Table 1 Thermal Spray Wire and Bare Wire Welding Products (continued)

ALLOY	UNS Alloy No.	Normal Composition, Weight Percent												
		Ni▲	Co▲	Cr▲	Mo	W	Fe	Si	Mn▲	Al▲	Ti	Cu▲	B	Others (V▲)
20CB3 alloy	N08020	33	<0.1	20	3*	--	71	0.4*	2*	<0.1	<0.1	3.4	<0.1	Cb-.06*, V-<0.1, Ta-<0.1
52 alloy	N14052	50	<0.1	<0.1	--	--	49	0.1	0.5*	<0.1	<0.1	<0.1	--	
72 alloy	N06072	55	<0.1	44	<0.1	--	0.3	<0.1	<0.1	0.2*	0.5	<0.1	<0.1	
80/20 alloy	N06003	78	<0.1	20	--	--	0.7	1.3	<0.1	0.2	--	<0.1	--	
80/20 CB alloy	N06009	77	--	19	--	--	0.7	1.3	0.3	--	--	--	--	Cb-0.8
95/5 alloy	N03301	94	<0.1	--	--	--	<0.1	0.5*	0.3	5	0.7*	0.1*	--	Cb-<0.1, Ta-<0.1
200 alloy	N02200	99.4	--	<0.1	<0.1	--	0.2	<0.1	<0.1	--	<0.1	<0.1	--	
214W alloy	N07214	<70	2*	<17	0.5*	0.5*	<4	0.2*	0.5*	<5	0.5*	--	0.004*	Cb 0.15*; Y<0.04; Zir 0.02*
202 alloy	S20200	5*	--	18*	--	--	69*	0.6*	8	--	--	--	--	
302 alloy	S30200	8	--	18	0.3*	--	72	0.6*	1.8*	--	--	0.4*	--	
302 MO alloy	S30200	9	0.1	17	1.3	--	71	0.5	1.2	<0.1	--	0.1	--	
302 N alloy	S30200	9	--	18	--	--	70	0.6*	1.9	--	--	0.4	--	
302 NC alloy	S30200	8	--	17	<0.1	<0.1	74	0.4	0.3	<0.1	<0.1	<0.1	<0.1	V-0.1, Ta-<0.1
302 V alloy	S30200	8	<0.1	18	0.4	--	72	0.4	1	<0.1	--	0.2	--	
304 alloy	S30400	9	--	18	0.3*	--	71	0.5*	1.8*	--	--	0.3*	--	
304 L alloy	S30403	9	0.2*	18	0.4*	--	70	0.7*	1.8*	<0.1	--	0.5*	--	Y-<0.1
304 V alloy	S30400	8	0.15	18	0.2*	--	72	0.6*	0.7*	--	--	0.3*	--	
305 alloy	S30500	12*	--	18	0.3*	--	68	0.5*	1.4*	--	--	0.4*	--	
308 L alloy	S30800	10	--	21	--	--	66	0.8	1.9	--	--	--	--	
316 alloy	S31600	10	--	17*	2	--	69	0.5*	1.5*	--	--	0.5*	--	
316 L alloy	S31603	10	--	16	2	--	70	0.5*	1.5*	--	--	<0.1	--	
347 alloy	S34700	9	<0.1	17	0.3	--	70	0.6	1.5	<0.1	<0.1	0.2	<0.1	Cb-0.6, V-<0.1, Ta-<0.1
416 alloy	S41600	0.3*	--	13	<0.1	--	85	0.5*	0.9*	<0.1	--	0.1	--	
420H alloy	S42080	0.5*	--	<14	0.75*	--	82	0.5*	<0.6	--	--	0.75*	--	
420 alloy	S42000	0.1	--	13	--	--	86	0.2	0.5*	<0.1	--	0.1	--	
430 alloy	S43000	0.2*	--	17	<0.1	--	82	0.5*	0.5*	<0.1	--	0.1	--	
455 alloy	S45500	8	--	11	<0.1	--	77	<0.1	<0.1	--	1.2	2.2	--	Cb-0.2
600 alloy	N06600	74	0.05*	16	0.3	<0.1	9	0.4*	0.8	0.2	0.3*	0.02*	--	
601 alloy	N06601	60	--	23	--	--	16	0.3*	0.6	1.5	0.3	<0.1	0.003	
622 alloy	N06022	52	2.5*	<23	14	<3.5	<3	0.08*	0.05*	--	--	0.5*	--	V 0.35*;

