MATERIAL SAFETY DATA SHEET

ARCOS , LLC
ONE ARCOS DRIVE
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(570) 339-5200
www.arcos.us

MSDS No. A1000
Rev Date : 27-Feb-2007

SECTION I - PRODUCT TYPE - STAINLESS STEEL ALLOYS

Covered Welding Electrodes

SECTION II a – TRADENAME AND MAXIMUM DEPOSIT COMPOSITION[1] (% WT.)

ARCOS DESIGNATION[2]:	Fe	Cr	Cu	Mn	Mo	Ni	Si	Ti	Cb	Co	W	Al	C	Other
307	Bal	21.5		4.8		10.7								
308	Bal	20.0		2.5		11.0								
309	Bal	25.0		2.5		14.0								
309Cb	Bal	25.0		2.5		14.0			1.0					
309MoL	Bal	25.0		2.5	3.0	14.0								
310	Bal	28.0		2.5		22.5								
310Cb	Bal	28.0		2.5		22.0			1.0					
310Mo	Bal	28.0		2.5	3.0	22.0								
312	Bal	32.0		2.5		10.5								
316	Bal	20.0		2.5	3.0	14.0								
317	Bal	21.0		2.5	4.0	14.0								
318	Bal	20.0		2.5	3.0	13.0								
320	Bal	21.0	4.0		3.0	36.0								
320LR	Bal	21.0	4.0	2.5	3.0	36.0								
630(327)	Bal	16.8	4.0			5.0								
330	Bal	17.0		2.5		37.0								
334 (330-04)	41.9	20.0		6.0		37.0								
347	Bal	21.0		2.5		11.0								
410	Bal	13.5				0.6								
410NiMo	Bal	12.5				5.0								
420	Bal	14.0												
16-8-2	Bal	16.5		2.5	2.0	9.5								
2205	Bal	23.0		2.0	3.5	6.5								
2209	Bal	22.5		1.5	3.5	8.5	1.0							
2507	Bal	25.0		4.0	7.0									
CD-4MCu	Bal	25.0	3.0		2.0	5.0								
RA85H®	Bal	25.0		2.5		16.0	4.5							
RA333®	Bal	27.0		3.3	4.0	47.0	1.0			3.5	3.5			

[1]Composition of HAZARDOUS INGREDIENTS (as defined by OSHA – 29CFR1910.1200 and PA TITLE 34) – 1% or greater by weight, except .01% or greater for nickel and chromium.
[2]May be prefixed by E or MIL, may be suffixed by -15, -16, -17 or SP. "L" suffix designates low carbon, "Si" suffix designates high silicon .65-1.00, "H" designates high carbon. "MOD" suffix designates a customer modified chemistry that does not exceed the listed elements.
[3]Representative tests have indicated that Cadmium content is less than .03% in all products tested.

WARNING: ALL OF THE PRODUCTS LISTED ABOVE CONTAIN OR PRODUCE CHEMICALS KNOWN TO CAUSE CANCER.

SECTION I - PRODUCT TYPE - NICKEL ALLOYS

Covered Welding Electrodes

SECTION II a – TRADENAME AND MAXIMUM DEPOSIT COMPOSITION[1](% WT.)

ARCOS DESIGNATION[2]:	Fe	Cr	Cu	Mn	Mo	Ni	Si	Ti	Cb	Co	W	Al	C	Other
1N12, NiCrMo-3	7.0	23.0			10.0	Bal			4.2					
4N11, Ni-1						Bal	1.0	4.0				1.0		
4N1A, NiCrFe-2	12.0	17.0		3.5	2.5	Bal			3.0					
8N12, NiCrFe-3	10.0	17.0		9.5		Bal			2.5					
9N10, NiCu-7			38.0	4.0		Bal	1.5							
Alloy 22	6.0	22.5			14.5	Bal				2.5	3.5			
C276®, NiCrMo-4	7.0	16.5		1.0	17.0	Bal			2.5	2.5	4.5			
352	12.0	31.5		1.0		Bal			2.5					
Alloy 59®	1.5	24.0		1.0	16.5	Bal								
Alloy 602CA	9.5	25.0				Bal							2.0	
617	2.5	26.0		2.5	10.0	Bal	1.0			15.0		1.5		
803, CuNi, CuNi (70:30)			Bal	2.5		32.0								
2216	48.9			13.5		44.5								
2535R	38.7	26.5		2.0		36.5								
3545R	20.5	36.0		2.0		46.0								
Alloy W	7.0	6.0		1.0	27.0	Bal	1.0				1.0			
Alloy X	20.0	23.0		1.0	17.0	Bal				2.5	1.0			

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SECTION I - PRODUCT TYPE - STAINLESS STEEL ALLOYS

Bare Wire Materials

SECTION II a – TRADENAME AND MAXIMUM DEPOSIT COMPOSITION[1](% WT.)

