Avesta Welding

Material Safety Data Sheet

Stainless steel Welding Wire

Member of the Böhler Welding Group

In accordance with:	ANSI Z400.1-2004
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1. PRODUCT AND COMPANY IDENTIFICATION

Product name:	**AVESTA 2507/P100**
Classification:	AWS A5.9/ASME SFA5.9 Bare Stainless Welding Electrodes and Rods ER2594
Products:	Solid stainless steel wire for: Gas Metal Arc welding, Gas Tungsten Arc Welding, Submerged Arc Welding, Plasma Arc Welding, Laser Welding
Company:	Avesta Welding LLC. 10401, Greenbough Drive, Stafford, TX 77477 Telephone number: 1-800-441-7343 Fax number: 1-716-827-4404
Emergency numbers:	USA 1-800-424-9300 Chemtrec Canada 1-613-996-6666 Canutec
Additional information:	Shirley Ayles.Telephone number: 281-499-1212 (Office hours) e-mail: Shirley.ayles@bwgus.com

2. HAZARDS IDENTIFICATION

Caution! Protect yourself and others. FUMES AND GASES can be dangerous to your health. ARC RAYS can injure and burn skin. ELECTRIC SHOCK can kill.

Attention! Cancer hazard. Dust and fumes can cause cancer.

OSHA Regulatory status

Solid Stainless Steel Products covered by this MSDS are shipped as non-flammable, nonexplosive, non-reactive articles and do not constitute a hazardous material in solid form under the terms of OSHA Hazard Communications Act. However, some metallic elements from which this product is manufactured are listed in OSHA Hazard Communication Standard (29 CFR 1910.1200).

Solid stainless steel does not contain hexavalent chromium. Chromium as Cr(VI) compound can be found in fumes and dust formed by welding and thermal cutting, mechanical working, hot rolling, hot forging of stainless steel. Cr(VI) is classified by NTP as "Known to be a human carcinogen" and by ACGIH as A1 "Confirmed Human carcinogen". Manganese as metal and inorganic compound in fumes and dust may cause CNS (manganism). Nickel in alloys is not listed by NTP and classified by ACGIH as A5 "Not suspected as a Human carcinogen". Quartz or sand is classified by IARC as "Carcinogenic to humans", by NTP as "Known to be a human carcinogen" and by ACGIH as A2 "Suspected human carcinogen".

Potential health effects

When these products are used in a welding process the following hazards are most important:

Shock: Electrical shock can kill.
Eye contact: Arc rays can severely damage eyes and skin.
Skin contact: Spatter, melting metals and arc rays can cause injuries and start fires.
Inhalation: Dust and fumes produced as a by-product during welding, brazing, thermal cutting or similar processes may contain fumes of chromium (VI) oxides and other welding rod components.

The evidence indicates that workers exposed to Cr(VI) are at an increased risk of developing lung cancer. It also indicates that occupational exposure to Cr(VI) may result in asthma, and damage to the nasal epithelia and skin. To avoid any risk follow the recommendation shown in Federal rule 71:10099-10385 establishing an 8-hour time-weighted average (TWA) exposure limit of 5 micrograms of Cr(VI) per cubic meter of air (5 µg/m3). This is a considerable reduction from the previous PEL of 1 milligram per 10 cubic meters of air (1 mg/10 m3, or 100 µg/m3) reported as CrO3, which is equivalent to a limit of 52 µg/m3 as Cr(VI).

This rule also contains ancillary provisions for worker protection such as requirements for exposure determination, preferred exposure control methods, including a compliance alternative for a small sector for which the new PEL is infeasible, respiratory protection, protective clothing and equipment, hygiene areas and practices, medical surveillance, recordkeeping, and start-up dates that include four years for the implementation of engineering controls to meet the PEL.

Section 11 discusses health effects in more detail.

3. COMPONENTS/ INFORMATION ON INGREDIENTS

This product is manufactured by extruding a coating onto a stainless steel wire.