Table 1 Thermal Spray Wire and Bare Wire Welding Products (continued)

ALLOY	UNS Alloy No.	Normal Composition, Weight Percent												
		Ni▲	Co▲	Cr▲	Mo	W	Fe	Si	Mn▲	Al▲	Ti	Cu▲	B	Others (V▲)
800 alloy	N08800	32	0.2*	19.5	0.2*	--	46*	0.8*	1.0	0.6*	0.5	0.2*	--	
825 alloy	N08825	41*	0.06*	23*	3*	--	31*	0.3*	0.6*	0.1	1*	2.5*	--	

(▲) Reportable ingredients per Section 313 of SARA - See Section 15 for additional information. XX* - indicates maximum value. XX^b - indicates minimum value. XX** - Haynes metal No.

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Table 2 Product Hazard Rating - Hazardous Materials Identification System (HMIS)
H = Health Rating F = Flammability Rating R = Reactivity Rating

ALLOY	Alloy No.	H	F	R	ALLOY	Alloy No.	H	F	R
HASTELLOY® HYBRID-BC1® alloy	N10362	3*	0	0	M-400 alloy	N04400	2*	0	0
HASTELLOY® B-3® alloy	N10675	3*	0	0	M-413 alloy	C71581	2*	0	0
HASTELLOY® C-4 alloy	N06455	3*	0	0	N 61 alloy	N02061	2*	0	0
HASTELLOY® C-22® alloy	N06022	3*	0	0	NFE 258 alloy	W82002	2*	0	0
HASTELLOY® C-22HS® alloy	N07022	3*	0	0	NIT 32 alloy	S20000	3*	0	0
HASTELLOY® C-86 alloy	N06686	3*	0	0	NIT 50 alloy	S20000	3*	0	0
HASTELLOY® C-276 alloy	N10276	3*	0	0	NIT 60 alloy	S21800	3*	0	0
HASTELLOY® C-2000® alloy	N06200	3*	0	0	MP35N alloy	R30035	3*	2	0
HASTELLOY® G-30® alloy	N06030	3*	2	0	ULTIMET® alloy	R31233	2*	2	0
HASTELLOY® G-35® alloy	N06035	3*	0	0	17/7 PH alloy	S17700	3*	0	0
HASTELLOY® N alloy	N10003	3*	0	0	20CB3 alloy	N08021	3*	0	0
HASTELLOY® S alloy	N06635	3*	0	0	52 alloy	N14052	2*	0	0
HASTELLOY® W alloy	N10004	3*	0	0	72 alloy	N06072	3*	0	0
HASTELLOY® X alloy	N06002	3*	0	0	80/20 alloy	N06003	3*	0	0
HAYNES® C-263 alloy	N07263	3*	2	0	80/20 CB alloy	N06003	3*	0	0
HAYNES® GTD222 alloy	2220**	3*	2	0	95/5 alloy	N03301	2*	0	0
HAYNES® HR-120® alloy	N08120	3*	0	0	200 alloy	N02200	2*	0	0
HAYNES® HR-160® alloy	N12160	3*	2	0	202 alloy	S20200	3*	0	0
HAYNES® HR224® alloy	2224**	3*	0	0	214 W	N07214	3*	0	0
HAYNES® HR235™ alloy	2431	3*	0	0	302 alloy	S30200	3*	0	0
HAYNES® Waspaloy alloy	N07001	3*	2	0	302 MO alloy	S30200	3*	0	0
HAYNES® NS-163® alloy	1630**	3*	2	0	302 N alloy	S30200	3*	0	0
HAYNES® X-750 alloy	N07750	3*	0	0	302 NC alloy	S30200	3*	0	0
HAYNES® 25 alloy	R30605	2*	2	0	302 V alloy	S30200	3*	0	0
HAYNES® 82	N06082	3*	0	0	304 alloy	S30400	3*	0	0
HAYNES® 92 alloy	N07092	3*	0	0	304 L alloy	S30403	3*	0	0
HAYNES® 188 alloy	R30188	3*	2	0	304 V alloy	S30400	3*	0	0
HAYNES® 214® alloy	N07214	3*	0	0	305 alloy	S30500	3*	0	0

