cr, certain water insoluble: EPA-A human carcinogen, studies support a causal association between exposure and cancer; EPA-K known human carcinogen; IARC-1 carcinogenic to humans; TLV-A1 confirmed human carcinogen; NTP-K known to be a human carcinogen.

Chromium Metal: IARC-3 unclassifiable as to carcinogenicity in humans. TLV-A4 not classified as a human carcinogen.

Molybdenum Soluble Compounds, as Mo: TLV-A3 confirmed animal carcinogen with unknown relevance to humans.

Molybdenum Trioxide: MAK-3B substance for which in vitro tests or animal studies have yielded evidence of carcinogenic effects.

Nickel, Alloys: IARC-2B possibly carcinogenic to humans.

Nickel Compounds: IARC-1 carcinogenic to humans; MAK-1 substances that cause cancer in man and can be assumed to make a significant contribution to cancer risk; NTP-K known to be a human carcinogen.

Nickel, Elemental: IARC-2B possibly carcinogenic to humans; NTP-K known to be a human carcinogen; MAK-1 substances that cause cancer in man and can be assumed to make a significant contribution to cancer risk; TLV-A5 not suspected as a human carcinogen on the basis of properly conducted epidemiological studies in humans.

Nickel, Insoluble Compounds, as Ni: NTP-K known to be a human carcinogen; TLV-A1 confirmed human carcinogen; NTP-K known to be a human carcinogen.

Nickel, Soluble Compounds, as Ni: NTP-K known to be a human carcinogen; TLV-A4 not classified as a human carcinogen.

Nickel Carbonate: IARC-1 carcinogenic to humans; MAK-1 substances that cause cancer in man and can be assumed to make a significant contribution to cancer risk; NTP-K known to be a human carcinogen.

Nickel Dioxide: IARC-1 carcinogenic to humans; MAK-1 substances that cause cancer in man and can be assumed to make a significant contribution to cancer risk; NTP-K known to be a human carcinogen.

Nickel Hydroxide: IARC-1 carcinogenic to humans; MAK-1 substances that cause cancer in man and can be assumed to make a significant contribution to cancer risk; NTP-K known to be a human carcinogen.

Nickel Oxide: IARC-1 Carcinogenic to humans; MAK-1 substances that cause cancer in man and can be assumed to make a significant contribution to cancer risk; NTP-K known to be a human carcinogen. TLV-A1 confirmed human carcinogen; NTP-K known to be a human carcinogen.

Nickel Sulfide: EPA-A human carcinogen, studies support a causal association between exposure and cancer; IARC-1 carcinogenic to humans; MAK-1 substances that cause cancer in man and can be assumed to make a significant contribution to cancer risk; NTP-K known to be a human carcinogen. TLV-A1 confirmed human carcinogen; NTP-K known to be a human carcinogen.

Silica-Crystalline Cristobolite; Silica-Crystalline Quartz- IARC-1: Carcinogenic to humans; NTP-K: Known to be a human carcinogen; TLV-A2: Suspected human carcinogen.

Silica fume—IARC-3: Unclassifiable (inadequate evidence) as to carcinogenicity in humans.

Welding Fumes (not otherwise classified)—IARC-2B: Possibly carcinogenic to humans.

XII. Ecological Information

Product Persistence: The WeldCote Metals covered electrodes consist of a steel core wire encircled by cellulose fibers, inorganic minerals, chemical, metal/alloy powders bonded with cured silicate. The products are expected to slowly corrode in an outdoor ambient environment. Over time, some of the ingredients in the covering may leach into the environment.

Biodegradability: No test data.

Most of chemicals found in the covering are not biodegradable.

Silicate solutions and sodium silicate powder are not persistent in aquatic systems, but their high pH when undiluted or unneutralized is acutely harmful to aquatic life. Diluted material rapidly depolymerizes to yield dissolved silica in a form that is indistinguishable from natural dissolved silica. The dissolution of cured silicate materials and sodium silicate powder generally does not bioaccumulate.

