



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 - ALL-STATE COLD SPRAY POWDERS

Manufacturer - THE ESAB GROUP, INC.

Telephone No. - 1-717-637-8911

Website: www.esabna.com

Address - 801 Wilson Avenue
Hanover, PA 17331

Emergency No. - 1-800-424-9300
(CHEMTREC)

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

All-State Product Trade Name	% Aluminum	% Copper	Iron
TOP BRONZ No. 1 ①	9-10	0.5-2	X
TOP BRONZ No. 2 ①	10-15	85-90	--

NOTE: X indicates material is present
① 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)	
Aluminum	(7429-90-5)	*	5	(Welding Fume)	5	(Welding Fume)	--
Copper	(7440-50-8)	*	0.2	(Fume)	0.1	(Fume)	--
			1	(dusts and mists as Cu)	1	(dusts and mists as Cu)	
Iron	(7439-89-6)		5	(Oxide Fume as Fe)	10	(Oxide Fume as Fe)	--

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.

III. Physical Data

Physical State: Gas () Liquid () Solid (X)

Vapor Pressure (mm Hg): 1 @ 1628°C

Solubility in Water: Insoluble

Specific Gravity: 8.9

Water Reactive: None

Odor and Appearance: Gold colored, metallic powder. Odorless.

IV. Fire & Explosion Hazard

Flammable/Explosive: NO (X) YES ()

Extinguishing Media: Use gentle surface application of Class D extinguishing agent or dry inert granular material (e.g. sand) to cover and ring the burning powder.

Special Fire Fighting Procedures: None.

Unusual Fire and Explosion Hazards: Copper reacts violently with: C₂H₂, NH₄NO₃, Bromates, Chlorates, Iodates, Cl₂, H₂O₂, H₂S, Hydrazine monohydrate, Hydrazoic acid, K₂O₂, NaN₃, Na₂O₂, Pb(N₃)₂, ClF₃.

V. Reactivity Data

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

Incompatibility (Materials to Avoid): 1-bromo-2-propyne.

Hazardous Decomposition Products: Decomposition with nitric acid causes evolution of nitrous oxide fume.

Thermal spray 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: 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 fumes and gases, as well as the presence of contaminants in the atmosphere (such as dusts and fumes from grinding or chlorinated hydrocarbon vapors from cleaning and 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 COPPER MAY BE REACHED BEFORE THE GENERAL LIMIT FOR WELDING FUMES OF 5 mg/m³ IS REACHED. MONITOR FUMES FOR COPPER. 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 F1.1 "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 a thermal 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.

Do not ingest the metal powder. Some individuals may show unusual sensitivity to the fume exposure and to the powder.

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 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 copper in fume can cause metal fume fever. Short term symptoms may include a metallic taste in the mouth, dryness or irritation of the throat followed by coughing, shortness of breath, nausea, fever, body ache, and chills. Symptoms usually disappear within 24 hours. Toxic to persons with "Wilson's" Disease.

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. Individuals with "Wilson's" disease may accumulate large amounts of copper in liver, kidney, brain and cornea.

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. Inhalation of sublimed oxide has caused metal fume fever. Individuals with "Wilson's" disease will accumulate large amounts of copper in liver, kidney, brain and cornea. Copper poisoning has been reported in the literature from exposure to high levels of copper. Liver damage can occur due to copper accumulation in the liver; damage is characterized by cell destruction and cirrhosis. High levels of copper may cause central nervous system damage characterized by nerve fiber separation and cerebral degeneration.

Exposure limits for the ingredients are listed in Section II. TLV-TWAs should be used as a guide in the control of health hazards and not as fine lines between safe and excessive concentrations. 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. As noted in Section V, the cold spraying fume is a mixture of many components. Therefore, a statutory computation of the *equivalent exposure* is required. The *equivalent exposure* value for the cold spraying 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.

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. If breathing has stopped, perform artificial respiration. Summon medical aid immediately. Remove to fresh air. 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. If eyes affected, wash eyes with sterile eyewash solution. Consult physician. If skin affected, wash areas of skin contact with copious amounts of soap and clean water. If swallowed, subject likely to expel powder by spontaneous vomiting. Call Poison Control Center.

Carcinogenic Assessment (NTP Annual Report, IARC Monographs, Other): NONE.

● **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.)

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, 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, 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/brazing/spraying in confined spaces or where local exhaust or ventilation does not keep exposure below 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 3M type 8710 or equivalent nuisance dust mask is recommended.

Eye Protection: Wear safety glasses or goggles.

Protective Clothing and Equipment: 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 the 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 Methods: 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.