



Material Safety Data Sheet

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

Hazard Ratings
4 = Extreme
3 = High
2 = Moderate
1 = Slight
0 = Insignificant

I. Product Identification

Product Type - MISCELLANEOUS ARCALOY STAINLESS STEEL COVERED ELECTRODES

Manufacturer - THE ESAB GROUP, INC. **Telephone No.** - 1-717-637-8911

Website: www.esabna.com **1-800-933-7070**

Address - 801 Wilson Avenue, P. O. Box 517 **Emergency No.** - 1-717-637-8911
Hanover, PA 17331 **(CHEMTREC)** 1-800-424-9300

Product Description: Covered electrodes are manufactured by concentrically extruding a silicated chemical mixture onto rods followed by an oven curing. These covered electrodes are for use with the SMAW process to join and to surface stainless steels and some dissimilar base materials.

APPROXIMATE COMPOSITION OF COVERED ELECTRODES (Wt. %)

Product Trade Name	%Mn	%Ni	%Cr	F Cmpds	CaCO ₃	Si	Silicate Binder	TiO ₂	Mineral Silicates	Mo	Cb*	Fe	AWS** Classification
ARCALOY Ⓞ													
410-16	1-2	<1	7-9	X	X	X	X	X	X	--	--	X	E410-16
410NiMo-16	1-2	2-3	7-9	X	X	X	X	X	X	X	--	X	E410NiMo-16
430-16	1-2	<1	9-11	X	X	X	X	X	X	--	--	X	E430-16
ARCALOY PLUS Ⓞ													
308L-17	1-2	5-7	15-17	X	X	--	X	X	X	--	--	X	E308/308L-17
309L-17	1-2	7-9	19-21	X	X	--	X	X	X	--	--	X	E309/309L-17
316L-17	1-2	7-9	14-16	X	X	--	X	X	X	X	--	X	E316/316L-17
317L-17	1-2	8-10	15-17	X	X	--	X	X	X	X	--	X	E317/317L-17
347-17	1-2	5-7	15-17	X	X	--	X	X	X	--	X	X	E347-17

NOTE: X indicates material is present

* Also known as Niobium (Nb)

** AWS A5.4 Specification

Ⓞ See Note in Section VI

THE ESAB GROUP requests the users of these products to study this Material Safety Data Sheet (MSDS) and the product labels and 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.

II. Hazardous Ingredients

IMPORTANT: This section covers the materials from which this product is manufactured. The fumes and gases produced during normal use of these products are covered in Section V. The term **HAZARDOUS** should be interpreted as a term required and defined by Laws, Statutes, or Regulations, and does not necessarily imply the existence of any hazard when the products are used as directed by **THE ESAB GROUP**.

Material	(CAS No.)	SARA	ACGIH TLV		OSHA - PEL		
			TWA (mg/m ³)		TWA (mg/m ³)	STEL (mg/m ³)	
Calcium Carbonate (CaCO ₃)	(1317-65-3)		10	(Dust)	5	(Respirable)	--
Chromium (Cr)	(7440-47-3)	*	0.5	(Metal)	1	(Metal)	--
			0.05	(CrVI inorganic compounds as Cr, water soluble)	0.005	(CrVI inorganic compounds as CrVI, water soluble)	
					C 0.1	(as CrO ₃)	
			0.01	(CrVI inorganic compounds as Cr, water insoluble)	0.005	(CrVI inorganic compounds as CrVI, water insoluble)	
					C 0.1	(as CrO ₃)	
Columbium (Cb)	(7440-03-1)		10	(Nuisance Particulate)	5	(Respirable Dust)	--
Copper (Cu)	(7440-50-8)	*	0.2	(Fume)	0.1	(Fume)	--
Cryolite (Na ₃ AlF ₆)	(15096-52-3)		2.5	(as F)	2.5	(as F)	--
Fluorspar (CaF ₂)	(7789-75-5)		2.5	(as F)	2.5	(as F)	--
Iron (Fe)	(7439-89-6)		5	(Oxide Fume)	10	(Total Particulate)	--
Manganese & Manganese Compounds, as Mn	(7439-96-5)	*	0.2		1	(Fume)	3
Molybdenum (Mo), Insoluble Compounds as Mo	(7439-98-7)		10	(Inhalable Fraction)	5	(Soluble)	--
Soluble Compounds as Mo			3	(Respirable Fraction)			
Nickel (Ni)	(7440-02-0)	*	0.5	(Respirable Fraction)			
			1.5	(Inhalable Fraction, elemental)	0.1	(Soluble)	--
			0.2	(Inhalable insoluble inorganic compounds)			
			0.1	(Inhalable soluble inorganic compounds)			
Mineral Silicates, Use Quartz Formula	(14808-60-7)		0.05	(Respirable Quartz)	10/(% SiO ₂ +2) ; SiO ₂ measured as Respirable Fraction		--
Silicate Binder	(1344-09-8), (1312-76-1) & (12627-14-4)		10		5	(Respirable)	--
Silicon (Si)	(7440-21-3)		10	(Dust)	5	(Respirable)	--
Sodium Fluoride (NaF)	(7681-49-4)		2.5	(as F)	2.5	(as F)	--
Titanium Dioxide (TiO ₂)	(13463-67-7)		10	(Dust)	5	(Respirable)	--

NOTE: 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.