Ecotoxicity: No test data.

Typical for cellulose: acute aquatic 96-hour static LC50 value falls within the practically nontoxic range of 100-1000 mg/L, according to U.S. Fish and Wildlife criteria (rainbow trout and Bluegill Sunfish were species tested).

Typical for silicate solutions: "The following data is reported for sodium silicate on a 100% solid basis: A 96 hour median tolerance for fish (*Gambusia affinis*) of 2320 ppm; a 96 hour median tolerance for water fleas (*Daphnia magna*) of 247 ppm; a 96 hour median tolerance for snail eggs (*Lymnaea*) of 632 ppm; and a 96 hour median tolerance for Amphipoda of 160 ppm.

Biological Oxygen Demand (BOD): No test data.

Typical for silicate solutions: The dissolution of silicates in aquatic systems does not contribute to BOD.

Chemical Oxygen Demand: No test data.

Note on Ecological Toxicity: Fluoride can be highly toxic to aquatic and terrestrial flora and fauna. Care should be taken to prevent fluoride containing Weldcote Metals covered electrodes from entering the environment.

XIII. Disposal Considerations

Waste Disposal Method: Discard any product, residue, disposable container, or liner in an environmentally acceptable manner, in full compliance with Federal, State and Local regulations. If used or waste product(s), such as slag and filtered fumes, are disposed of, testing including TCLP, should be conducted to determine hazard characteristics.

RCRA: The (unused) product does not contain hazardous RCRA listed components.

XIV. Transport Information

U. S. DEPARTMENT OF TRANSPORTATION:

Proper Shipping Name: NOT DOT REGULATED.

XV. Regulatory Information

Environmental Protection:

United States EPA Toxic Substance Control Act: All constituents of these products are on the TSCA inventory list or are excluded from listing.

Canadian Environmental Protection Act (CEPA): All constituents of these products are on the Domestic Substance List (DSL).

EPCRA (SARA Title III) 302 Extremely Hazardous Substances:

Ingredient name	304 EHS RQ	302 EHS TPQ
No ingredients listed in this section.		

EPCRA (SARA Title III) 313 Toxic Chemical (May be subject to annual reporting; see Section II for weight percent.):

Ingredient name	CAS Number
Chromium (Cr)	7440-47-3
Manganese (Mn)	7439-96-5
Nickel (Ni)	7440-02-0

Note on Welding Process Emission Factors to compute released quantities. *The Plain English Guide to the Clean Air Act*, EPA-400-K-93-001, April 1993, AP-42, Section 12.19 contains compiled emission factors for the SMAW, GMAW, FCAW and SAW welding processes. The emission factors for SAW are substantially lower than the open arc processes. The emission factors for GTAW are very low and generally not measured. *Also See:* ANSI/AWS F1.6 "Guide for Estimating Welding Emissions for EPA and Ventilation Permit Reporting" available from the American Welding Society.

CERCLA Reportable Quantities:

Ingredient name	CAS Number	RQ pounds
Chromium (Cr)	7440-47-3	5000
Nickel (Ni)	7440-02-0	100

Hazard: Immediate acute health hazard; delayed health hazard.

CANADIAN ENVIRONMENTAL PROTECTION ACT PRIORITIES LISTS

PSL1 *Hexavalent Chromium Compounds* are found in the emissions from the process.

Oxidic, Sulphidk, and Soluble Inorganic Nickel Compounds may be in the emissions from the process.

Inorganic Fluorides are within the core of some of the products. **See "Approximate Composition Tables".**

PSL2 *Respirable particulate matter less than or equal to 10 microns* in the welding fumes from the process are respirable.