Table 2 Product Hazard Rating – Hazardous Materials Identification System (HMIS)
H = Health Rating F = Flammability Rating R = Reactivity Rating

ALLOY	Alloy No.	H	F	R	ALLOY	Alloy No.	H	F	R
HAYNES® 230-W® alloy	N06231	3*	0	0	308 L alloy	S30800	3*	0	0
HAYNES® 242® alloy	N10242	3*	0	0	316 alloy	S31600	3*	0	0
HAYNES® 244™ alloy	2444	3*	0	0	316 L alloy	S31603	3*	0	0
HAYNES® 282® alloy	N07208	3*	2	0	347 alloy	S34700	3*	0	0
HAYNES® M418 alloy	N04060	2*	0	0	416 alloy	S41600	3*	0	0
HAYNES® 556® alloy	R30556	3*	0	0	420 alloy	S42000	3*	0	0
HAYNES® 617 CE's	N06617	3*	0	0	420H alloy	S42080	3*	0	0
HAYNES® 625 alloy	N06625	3*	0	0	430 alloy	S43000	3*	0	0
HAYNES® 625 (low iron) alloy	N06625	3*	0	0	455 alloy	S45500	3*	0	0
HAYNES® 718 alloy	N07718	3*	0	0	600 alloy	N06600	3*	0	0
I-35 alloy	K93601	2*	0	0	601 alloy	N06601	3*	0	0
MULTIMET® alloy	R30155	3*	0	0	622 alloy	N06022	3*	0	0
					800 alloy	N08800	3*	0	0
					825 alloy	N08825	3*	0	0

Note: Ratings applicable for the metal oxide components of each product. Metal oxides are typically found in welding fume.
The flammability and reactivity hazard ratings are appropriate for large, concentrated quantities of welding fume, such as found in a dust collector.
* = Chronic health effects, see Table 5.
XX** - Haynes metal No. HAYNES and HASTELLOY are trademarks of Haynes International, Inc.

Summary of HMIS rating numbers: H = Health Hazard rating; 0 = minimal hazard; 1 = slight hazard; 2 = moderate hazard; 3 = serious hazard; 4 = severe hazard
F = Flammability hazard rating: 0 = minimal hazard; 1 = slight hazard; 2 = moderate hazard; 3 = serious hazard; 4 = severe hazard
R = Reactivity hazard rating: 0 = minimal hazard; 1 = slight hazard; 2 = moderate hazard; 3 = serious hazard; 4 = severe hazard

Table 3

Shielded Metal Arc Welding (SMAW) Electrode Products			
Alloy	AWS/UNS Alloy No.	Core Wire composition (1) (~80% by Wt.)	Other Coating Ingredients (2) (~20% by Wt.)
HASTELLOY® B-3® alloy	W80675	N10675	Oxides and/or Fluorides of Aluminum (Al) ▲ Barium (Ba) Calcium (Ca) Magnesium (Mg) Potassium (K) Sodium (Na) Strontium (Sr) and Titanium (Ti)
HASTELLOY® C-4 alloy	W86455	N06445	
HASTELLOY® C-22® alloy	W86022	N06022	
HASTELLOY® C-276 alloy	W80276	N10276	
HASTELLOY® C-2000® alloy	W86200	N06200	
HASTELLOY® G-30® alloy	W86030	N06030	
HASTELLOY® G-35® alloy	W86035	N06035	
HASTELLOY® X alloy	W86002	N06002	
HAYNES® 230-W® alloy	W86231	N06231	
HAYNES® 182 alloy	W86182	N07092	
HAYNES® 117 alloy	W86117	N06617	
HAYNES® 112 alloy	W86112	N06625	
MULTIMET® alloy	W73155	R30155	
ULTIMET® alloy	R31233	R31233	
HAYNES® 25 alloy	W73605	R30605	

(1) Corresponding core wire composition of grade is provided in Table 1 as identified by UNS Number or alloy metal number.
(2) Chemical Abstracts Service (CAS) numbers, PEL and TLV ®-TWA information are provided in Table 4.
(▲) Reportable ingredients per Section 313 of SARA - See Section 15 for additional information.