ARCOS DESIGNATION[2]:	Fe	Cr	Cu	Mn	Mo	Ni	Si	Ti	Cb	Co	W	Al	C	Other
308	Bal	22.0		2.5		11.0								
309	Bal	25.0		2.5		14.0								
310	Bal	28.0		2.5		22.5								
312	Bal	32.0		2.5		10.5								
316	Bal	20.0		2.5	3.0	14.0								
317	Bal	20.5		2.5	4.0	15.0								
320	Bal	21.0	4.0	2.5	3.0	36.0								
320LR	Bal	21.0	4.0	2.0	3.0	36.0								
330	Bal	17.0		2.5		37.0								
330-04	Bal	20.0		6.0		37.0								
347	Bal	21.5		2.5		11.0								
409Cb	Bal	13.5				0.2								
410	Bal	13.5				0.6								
410NiMo	Bal	12.5				5.0								
439Ti	Bal	18.8						1.0						
630	Bal	16.7	4.0			5.0								
815	Bal	23.5				0.8						5.0		
16-8-2	Bal	16.5		2.5	2.0	9.5								
18CrCb	Bal	19.0				0.1								
2205	Bal	23.0		2.0	3.5	6.5								
2209	Bal	22.5		1.5	3.5	8.5	1.0							
2507	Bal	25.0		4.0	7.0									
2535R	38.7	26.5		2.0		36.5								
3545R	20.5	36.0		2.0		46.0								
CD-4MCu	Bal	25.0	3.0		2.0	5.0								
219	Bal	21.0		9.0		6.0								
209	Bal	22.0		5.0	2.0	12.5								
RA85H®	Bal	20.0				15.5	4.2	1.7				1.7		
RA333®	Bal	27.0		3.3	4.0	47.0	1.0			3.5	3.5			
430LCb	Bal	19.0				0.1								

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[3]Representative tests have indicated that Cadmium content is less than .03% in all products tested.

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SECTION I - PRODUCT TYPE - NICKEL ALLOYS

Bare Wire Materials

SECTION II a – TRADENAME AND MAXIMUM DEPOSIT COMPOSITION[1](% WT.)

ARCOS DESIGNATION[2]:	Fe	Cr	Cu	Mn	Mo	Ni	Si	Ti	Cb	Co	W	Al	C	Other
111 (80/20)	3.0	21.0		1.0		Bal	1.5							
166			56.0	2.3		Bal								
Alloy 22	6.0	22.5			14.5	Bal				2.5	4.5			
C276®, NiCrMo-4	7.0	16.5			17.0	Bal				2.5	4.5			
344			56.0	2.3		Bal								
352	10.5	31.0		1.0		Bal								
362, NiCrFe-5, 62	10.0	17.0				Bal			3.0					
382, NiCr-3, 82	3.0	22.0		3.5		Bal			3.0					
382H, 82H	3.0	20.5		3.3		Bal			2.5					
392, NiCrFe-6, 6A	8.0	17.0		2.7		Bal			3.5					
Alloy 59®	1.5	24.0			16.5	Bal								
Alloy 602CA	9.5	25.0				Bal						2.0		
617	3.0	24.0		1.0	10.0	Bal	1.0			15.0		1.5		
625, NiCrMo-3	5.0	23.0			10.0	Bal			4.2					
625 Plus	5.0	22.0			9.5	Bal		1.6	4.0					
651						99.9								
656			96.0	1.0			3.0							
813, CuNi, 67	1.0		70.5			32.0								
816, NiCu-7, 60	2.5		Bal	4.0		69.0		2.3						
861, Ni-1	1.0			1.0		Bal		3.5				1.5		
888 (95/5)						Bal	1.0					6.0		
2216	48.9			13.5		44.5								
Alloy X	20.0	23.0		1.0	10.0	Bal				2.5	1.0			
L-605	3.0	21.0		2.0		11.0	1.0			Bal	16.0			
718		21.0			3.3	Bal		1.2	5.5	1.0				
Ni55	44.5			1.0		57.5								
Ni99						99.0								

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[3]Representative tests have indicated that Cadmium content is less than .03% in all products tested.

WARNING: ALL OF THE PRODUCTS LISTED ABOVE CONTAIN OR PRODUCE CHEMICALS KNOWN TO CAUSE CANCER.

SECTION I - PRODUCT TYPE - OTHER ALLOYS

Product form as listed below.

SECTION II a – TRADENAME AND MAXIMUM DEPOSIT COMPOSITION[1](% WT.)