CANADA; INGREDIENT DISCLOSURE LIST

Aluminum oxide	1344-28-1
Calcium oxide	1305-78-1
Chromium, elemental	7440-47-3
Ferrosilicon	8049-17-0
Ferric oxide	1309-37-1
Fluoride Compounds Inorganic, n.o.s.	
Manganese, elemental	7439-96-5

Mica	12001-26-2
Molybdenum, elemental	7439-98-7
Nickel, elemental	7440-02-2
Silica	14808-60-7

State Right-To-Know:

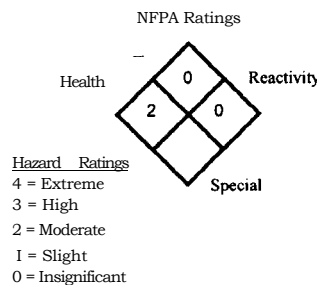
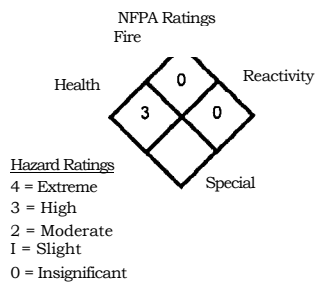
California Proposition 65

- ⓘ **WARNING:** This product, when used for welding or cutting, produces fumes or gases which contain chemicals known to the State of California to cause birth defects and, in some cases, cancer. (California Health & Safety Code §25249.5 et seq.)
 - Ⓢ **WARNING:** This product contains or produces a chemical known to the State of California to cause cancer and birth defects (or other reproductive harm). (California Health & Safety Code §25249.5 et seq.)
- See: AWS "Safety and Health Fact Sheet No. 23" at: www.aws.org.

XVI. Other Information

NFPA and HMIS Classifications:

NFPA: Shielded metal arc welding electrodes are not NFPA rated. As Mixture, the Weldcote Metals covered SMAW electrodes have been assigned the highest number in each category that a component material is known to be rated without consideration of the weight percentage.



Fluoride Bearing Electrodes

Non Fluoride Bearing Electrodes

HMIS: SMAW Weldcote Metals covered electrodes are not HMIS rated. The HMIS label and the values presented therein on this page are a best effort intended to communicate safety information and practices.



HMIS: Shielded Metal Arc Welding with Weldcote Metals covered SMAW electrodes is not HMIS rated. The HMIS label and the values presented therein on this page are a best effort intended to communicate safety information and practices.



Product Identity: MILD STEEL AND LOW ALLOY COVERED ELECTRODES

MSDS#105

DATE REVIEWED: 02/15/06

NOTE: This product has been classified according to hazard criteria of the CPR and the MSDS contains all the information required by the CPR Special Product Warning:

Additional Product Labeling:

WARNING: Overexposure to manganese can irreversibly affect the central nervous system. Symptoms of manganese overexposure include impaired speech, balance and movement. Fumes from the normal use of this product contain significant quantities of manganese compounds. The TLV for manganese exposure, 0.2 mg/m^3 , may be exceeded. Use enough ventilation, local exhaust and respirators to keep the worker's breathing zone and general area below the TLV for exposure to manganese.

Weldcote Metals and its employees request the users of these products to study this Material Safety Data Sheet (MSDS,) the product labels, the power source manual and instructions, and process literature, especially the sources cited herein, and to become fully aware of the product hazards and safety information. To promote the safe use of these products, a user should (1) notify and train its employees, agents and contractors concerning the information on this MSDS and any product hazards and safety information, (2) furnish this same information to each of its customers for these products, and (3) request that such customers notify and train their employees and customers, for these products, of the same product hazards and safety information.

The opinions expressed in this MSDS are those of qualified experts within Weldcote Metals.. We believe that the information contained herein is current as of the date of this MSDS. Since the use of this information and these opinions and the conditions of use of these products are not within the control of Weldcote Metals, it is the user's obligation to determine the conditions of safe use of these products.

Weldcote Metals believes this data to be accurate and to reflect qualified expert opinion regarding current research. However, Weldcote Metals can not make any expressed or implied warranty as to this information.