Table 4 Exposure Limits for Potentially Hazardous Constituents in Thermal Spray Wire and Welding Fumes

		Exposure Limits as 8-hour TWA (as mg/m^3)	
Metal or Chemical, Symbol	CAS Number	OSHA - Permissible Exposure Limit (PEL)[1]	ACGIH - Threshold Limit Value (TLV ®) [1]
Aluminum (Al/Al2O3)	7429-90-5/ 1344-28-1	Aluminum Oxide as Al: 15, total Aluminum Oxide as Al: 5, Respirable	Welding Fume as Al: 10
Argon [2] (A)	7440-37-1	Regarded as simple asphyxiant. Inert gases which may replace air and deprive the body of oxygen.	
Carbon Dioxide [2] (CO_2)	124-38-9	Regarded as simple asphyxiant. Inert gases which may replace air and deprive the body of oxygen.	
Helium [2] (He)	7440-59-7	Regarded as simple asphyxiant. Inert gases which may replace air and deprive the body of oxygen.	
Nitrogen [2] (N)	7727-37-9	Regarded as simple asphyxiant. Inert gases which may replace air and deprive the body of oxygen.	
Barium compounds (Ba X)	7440-39-3	Soluble compounds as Ba: 0.5	Soluble compounds as Ba: 0.5
Boron Oxide (B_2O_3)	1303-86-2	Oxide Dust Total: 15	Oxide Dust Total: 10
Calcium (Ca)	7440-70-2	None	None
Calcium Oxide (CaO)	1305-78-8	5	2
Carbon Monoxide [2] (CO)	630-08-0	55 (50 ppm)	29 (25 ppm)
Chromium VI Soluble Compounds	(3)	0.005	0.05 (as Cr)
Chromium VI Insoluble Compounds	(3)	0.005	0.01(as Cr)
Chromium oxide Cr III (Cr_2O_3)	1308-38-9	0.5 (as Cr)	0.5 (as Cr)
Chromium oxide Cr II (CrO)	12018-00-7	0.5 (as Cr)	-
Chromium metal (Cr)	7440-47-3	1 (as Cr)	0.5 (as Cr)
Cobalt (Co) and inorganic compounds	7440-48-4	0.1 metal dust and fume (as Co)	0.02 (as Co)
Columbium (Niobium) (Cb/Cb_2O_8, Nb/Nb_2O_8)	7440-03-1/ 1313-96-8	None	None
Copper oxide fume (CuO)	1317-38-0	0.1 (as Cu)	0.2 (as Cu)
Copper (Cu)	7440-50-8	1 (as Cu)	1 (as Cu)
Fluorides	(3)	2.5 (as fluorine)	2.5 (as fluorine)
Calcium Fluoride (CaF_2)	7789-75-5	None	None
Sodium Fluoride (NAF)	7681-49-4	None	None
Potassium Fluoride (KF)	7789-23-3	None	None
Aluminum Fluoride (AlF_3)	7784-18-1	None	None
Lithium Fluoride (LiF)	7789-24-4	None	None
Hydrogen Fluoride (HF)	7664-39-3	3 ppm	0.41; 1.64 (ceiling) [4]

Table 4 Exposure Limits for Potentially Hazardous Constituents in Thermal Spray Wire and Welding Fumes (continued)