Wire composition (typical values):

Component	CAS No.	% by Weight
Iron	7439-89-6	Balance
Silicon	7440-21-3	1,6
Manganese	7439-96-5	0,6
Chromium	7440-47-3	21,0
Nickel	7440-02-0	10,0
Molybdenum	7439-98-7	Max 0,3
Niobium	7440-32-6	Max 0,1
Copper	7440-50-8	Max 0,3
Cobalt	7440-48-4	Max 0,2

Other elements may be present such as Carbon, Nitrogen, Sulfur, Phosphorous, Arsenic, Boron, Aluminum, Calcium, Titanium, Tantalum and Tungsten. These are either not hazardous or below 0.1%

4. FIRST AID MEASURES

Employ first aid techniques recommended by the American Red Cross.
Shock: Turn off power. Remove from exposure area. Immediately call for medical assistance.
Eye Contact: For radiation arc burns, seek medical attention. In case of irritation from particulate, immediately flush with plenty of water for 15 minutes and call for medical assistance. Austenitic stainless steel particles are not magnetic and will not respond to a magnet over the eye.
Skin contact: For skin burns from arc radiation seek medical attention. In case of skin irritation or laceration, wash thoroughly with plenty of soap and water.
Inhalation: Inhalation of dust and/or fumes from cutting and welding operations – If breathing is difficult remove person from exposed area to fresh air.
Ingestion: Accidental ingestion is unlikely. If ingested, call for medical assistance

5. FIRE FIGHTING MEASURES

Welding electrodes are not combustible. There are no special hazards or precautions associated with welding electrodes if in vicinity of a fire.

6. ACCIDENTAL RELEASE MEASURES

Not applicable.

7. HANDLING AND STORAGE

Handling: Handle with care to avoid stings and cuts.

Storage: Store in original packaging. Keep away from acids and other chemical substances that could cause a reaction

8. EXPOSURE CONTROLS / PERSONAL

PROTECTION Exposure guidelines

ACGIH recommends a general limit to welding fumes of 5 mg/m^3 otherwise not specified. Other occupational exposure limits apply to some components and certain of their compounds. Table 1 shows limits according to current US legislation.

Table 1 Occupational exposure limits 8-hour TWA mg/m^3

Component	OSHA PEL	ACGIH TLV	Carcinogenetic listing		
			ACGIH	NTP	IARC
Iron oxide, dust & fume as Fe	10	5	A4	No	No
Silicon dust	15 5 (R)	10	No	No	No
Manganese, inorganic compounds as Mn	5	0.2	No	No	No
Manganese, fume as Mn	5	NE	No	No	No
Chromium metal as Cr	1	0.5	A4	No	No
Chromium Cr(II) and Cr(III) compounds Cr	0.5	0.5	A4	No	No
Cr(VI)compounds, water soluble as Cr	0.005*	0.1	A1, BEI	Yes	1
Cr(VI) compounds, insoluble as Cr	0.005*	0.1	A1	Yes	1
Nickel, in alloys as Ni	1	1.5 (I)	A5	No	2B
Nickel, elemental metallic as Ni	1	1.5 (I)	A5	Yes	2B
Nickel, soluble inorganic compounds as Ni	1	0.1 (I)	A5	Yes	1
Nickel, insoluble inorganic compounds Ni	1	0.2 (I)	A1	Yes	1
Nickel, subsulfide as Ni	NA	0.1 (I)	A1	Yes	1
Nickel, carbonyl as Ni	0.007	NE	No	Yes	1
Molybdenum, soluble compounds as Mo	5	0.5(R)	A3	No	No
Molybdenum, metal and insoluble compounds as Mo	15	10(I) 3 (R)	No	No	No
Niobium/Columbium	NE	NE	No	No	No
Aluminum oxide, as Al	10	10	A4	No	No
Titanium in titanium dioxide form, total dust	10	10	A4	No	No
Copper, fume, current as Cu	0.1	0.2	No	No	No
Copper, dusts and mists, current as Cu	1	1	No	No	No
Copper, elemental/metal and oxides proposed as Cu	NE	0.1	A4	No	No
Copper, soluble compounds, proposed Cu	NE	0.05	A4	No	No
Cobalt and inorganic compounds as Co	0.1	0.02	A3, BEI	Yes	2B
Calcium fluoride, as F	2.5	2.5	A4	No	No
Limestone, calcium carbonate, total dust	15 5(R)	10	No	No	No
Quartz, Silica Crystalline	30 10(R)	0.05(R)	A2	Yes	1
Welding Fumes, not otherwise classified	NA	5	No	No	No

TWA=Time Weighted Average, STEL= Short Term Exposure Limit NE=Not Established, R=Respirable fraction I=Inhalable fraction, BEI=Biological Exposure Index ACGIH Ratings: A1=Confirmed Human Carcinogen, A2=Suspected Human Carcinogen, A3=Confirmed Animal Carcinogen with Unknown Relevance to Humans, A4=Not classifiable as a Human Carcinogen, A5=Not suspected a Human Carcinogen. IARC Groups: 1=carcinogenic to humans, 2B=Possibly carcinogenic to humans

*OSHA has proposed a 1.0 µg/m^3 PEL for Cr(IV). The final value will be published in January 2006.

