



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

Material Safety Data Sheet

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

I. Product Identification

Product Type - ALL-STATE COLD SPRAY POWDERS

Website: www.esabna.com

Manufacturer - THE ESAB GROUP, INC.
www.esab.com

Telephone No. - 1-717-637-8911
1-800-933-7070

Address - 801 Wilson Avenue
Hanover, PA 17331

Emergency No. - 1-717-637-8911
(CHEMTREC) 1-800-424-9300

Product Description: A mixture of metal powders typically 1-50 microns intended for “cold spraying”, a process that uses a heated carrier gas and that accelerates the powder to supersonic speeds to fuse it to the substrate.

APPROXIMATE COMPOSITION (Wt. %)

All-State Product Trade Name	Al	Cr	Ni	C	Mo	Fe	Si
TOP AP ③	1-6	--	30-35	--	--	X	--
TOP BOND ③	4-11	--	85-96	--	--	--	--
TOP CHROME No. 1 ③	--	15-20	10-15	X	X	X	X
TOP CHROME No. 2 ③	3-7	5-10	70-75	--	X	X	--
TOP LUBE ③	--	10-15	80-85	--	--	X	--

NOTE: X indicates material is present.

③ 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 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)
Aluminum [metal dust] (Al)	(7429-90-5)	*	1**		15*, 5**	--
Carbon (C)	(7440-44-0)		3.5 (Carbon Black)		3.5 (Carbon Black)	--
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)	--
Iron (Fe)	(7439-89-6)		5 (Oxide Fume)		10 (Total Particulate)	--
Manganese (Mn)	(7439-96-5)	*	0.2 (Fume)		1 (Fume)	3
Molybdenum (Mo)	(7439-98-7)		5 (Soluble)		5 (Soluble)	--
Nickel (Ni)	(7440-02-0)	*	0.1 (Soluble)		0.1 (Soluble)	--
Silicon (Si)	(7440-21-3)		Withdrawn		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.

* Total dust, ** Respirable fraction, *** Inhalable fraction.
In the table above, "C" indicates "Ceiling Limit."

III. Physical Data

Physical State:	Gas ()	Liquid ()	Solid (X)		
Boiling Point (°F @ 760 mm Hg):	N/A				
Percent Volatiles by Volume:	N/A				
Evaporation Rate: (butyl acetate = 1)	N/A				
Solubility in Water:	Insoluble				
Specific Gravity	TOP AP	TOP BOND	TOP CHROME No. 1	TOP CHROME NO. 2	TOP LUBE
(H ₂ O = 1):	6.2	7.3	7.4	6.9	7.4
Odor and Appearance:	Metallic gray powder with no noticeable odor.				
Vapor Pressure (mm Hg)	1 mm				

IV. Fire & Explosion Hazard

Flammable/Explosive:	NO (X)	YES ()
Flash Point:	N/A	
Flammable Limits in Air: (% by Volume)	N/A	
Extinguishing Media:	Graphite, Dolomite or Sodium Chloride	
Special Fire Fighting Procedures:	DO NOT USE WATER.	
Unusual Fire and Explosion Hazards:	Not considered flammable, however, finely divided powder in the form of dust can ignite if contacted by an ignition source.	

V. Reactivity Data

Stability: Stable (X) Unstable () Hazardous polymerization will not occur.

Incompatibility (Materials to Avoid): Reacts with mineral acids and oxidizing agents to liberate hydrogen.

Hazardous Decomposition Products: Evolved hydrogen may become explosive hazard. Cold Spraying Process fumes and gases cannot be classified simply. The composition and quantity of both are dependent upon the material being worked, the process, procedures, carrier gas 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 cold spraying and fume generating 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 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 LIMITS FOR CHROMIUM, AND/OR NICKEL MAY BE REACHED BEFORE THE GENERAL LIMIT FOR WELDING FUMES OF 5 mg/m³ IS REACHED. MONITOR FUMES FOR CHROMIUM AND NICKEL. 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 worker's breathing zone. See 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

The material supplied with this MSDS is for use in a Cold Spraying Process. The process uses a heated carrier gas and accelerates the particles to supersonic velocity. The kinetic energy and the higher temperatures create a bond to the substrate. Familiarize yourself with OSHA and/or other local safety regulations before starting spraying operations. DO NOT operate your equipment or use the material before you have thoroughly read the Instruction Manual and Safety and Health Warning labels applicable to the process equipment. Cold Spraying of metal powders 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. Radiance 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 publications F52-529 "Precautions and Safe Practices for Electric Welding and Cutting" and 17982 "Standard for Fire Prevention During Welding, Cutting and Other Hot Work." 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. 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: Short-term exposure to the gases, fumes and dusts may include irritation of the eyes, lungs, nose and throat. Some toxic gases associated with welding and allied processes 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. Nickel bearing dust may irritate the skin.

Pre-existing Medical Conditions Aggravated by Overexposure: Individuals with allergies or impaired respiratory function may have symptoms worsened by exposure to fumes from welding and allied processes; 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 thermal spraying, gases or dust 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.

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 time 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 cold spraying is a mixture of many components. Therefore, a statutory computation of the *equivalent exposure* is required. The *equivalent exposure* value for the welding and brazing fume mixture 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. Threshold Limit Value for these products is 1 mg per cu meter of air.

Emergency First Aid Measures: In case of emergency, call for medical aid.

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:

Nickel and Chromium must be considered possible carcinogens under OSHA (29 CFR 1910.1200). IARC has indicated Nickel, Chromium, and certain of their compounds are probably carcinogenic for humans, but the compounds cannot be specified precisely. Their conclusions were drawn from operations different from thermal spraying. Regardless, exposure level must be kept below those levels specified in Section II.

ⓘ **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 CFR 1910), U.S. Government Printing Office, Washington, D.C. 20402 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 the fumes.

Respiratory Protection: Use respirable fume respirator or air supplied respirator when cold spraying in confined spaces or where local exhaust or ventilation does not keep exposure below the TLVs. 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 safety glasses or goggles. Do not wear contact lenses.

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.

Procedure For Cleanup Of Spills Or Leaks: Can be swept and/or shoveled up and replaced in original container. Care should be taken to maintain work area atmosphere below TLV levels.

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.

Precautions To Be Taken In Handling And Storing: Nickel powder should be handled and stored in closed containers. Avoid skin contact. Store metal powders in a dry area. Do not store adjacent to mineral acids.

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.