		Exposure Limits as 8-hour TWA (as mg/m^3)	
Metal or Chemical, Symbol	CAS Number	OSHA - Permissible Exposure Limit (PEL)[1]	ACGIH - Threshold Limit Value (TLV ®) [1]
Iron oxide (dust and fume) (Fe_2O_3)	1309-37-1	10 (as Fe)	5 [5] (as Fe)
Lanthanum (La)	7439-91-0	None	None
Lithium (Li/Li_2O)	7439-92-2/ 12057-24-8	None	1 (as Li_2O) (ceiling) [4], [6]
Magnesium (Mg)	7439-95-4	None	None
Magnesium Oxide (MgO)	1309-48-4	Fume as MgO: 15	Fume as MgO: 10 [7]
Manganese (Mn, MnO)	7439-96-5	5 (ceiling)[4] (as Mn)	0.02 (as Mn)
Molybdenum compounds (Mo X)	7439-98-7	Soluble Compounds as Mo: 5	Soluble Compounds as Mo: 0.5[5] Insoluble Compounds as Mo: 3[5]; 10 [7]
Nickel (Ni, NiX)	7440-02-0	1 (elemental, soluble and insoluble compounds) (as Ni)	1.5[7] elemental, 0.1[7] soluble, 0.2[7] insoluble compounds as Ni
Nitric Oxide[2] (NO)	10102-43-2	30	31
Nitrogen Dioxide[2] (NO_2)	10102-44-2	9 (ceiling)	5.6; 9.4 (STEL) [8]
Ozone[2] (O_3)	10028-15-6	0.2 (0.1 ppm)	0.1 (0.05 ppm), Heavy workload[9]
Potassium (K/K_2O)	7440-09-7/ 12136-47-7	None	None
Silica fume (amorp) (SiO_2)	69012-64-2	None	None
Silicon (Si)	7440-21-3	Total Dust: 15, Respirable Dust: 5	None
Sodium (Na/Na_2O)	7440-23-5/ 1313-59-3	None	None
Strontium (Sr/SrO)	7440-24-6/ 1314-11-0	None	None
Tantalum (Ta)	7440-25-7	Metal and Oxide Dust: 5	Metal and Oxide Dust as Ta: 5
Titanium Dioxide (TiO_2)	13463-67-7	15	10
Titanium (Ti)	7440-32-6	None	None
Tungsten (W) compounds	7440-33-7	None	Insoluble compounds as W: 5; 10 (STEL) [8] Soluble compounds as W: 1; 3 (STEL) [8]
Vanadium Pentoxide (V_2O_5)	1314-62-1	0.5 ceiling - respirable dust 0.1 ceiling - fume	0.05 Respirable Dust or Fume [5]
Yttrium (Y)	7440-65-5	1	Metal and Compounds as Y: 1

Table 4 Exposure Limits for Potentially Hazardous Constituents in Thermal Spray Wire and Welding Fumes (continued)

		Exposure Limits as 8-hour TWA (as mg/m^3)	
Metal or Chemical, Symbol	CAS Number	OSHA - Permissible Exposure Limit (PEL)(1)	ACGIH - Threshold Limit Value (TLV ®) (1)
Zirconium compounds (Zr X)	7440-67-7	Compounds as Zr: 5	Zr Metal and Compounds as Zr: 5; 10 (STEL) (8)

(1) All limits are Total Dust unless indicated otherwise.
(2) Gases generated by arc welding processes.
(3) Varies with compound.
(4) Ceiling limit - shall not be exceeded instantaneously.
(5) Respirable fraction of particulate - refer to the ACGIH-TLV ® booklet for a definition.
(6) Workplace Environmental Exposure Levels (WEEL), published by the American Industrial Hygiene Association.
(7) Inhalable fraction of particulate - refer to the ACGIH-TLV ® booklet for a definition.
(8) STEL = Short-term exposure limit - A 15-minute TWA exposure limit.
(9) See additional TLV ® listings for moderate or light workloads.
(10) National Institute For Occupational Safety and Health (NIOSH) Recommended Exposure Limit (REL).

Table 5 Health Hazards

The following table shows the compounds and gases which have been discussed previously, and which may be encountered, their names and formulas, their CAS number, and briefly describes possible known short term and long term health effects which may result from excessive exposure.