Engineering controls

Ventilation: When welding or thermal cutting use enough general ventilation, local exhaust at the arc, or both to keep fumes and gases from the workers breathing zone. Train workers to keep their head out of the welding plume. If the fumes are removed by filtration or some other means and the airgas stream is put back into the room, gases may build up to toxic or asphyxiation level. Gas build-up should be monitored and if excessive should be reduced by some supplementary system and/or general ventilation.

Welding and related processes: Read and understand the MSDS, manufacturers instruction, and precautionary labels for welding consumables. See American National Standard Z49.1, Safety in Welding and Cutting, published by the American Welding Society, 550 N.W. LeJeune Road, Miami, Florida 33126 or download free from **http://www.aws.org** and OSHA Publication 2206 (29 CFR 1910), U.S. Government Printing Office, Washington, D.C. 20402, for more details on exposure controls.

Eye / face protection: Arcs produce ultraviolet and infrared radiation. Wear a welder's helmet or use a face shield with protective filter lenses. As a rule start with a lens shade that is too dark to see the weld zone. Then go to a lighter shade (lower number shade), which gives sufficient view of the weld zone. Do not go below the minimum recommended in ANSI Standard Z49.1. Select welding lens shades from the American Welding Society (AWS) publication F2.2. Provide protective screens and flash goggles to shield others.

Skin protection: Wear protective gloves to prevent cuts and skin abrasions, radiation sparks, and electrical shock. A dry welder's glove is recommended. Respiratory protection: Use a NIOSH approved respirator for fumes or an air supplied respirator where local exhaust or general dilution ventilation does not keep exposures below the PEL or TLV for air contaminants.

Protective clothing: Wear hand and body protection during welding, brazing, and thermal cutting on stainless steel. Refer to ANSI Z49.1 for more information. At a minimum this includes hand protection and a protective face shield. It may include arm protectors, aprons, hats, hard hats, and shoulder protectors as well as dark, substantial clothing.

General Hygiene Considerations: Keep head out of fumes. Do not breathe the fumes and gases generated. Keep the workplace dry.
Do not touch live electrical parts. Do not eat, smoke, or drink in areas where welding is performed. Utilize good personal hygiene including washing hands and face prior to eating or drinking.

9. PHYSICAL AND CHEMICAL PROPERTIES

Color: Varying. Normally grey, green or red coating.
Odor: Odorless
Odor threshold: Not applicable
Physical state: Solid pH: Not applicable
Melting point: 2500 – 2760 ºF (1370 – 1520ºC)
Boiling point: Not applicable
Flash point: Not applicable
Evaporation rate: Not applicable
Flammability: Not applicable
Explosive limits: Not applicable
Vapor pressure: Not applicable
Vapor density: Not applicable
Specific gravity: 0.27 - 0.30 lbs./in3 (7.7 – 8.1 kg/dm3)
Solubility (water): Insoluble
Partition coefficient: Not applicable
Auto-ignition temperature: Not applicable
Decomposition temperature: Not applicable
Thermal expansion (ambient to 100ºC): 10 – 16x10^6 m/mºC
Thermal conductivity (ambient temperature): 12 – 30 W/ mºC
Magnetic: Austenitic stainless steels are non-magnetic in most supply conditions. Duplex, ferritic and martensitic stainless steels are magnetic.

10. STABILITY AND REACTIVITY

General: This product is intended for normal welding.

Chemical stability: Stable and non-reactive under normal conditions.

Conditions to avoid: None known

Incompatible materials: May react in contact with strong acids to release gaseous acid decomposition products, e.g. hydrogen, oxides of nitrogen.

Possibility of hazardous by-products – Welding fumes: Decomposition products from welding will include those originating from the volatilization, reaction, or oxidation of ingredients in welding rods, fluxes, and fillers, plus those from the base metal and coatings, etc. Possible decomposition products that may be generated during welding include complex oxides of the ingredients listed in Section 3. Fumes generated during welding may contain: chromium compounds, including hexavalent chromium Cr (VI); nickel; manganese; iron; molybdenum; and silicon compounds. Expected gaseous products would include carbon oxides, nitrogen oxides and ozone.