Some of these products may not contain all of the materials listed. For details of composition, refer to the COMPOSITION TABLE in Section I.

In the table above, "C" indicates "Ceiling Limit."

III. Physical Data

As shipped, these products are nonflammable, non-explosive, non-reactive, and non-hazardous.

Physical State: GAS () LIQUID () SOLID (X)

Odor and Appearance: Flux coated mild steel or stainless steel core wire. Odorless.

IV. Fire & Explosion Hazard

Flammable/Explosive: NO (X) YES ()

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

Extinguishing Media: This product will not burn; however, 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 and Cutting" and "Safe Practices" Code: SP, 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, Batterymarch Park, Quincy, MA 02269 for additional fire prevention and protection information.

V. Reactivity Data

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

Incompatible products: None currently known.

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 worker's 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). 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, ozone and nitrogen oxides (refer to "Characterization of Arc Welding Fume" available from the American Welding Society). THE FUME LIMIT FOR CHROMIUM, NICKEL, AND/OR MANGANESE MAY BE REACHED BEFORE THE GENERAL LIMIT FOR WELDING FUMES OF 5 mg/m³ IS REACHED. MONITOR FUMES FOR CHROMIUM, NICKEL, AND MANGANESE. A SIGNIFICANT AMOUNT OF THE CHROMIUM IN THE FUMES CAN BE HEXAVALENT CHROMIUM, WHICH HAS A VERY LOW EXPOSURE LIMIT, 0.005 mg/m³ (5µg/m³). 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 welder's 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.

VI. Physical and Health Hazard Data

Electric arc working may create one or more of the following health or physical hazards. Fumes and gases can be dangerous to your health. Electric shock can kill you. Arc rays can injure eyes and burn skin. Noise can damage hearing. An additional detailed description of the Health and Physical Hazards and their consequences may be found in ESAB's free publications F52-529 "Precautions and Safe Practices for Electric Welding and Cutting" and F2035 "Precautions and Safe Practices for Gas Welding, Cutting and Heating." You may obtain copies from your local supplier or by writing to the address in Section I.

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. When these products are used as recommended by **THE ESAB GROUP**, and ventilation maintains exposure to the decomposition products below the limits recommended in this section, overexposure 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, 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 composition and 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 are considered carcinogenic. Long term overexposure to nickel fumes may also cause pulmonary fibrosis and edema. 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. Overexposure to copper fumes may lead to copper poisoning, resulting in hemolytic anemia and liver, kidney and spleen damage. 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 fluoride absorption can result in osseous fluorosis, increased radiographic density of the bones and mottling of the teeth.

Exposure limits for the ingredients are listed in Section II. The 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 THE ESAB GROUP, and the preventive measures taught in this MSDS are followed, overexposure to hazardous substances will not occur.

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. 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 to remove all residue. If irritation persists, consult a physician.

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.

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 Sub 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.

⊗ **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.)

VII. Precautions for Safe Handling and Use/Applicable Control Measures

Read and understand the manufacturer's instructions and the precautionary label on this product. 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 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:

Ventilation: 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. Train the welder to keep his head out of the fumes.

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.

Eye Protection: Wear helmet or use face shield with filter lens. As a rule of thumb, start with a shade which is too dark to see the weld zone. Then go to the next lighter shade which gives sufficient view of the weld zone. Provide protective screens and flash goggles, if necessary, to shield others. Wear safety glasses or goggles when handling this material to prevent eye contact. Do not wear contact lenses in any environment where dust or fumes are present. Readily available eye baths are recommended in areas where operations may produce fumes and dusts.

Protective Clothing: Wear head, hand, and body protection which help to prevent injury from radiation, sparks and electrical shock. See ANSI Z-49.1. At a minimum, this includes welder's gloves and a protective face shield and may include arm protectors, aprons, hats, shoulder protection, as well as dark substantial clothing. Train the welder not to touch live electrical parts and to insulate himself from work and ground.

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

Procedure for Cleanup of Spills or Leaks: NOT APPLICABLE

Waste Disposal Method: Prevent waste from contaminating surrounding environment. Discard any product, residue, disposable container, or liner in an environmentally acceptable manner, in full compliance with Federal, State and Local regulations.

The opinions expressed in this MSDS are those of qualified experts within **THE ESAB GROUP**. 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 **THE ESAB GROUP**, it is the user's obligation to determine the conditions of safe use of these products.