Name of Compound, Formula and CAS Number	On Any Carcinogens List? If So, Which Ones?	Health Effects Resulting From Excessive Exposure	
		Acute (Short Term)	Chronic (Long Term)
Welding Fumes and Components of Welding Fumes			
Welding Fumes (not otherwise classified) CAS No. - none	Yes IARC	May include metallic taste, nausea, tightness of chest, fever, dizziness, dryness or irritation of eyes, nose or throat	Excessive levels may cause bronchial asthma, lung fibrosis, pneumoconiosis or siderosis.
Hexavalent Chromium (Cr VI) Sodium Chromate Na_2CrO_3 (soluble) CAS No. 7775-11-3 Potassium Chromate K_2CrO_3 (soluble) CAS No. 7789-00-6	Yes IARC group 1 NTP-K OSHA	Inhalation and Skin Contact: Irritation of mucous membranes	Inhalation: Perforation of the nasal septum. Increased incidence of lung cancer. Skin Contact: Skin ulceration, dermatitis.
Chromium Metal-Cr CAS No. 7740-47-3 Chromium oxide (Cr II) CrO CAS No. 12018-00-7 Chromium oxide (Cr III) Cr_2O_3	Yes IARC group 3	Skin Contact: Allergic reactions (dermatitis) in some people.	None known.
Nickel-Ni CAS No. 7440-02-0 Nickel oxide-NiO CAS No. 1313-99-1	Yes IARC group 1 NTP-K	Inhalation: Respiratory irritation. Allergic reactions in some people. Metallic taste, nausea, tightness in chest, metal fume fever. Skin Contact: Contact dermatitis with permanent sensitization.	Inhalation: Chronic pulmonary irritation. Perforation of nasal septum. Increased incidence of lung and larynx cancer.
Cobalt-Co CAS No. 7440-48-4 Cobalt Oxide - CoO CAS no. 1307-96-6	No	Inhalation: Pulmonary irritant, sensitization,cough. Eye Contact: Irritation, conjunctivitis Skin: Mild irritation sensitization, allergic dermatitis. Ingestion: Pain, nausea, vomiting, hypotension (low blood pressure).	Chronic exposure to cobalt is more dangerous than isolated exposures. Possible lung fibrosis and respiratory hypersensitivity. Heart disease, elevated red blood cell counts, chest pain and edema.
Copper-Cu CAS No. 7440-50-8 Copper oxide-CuO CAS No. 1317-38-0	No	Inhalation: Metal fume fever, muscle ache, respiratory irritant. Skin: Irritation, Ingestion: Nausea, vomiting, abdominal pain; large doses may cause stomach and intestine ulceration, and kidney and liver damage.	Mild dermatitis and degeneration of mucous membranes. Repeated inhalation can cause chrome respiratory disease.

Table 5 Health Hazards (continued)

Name of Compound, Formula and CAS Number	On Any Carcinogens List? If So, Which Ones?	Health Effects Resulting From Excessive Exposure	
		Acute (Short Term)	Chronic (Long Term)
Manganese-Mn CAS No. 7439-96-5 Manganese dioxide-as Mn for fume MnO_2 CAS No. 1313-13-9	No	Can include metal fume fever, dry throat, coughing, tight chest, low back pain, vomiting, fatigue, headache	"Manganism." SENSITIVITY VARIES. Affects central nervous system. Muscular weakness, tremors, symptoms similar to Parkinson=s disease. Exposed employees should get quarterly medical examinations for manganism.
Vanadium Pentoxide (V_20_5)	No	Irritant to mucous membranes. Metallic taste, cough, throat and eye irritation, eczema.	Nasal catarrh, nose bleeds, chronic respiratory problems.
Iron-Fe CAS No. 7439-89-6 Iron Oxide-Fe0 CAS No. 1345-25-1 Iron Oxide-Fe_20_3 CAS No. 1309-37-1 Iron Oxide-Fe_30_4 CAS No. 1309-38-2	No	Probably none, except as nuisance dust.	Possible siderosis if exposures are excessive and long term. Regarded as benign. Lungs clear gradually after exposure is ended.
Calcium Fluoride CaF_2 (Insoluble) CAS No. 7789-75-5 Sodium fluoride NaF fume (Soluble) CAS No. 7681-49-4 Potassium fluoride KF (Soluble) CAS No. 7789-23-3 Aluminum Fluoride AlF_3 (Insoluble) CAS No. 7784-18-1 Lithium Fluoride LiF (Slightly soluble) CAS No. 7789-24-4	No	CaF_2 probably inert. Soluble fluorides may be irritants and corrosive to mucous membranes.	Soluble portions may cause osteoporosis and mottling of teeth, but effects seem reduced in the presence of iron as found in welding electrode fumes.
Gases Generated by Arc Welding processes			
Fluorides: i.e., Silicon Tetrafluoride SiF CAS No. 7783-61-1 Hydrogen fluoride HF CAS No. 7664-39-3	See soluble fluorides portion under Welding Fumes		
Nitric oxide-NO CAS No. 10102-43-2	No	Irritant to mucous membranes, drowsiness.	Chronic respiratory disease.
Nitrogen dioxide-NO_2 CAS No. 10102-44-2	No	Irritant to mucous membranes, coughing, chest pain, pulmonary edema.	Chronic respiratory disease.