ARCOS DESIGNATION[2]:	Fe	Cr	Cu	Mn	Mo	Ni	Si	Ti	Cb	Co	W	Al	C	Other
Insert														
MS-1	Bal	0.1		1.0		0.4								
MS-2	Bal	0.1		1.0		0.1								
Bare Wire														
502/80S-B6	Bal	6.0		1.0		0.4								
505	Bal	10.5		1.0	1.2	0.4								
515/80S-B2	Bal	1.5				0.1								
521/90S-B3	Bal	2.7				0.1								
577	Bal	12.5			1.3	0.8								
105S-1	Bal	0.1		1.7		1.0								
70S-2	Bal			1.4										
70S-6	Bal			1.9										
90S-B3	Bal	3.0		1.0	1.2									
90S-B9	Bal	9.5		1.3	1.2	1.0								
Copper 1			98.0											
Ti-1, 2								Bal						
Ti-5/6Al4V								Bal				6.7		4.5 V
Ti- 12						0.8		Bal						
Covered Electrode														
8016-B6	Bal	6.0				0.4								
8018-C3	Bal	0.2		1.3		1.1								
9015-B9	Bal	10.5		1.3	1.2	1.0								
Tubular														
Arcos 1	Bal	26.0		3.0		10.0	2.5						3.0	4.0 B
EC409Cb	Bal	13.5				0.2								
EC439Ti	Bal	18.8						1.0						

[1]Composition of HAZARDOUS INGREDIENTS (as defined by OSHA – 29CFR1910.1200 and PA TITLE 34) – 1% or greater by weight, except .01% or greater for nickel and chromium.
[2]Covered electrodes may be prefixed by E or MIL, may be suffixed by -15, -16, -17 or SP. Bare wire may be prefixed by EN, T, ER, IN, MIL or RN. "L" suffix designates low carbon, "Si" suffix designates high silicon .65-1.00, "H" designates high carbon. "MOD" suffix designates a customer modified chemistry that does not exceed the listed elements.
[3]Representative tests have indicated that Cadmium content is less than .03% in all products tested.

WARNING: ALL OF THE PRODUCTS LISTED ABOVE CONTAIN OR PRODUCE CHEMICALS KNOWN TO CAUSE CANCER.

SECTION III – HAZARDOUS INGREDIENTS[1]

IMPORTANT – This section lists hazardous ingredients in the as shipped products.

INGREDIENT	PEL(TWA)[3]	TVL-TWA[4]	CAS#[5]
Aluminum (Al)	15.5	10	7429-90-5
Calcium Carbonate (containing silica)	15(5*)	10	1317-65-3
Calcium Fluoride (As F)	2.5	2.5	7789-75-5
Calcium Silicate	15(5*)	None	13983-17-0
Chromium (Cr)	1	0.5	7440-47-3
Cobalt (Co)	0.1	0.02	7440-48-4
Copper (Cu)	1	1	7440-50-8
Feldspar (containing silica)	10**	2(Total Dust)	68476-25-5
Hydroxyethyl Cellulose	None	None	9004-62-0
Iron (Fe)	None	None	7439-89-6
Iron Oxide	10	5	1309-37-1
Lithium Silicate	None	None	12627-14-4
Manganese (Mn)	C5	5	7439-96-5
Magnesium Carbonate	15(5*)	10	546-93-0
Magnesium Fluoride (As F)	2.5	2.5	7783-40-6
Manganese Oxide	C5	5	1344-43-0
Molybdenum (Mo)	15	10	7439-98-7
Nickel (Ni)	1	1	7440-02-0
Potassium Bichromate	C0.1	0.05	7778-50-9
Potassium Hydroxide	C2	C2	1310-58-3
Potassium Silicate	None	None	1312-76-1
Silicon	10(5)	10	7440-21-3
Sodium Aluminum Fluoride (As F)	2.5	2.5	13775-53-6
Sodium Silicate	—C2 (As NaOH)—		1344-09-8
Titanium Dioxide	15(5*)	10	13463-67-7
Tungsten (W)	5(STEL-10)	5	7440-33-7

Nuisance particulates as respirable dust at 5mg/m3 (*Respirable Fraction)(**Crystalline Silica)
(C = Ceiling Limit) (STEL – Short Term Exposure Limit)

[1]Composition of HAZARDOUS INGREDIENTS (as defined by OSHA – 29CFR1910.1200 and PA TITLE 34) – 1% or greater by weight, except .01% or greater for nickel and chromium.
[3]OSHA Permissible Exposure Limits (mg/m^3)(Time Weighted Averages)
[4]Threshold Limit Value – Time Weighted Average (mg/m^3) = American Conference of Governmental Industrial Hygienist (ACGIH)
[5]Chemical Abstract Services Number

SECTION IV – PHYSICAL DATA

Covered Welding Electrodes are solid wire with a flux coating.
Bare Filler Metals are solid wire.