Generally, the composition and quantity of fumes and gases are dependent upon the base metal and the process, procedures, and consumables being 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 base metal (such as paint, plating, galvanizing, and phosphate coatings), the number of workers performing welding, brazing, thermal cutting, or other related operations, the volume of the work area, the quantity of consumables used, the design and amount of ventilation delivered, the position of the worker's head with respect to the fume plume, and the presence of contaminants in the atmosphere (such as chlorinated hydrocarbon vapors from solvent, cleaning, or painting activities) which may decompose by the arc into toxic gases such as phosgene.

The employer is required by OSHA to limit the worker's level of exposure to chemicals for which OSHA has established a PEL in 29 CFR 1910 Subpart Z. The only way to determine a worker's exposure to welding, brazing or thermal cutting decomposition products is by sampling and analyses using accepted industrial hygiene techniques. The composition and quantity of the fumes and gases to which a worker is exposed can be established from an air sample(s) obtained from inside the welder's helmet, if worn, or in the worker's breathing zone. Review ANSI/AWS F1.l standards for further information on air sampling for welding decomposition products.

11. TOXICOLOGY INFORMATION

Acute effects

In its solid form welding electrodes do not present an inhalation, absorption, or ingestion hazard.

Short-term over-exposures to the fumes generated by welding on stainless steel may result in dizziness; nausea; and irritation of the eyes, skin, lungs, nose and throat. Metal fume fever, a flu-like illness lasting about 24 hours with chills, ache, cough, and fever can be caused by overexposure to metal fumes, including iron, chromium, manganese and copper. Some toxic gases may cause pulmonary edema, asphyxiation and death. Metal dust particles may cause eye, skin and/or respiratory system irritation. Acute asthma attacks may be experienced by asthmatics when metal dust or fume is inhaled.

Chronic effects, inhalation or ingestion

Dust and fumes: Welding and thermal cutting may produce stainless steel dust or fumes containing complex or mixed oxides (spinels) of its components. Over long periods, inhalation of excessive airborne levels may have long term health effects, primarily affecting the lungs, e.g. lung fibrosis, or pneumoconiosis. Overexposure to iron oxide can cause siderosis (deposits of iron in the lungs) which may affect pulmonary function. However, studies of workers exposed to nickel powder and dust and fumes generated in the production of nickel alloys and stainless steels have not indicated a respiratory cancer hazard.

Nickel: For stainless steels there is no direct evidence of carcinogenic effects in man, nor indirect evidence from animals tested by relevant routes, i.e. inhalation or ingestion. In other studies, using non-relevant routes in animals, alloys with up to 40% nickel caused no significant increase in cancer. The National Toxicology Program modified its classification of nickel in the 10th Report on Carcinogens, 2002. Nickel alloys, e.g. stainless steels were reviewed but were excluded due to human data are inadequate and rodent cancer data not sufficient to list. NTP regards metallic nickel as "reasonably anticipated to be a carcinogen" and nickel compounds are "known human carcinogens". California Proposition 65 has adopted the same distinctions as NTP. ACGIH is now classifying elemental nickel as A5 "Not suspected as a Human carcinogen". OSHA has not made a distinction and lists "nickel metal and insoluble compounds" in 29 CFR 1910.1200.

***Chromium*:** Welding fumes and thermal cutting fumes may contain Cr(VI) hexavalent chromium compounds. Studies have shown that some hexavalent chromium compounds can cause cancer. Chromium as Cr(VI) hexavalent compound in fumes and dust is classified by NTP as "Known to be a human carcinogen" and by ACGIH as A1 "Confirmed Human carcinogen".

Chromium as metal or Cr(II) and Cr(III) oxides is not listed by NTP and is classified by ACGIH as A4 " Not classifiable as a human carcinogen".

However, epidemiological studies amongst welders indicate no extra risk of cancer when welding stainless steels, compared to the slightly increased risk when welding steels that do not contain chromium.

Manganese: Overexposure to manganese can result in central nervous system effects referred to as manganism, including symptoms of muscular weakness and tremors similar to Parkinson's disease.

Molybdenum and Copper: Both molybdenum and copper are necessary nutritional elements. High doses of molybdenum may antagonize absorption of copper. Likewise, high doses of copper may antagonize absorption of molybdenum. Overexposure to Molybdenum causes anemia, gout-like syndrome and increases uric acid levels. In experimental animals molybdenum toxicity causes weight loss, harmful changes of the liver, kidneys, and bones and impaired reflexes.