Table 5 Health Hazards (continued)

Name of Compound, Formula and CAS Number	On Any Carcinogens List? If So, Which Ones?	Health Effects Resulting From Excessive Exposure	
		Acute (Short Term)	Chronic (Long Term)
Ozone-O_3 CAS No. 10028-15-6	No	Irritant to mucous membranes, pulmonary edema.	Chronic respiratory disease.
Carbon monoxide-CO CAS No. 630-08-0	No	Headache, rapid breathing, oxygen deprivation, confusion, dizziness, weakness.	Oxygen deprivation.
Argon-A CAS No. 7440-37-1 Carbon dioxide-CO_2 CAS No. 124-38-9 Helium-HE CAS No. 7440-59-7 Nitrogen-N	No	Inert gases which may replace air and deprive the body of oxygen. (CO_2 is not inert but effect is as above).	None known

Table 6

Welding Fumes and Gases Information

PRODUCTS	FUMES EXPECTED	GASES EXPECTED
Bare Wire Products used in Gas Metal Arc Welding (all alloys listed in Table 1)	Complex oxide combinations of all elements present in the welding wire grade listed in Table 1 (including trivalent, and hexavalent chromium) The exposure limit for hazardous constituents in welding fumes is listed in Table 4	Normally low. Ozone and oxides of nitrogen generation possible at welding arc or well away from arc. Inert shielding gases can cause asphyxiation in confined welding spaces and unventilated areas.
Bare Wire Products used in Gas Tungsten Arc Welding, plasma arc welding and other similar processes (all alloys listed in Table 1)	Same as above, however, fume volume is very small under normal GTAW conditions	Same as above
All Shielded Metal Arc Welding electrode alloys listed in Table 3	Complex oxide and fluoride combinations of all electrode ingredients listed in Table 3	Normally low, if any symptoms indicate the need, check for gaseous fluorides and/or oxides of nitrogen See Health Hazard Data given in Table 5 for symptoms.
Bare Wire Products used in Submerged Arc Welding (some alloys listed in Table 1)	Same as above, however, fume volume is very small under normal SAW conditions	Same as above
Other conditions which also influence the composition and quantity of the fume and gases to which employees may be exposed include: (1) coatings on the metal being welded (such as paint, plating, galvanizing) (2) the number of welders and volume of the work space (3) the quality and amount of ventilation (4) position of the welder=s head relative to the fume plume, and (5) presence of contamination in the atmosphere (such as chlorinated hydrocarbon vapors from cleaning and degreasing).		

LABEL INFORMATION
Welding Products and Thermal Spray Wire

Notice: The following hazard statements and precautionary statements apply only to the metal fume and dust created during welding and thermal spray operations.

HAZARD STATEMENTS:
May cause cancer by inhalation.
May cause an allergic skin reaction.
Causes skin irritation.
Harmful if inhaled.
Harmful if swallowed

PRECAUTIONARY STATEMENTS:
Obtain special instructions before use.
Do not handle until all safety precautions have been read and understood.
Avoid breathing dust or fume.
Do not eat, drink or smoke when using this product.
Use only outdoors or in a well-ventilated area.
In case of inadequate ventilation, wear respiratory protection.
Wear protective gloves, protective clothing, eye, and face protection
Contaminated work clothing should not be allowed out of the workplace.
If exposed or concerned, get medical advice/attention.
Refer to special instructions; Safety Data Sheet.

Signal Word: DANGER

NOTICE: PROTECT yourself and others. Be sure this label is read and understood by the welder (end user). FUMES AND GASES can be hazardous to your health. ARC RAYS can injure eyes and burn skin. ELECTRIC SHOCK can KILL.

- Before use, read and understand the manufacturer's instructions, the Safety Data Sheet and your employer's safety practices.
- Keep your head out of fumes.
- Use enough ventilation, exhaust at the arc, or both, to keep fumes and gases from breathing zone and the general area.
- Special care should be taken when welding galvanized, plated, or painted parts to avoid exposure to toxic fumes.
- Wear correct eye, ear, and body protection. Wear welder's gloves when inserting the electrode into the holder. Do not touch any unprotected part of your body.
- Do not touch live electric parts.
- Use of thermal spray wire will create similar hazards described for welding products, and may also create high noise levels.
- See American National Standard ANSI Z49.1, *Safety in Welding, Cutting and Allied Processes,* published by the American Welding Society, 550 Northwest LaJeune Road, Miami, Florida 33126. United States (U.S.) Occupational Safety and Health Administration (OSHA) *Safety and Health Standards* are published by the U.S. Government Printing Office, 732 North Capitol Street, Washington, D.C. 20401.

NOTICE: This product and fumes generated from the normal use of this product contain Manganese. The inhalation of welding rod fumes containing Manganese has been associated with the development of serious Parkinson's Disease-like symptoms, Parkinsonism, Manganism, and other central nervous system conditions. Such symptoms may include impaired speech, balance and movement. Avoid breathing fumes generated in the welding process by utilizing appropriate environmental controls, including but not limited to ventilation, exhaust, and respirators.

NOTICE: Read and understand the warning label, affixed to this package and the Safety Data Sheet for this product before using. The following chemicals and their oxides may be hazardous during welding: manganese, silicon dioxide, iron oxide, cobalt, hexavalent chromium, molybedenum, nickel, vanadium, and tungsten. Lung damage, nervous system damage and allergic skin reaction may result from overexposure. The U.S. OSHA considers hexavalent chromium and nickel compounds as carcinogens.

NOTICE: SPECIAL VENTILATION AND/OR EXHAUST REQUIRED: Use industrial hygiene monitoring to ensure that use of this material will not exceed the applicable OSHA Permissible Exposure Limit (PEL), Threshold Limit Value® (TLV®) and equivalent exposure limits. The TLV® for manganese (0.02 mg/m^3), cobalt (0.02 mg/m^3), and PEL for hexavalent chromium (0.005 mg/m^3) may be exceeded during welding. Use enough ventilation, local exhaust and respirators to keep the worker's breathing zone and general area below the TLV® for exposure to manganese.

LABEL INFORMATION
Welding Products and Thermal Spray Wire

NOTICE: 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 Section 25249.5 et seq.).

FIRST AID (The following instructions apply only to welding dust and fume forms of the product)

Inhalation: Breathing difficulty caused by inhalation of dust or fume requires removal to fresh air and keep the person comfortable. If breathing has stopped, perform artificial respiration and obtain medical assistance if exposed or concerned.

Ingestion: If swallowed, rinse mouth, but never give anything by mouth to an unconscious person. Contact a poison control center. Unless the poison control center advises otherwise, have that conscious person slowly drink 1 to 2 glasses of water to dilute, inducement of vomiting is not necessary. Obtain medical assistance if you feel unwell.

Skin: Remove contaminated clothing. Do not shake clothing. Wash clothing before reuse. Skin contamination with dust or fume can be removed by washing with soap and water. If skin irritation or rash occurs, call a poison center. Get medical advice/attention.

Eyes: Do not allow victim to rub or keep eyes tightly shut. Dust or fume should be flushed from the eyes with copious amounts of clean water, until transported to an emergency medical facility. Consult a physician at once.

Typical Welding Fume Constituents:

Sodium Dichromate	Potassium Dichromate	Nickel (Ni)	Cobalt (Co)	Manganese
CAS No. 10588-01-9	CAS No. 7778-50-9	CAS No 7440-02-0.	CAS NO. 7440-48-4	CAS No.7439-96-5

Conditioning Information

All welding electrodes should be stored in a dry rod oven after the canister has been opened. It is recommended that the dry rod oven be maintained at about 250 to 400ºF (121 to 204ºC). The HASTELLOY B-2 and B-3 alloys coating formulation are considered a low moisture formulation and therefore it is mandatory that those electrodes be carefully controlled. If electrodes are exposed to an uncontrolled atmosphere, they can be reconditioned by heating in a reconditioning oven at 600 to 700ºF (316 to 371ºC) for 2 to 3 hours.

HAYNES
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