Cobalt: Cobalt dust may cause an asthma-like disease. Cobalt is listed as "Possibly carcinogenic to humans" by IARC and cobalt sulfate is included in NTP's 11th report on Carcinogens. ACGIH classifies cobalt as A3 Confirmed Animal Carcinogen with Unknown Relevance to Humans.

Dermatological effects

Stainless steels do not cause nickel sensitization by prolonged skin contact in human. However, nickel is classified as a skin sensitizer. It causes skin sensitization in susceptible individuals through prolonged intimate contact with the skin (e.g. wearing jewellery). Numerous patch tests have established that most stainless steels do not cause sensitization. However, studies have shown that, in some individuals already sensitized to nickel, close and prolonged skin contact with the re-sulfurized free-machining types of stainless steels with 0.15 – 0.35% S (416, 430F, 303, 303Cu) may cause an allergic reaction.

Other observations

NIOSH lists Welding exposure as the 10th largest cause of work related asthma, but makes no distinction between stainless and carbon steel welding. There are some reports indicating that there is a risk of developing asthma from chromium VI compounds and nickel in welding fumes. In the European Union, stainless steel welding fume did not meet the classification criteria required to be listed as a "substance causing asthma".

12. ECOLOGICAL INFORMATION

Welding consumables and materials could degrade into components originating from the consumables or from the materials use din the welding process.

13. DISPOSAL CONSIDERATIONS

RCRA Hazardous waste if discarded, due to the chromium, manganese and nickel contents. Recycle if possible. Surplus and scrap (waste) stainless steel is valuable and in demand for the production of prime stainless steel. Recycling routes are well established, and recycling is therefore the preferred disposal route.

EPCRA / SARA Section 302, 304, 311/312 and 313.

Component	CAS #	Section 302 EHS	Section 304 Spill	Section 311/312 Hazard classes	Section 312 SARA Tier II	Section 313 Form R
			Reporting Quantity, lbs.		Threshold Planning Quantity, lbs.	By weight %
Chromium	7440-47	Not applicable	5,000	Chronic health hazard	10,000	16 - 28
Nickel	7440-02	Not applicable	100	Chronic health hazard	10,000	4.5 - 35
Manganese compounds	N450	Not applicable	No RQ established	Chronic health hazard	10,000	0 – 2.0
Aluminum oxide	1344 28-1	Not applicable	No RQ established	Not established	Not established	0 - 10

14. TRANSPORT INFORMATION

Welding electrodes in the solid form are not classified as HAZMAT. No Label is required during transport.

15. REGULATORY INFORMATION

For welding electrodes the required Label may be transmitted to the customer at the initial shipment, see 29 CFR 1910.1200 (f)(2)(i).

Inventories

OSHA	United States	Included
TSCA	United States	Included

California Safe Drinking Water and Toxic Enforcement Act (Proposition 65)

WARNING: This product contains or produces chemicals known to the State of California to cause cancer and birth defects (or other reproductive harm). (California Health and Safety Code §25249.5 et seq.)

16. OTHER INFORMATION

Basic information used to draw up this MSDS:

References to key data: OSHA, Standards 29 CFR.1910.1000 –1200 ANSI Z49.1 " Safety in welding and cutting". ANSI/AWS F1.1 Airborne Sampling Method AWS F2.2 Lens Shade Selector EPA Consolidated List of Chemicals Subject to the Emergency Planning and Community-Right -to-Know Act (EPCRA) and section 112(r) of the Clean Air Act. DOT, Standards 49 CFR.172.101-102

National Toxicology Program, 11th Report on Carcinogens, 2005 ACGIH, TLVs and BEIs, 2005 edition International Agency for Research on Cancer. 'IARC Monographs on the Evaluation of Carcinogenic Risks to Humans', vol. 1- 88

N. Becker: Cancer mortality among arc welders exposed to fumes containing chromium and nickel. Results of a third follow-up: 1989-1995 IMOA, International Molybdenum Institute Avesta Welding MSDS, European version, LR114-02.

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The information contained in this document is based on the present level of our knowledge and experience. The information applies to this specific material as supplied. It may not be valid for this material if it is used in combination with any other material or in any other product form.

Availability

All Avesta Welding US MSDS are available from Avesta Welding LLC, 10401 Greenbough Drive, Stafford, TX 77477

Telephone number: 1-800-441-7343

and from Avesta Welding homepage:

www.avestawelding.com/products/ North America/MSDS North America