SECTION V – FIRE AND EXPLOSION DATA

Nonflammable; however, arcs, sparks and molten metal can ignite flammables and combustibles or cause explosions.

SECTION VI – REACTIVITY DATA

Welding and hot cutting fumes and gases cannot be classified simply. Their composition and quantity are dependent on the metal being welded, the procedures, processes and the type of wire or electrodes used. Other influencing factors are the presence of contaminants in the atmosphere. Decomposition products from the welding or cutting operation include those from the volatilization, reaction and/or oxidation of the materials in Section III and may include oxides of the metals, chromates and complex metallics. Gaseous reaction products may include carbon monoxide, ozone and nitrogen oxides. Chlorinated solvents may be decomposed into toxic gages such as phosgene.

When the electrodes are consumed, the fume and gas decomposition products generated are different in form from the ingredients listed in Section III. New compounds not in the electrodes may form. The known gases and fumes that may form during welding or hot cutting and their exposure limits are noted in the following table:

FUME	PEL(TWA)[3]	TVL-TWA[4]	CAS#[5]
Aluminum Fumes	5	5	7429-90-5
Carbon Monoxide	55(C229)	29	630-08-0
Chromium	1	0.5	7440-47-3
Chromium (Chromates)	C0.1	0.05	Varies with Compound
Cobalt Fume (Co)	0.1	0.05	7440-48-4
Copper Fume (Cu)	0.1	0.2	7440-50-8
Fluorides (As F)	2.5	2.5	Varies with Compound
Iron Oxide Fume (As Fe)	10	5	1309-37-1
Magnesium Oxide Fume (MgO)	5*	10	1309-48-4
Manganese Fume (Mn)	C5	1	7439-96-5
Molybdenum (Mo) (Soluble)	5	5	7439-98-7
Nickel (Ni) (Soluble)	0.5	0.1	7440-02-0
Nitrogen Dioxide	C9	5.6	10102-44-0
Ozone	0.2(STEL .6)	C.2	10028-15-6
Phosgene	0.4	0.4	75-44-5
Potassium Hydroxide (KOH)	C2	C2	1310-58-3
Tungsten (W) (Soluble)	1(STEL-3)	1	7440-33-7

(PEL – TVA – TWA Values are mg/m^3) (C-ceiling limit) (STEL – Short Term Exposure Limit)
The limit for welding fumes not otherwise classified is 5 mg/m3. Some elements or compounds will exceed their PEL's/TVA's before the total fumes exceed 5 mg/m3.

[3]OSHA Permissible Exposure Limits (mg/m^3)(Time Weighted Averages)
[4]Threshold Limit Value – Time Weighted Average (mg/m^3) = American Conference of Governmental Industrial Hygiensit (ACGIH)
[5]Chemical Abstract Services Number

SECTION VII – HEALTH HAZARD DATA

*****This product Poses No Health Hazard As Shipped*****

Electric arc welding rays can injure eyes and burn skin.

Dust, fumes and gases produced during use are dangerous to your health. Lung damage may result from over exposure.

Sections II, III AND VI list specific hazardous ingredients, reaction products and OSHA PEL's and ACGIH TLV's.

AGGRAVATION

Some workers may experience discomfort at concentrations below the threshold limit values and others may be affected by a pre-existing condition or other occupational illness because of the wide variation in individual susceptibilities.

PRIMARY ROUTE OF ENTRY

Fumes, gases and dust can be a health hazard through inhalation.

ACUTE EXPOSURE

Short term exposure to welding fumes, gases or dust may result in discomfort such as dizziness, nausea, fever, dryness and/or irritation of nose, throat and eyes. Skin sensitivity may also be noted. Acute exposure can result in the same symptoms except to a greater degree as well as watery eyes, headache, breathing difficulty, frequent coughing and/or chest pains. Some toxic gases may cause pulmonary edema, asphyxiation and excessive exposure can be fatal.

CHRONIC EXPOSURE

Chronic exposure may result in neurological damage, lung fibrosis, pneumoconiosis and other lung diseases.

WARNING: ALL OF THE PRODUCTS DESCRIBED IN THIS MSDS CONTAIN OR PRODUCE CHEMICALS KNOWN TO CAUSE CANCER.

Nickel, chromium, cobalt and silica are known to cause cancer. Exposures to these chemicals must be maintained below the levels specified in Section III and VI.

EMERGENCY AND FIRST AID

In cases of electrical shock, turn off power prior to removal from exposure area and administration of first aid.

INHALATION:	Remove to fresh air. If breathing is difficult administer oxygen. If not breathing, begin artificial respiration. If no detectable pulse begin external heart massage.
SKIN:	Wash affected area with soap and water.
EYES:	Flush with large amounts of fresh water for at least 15 minutes.
INGESTION:	Seek medical attention.

*****In all cases, seek medical attention for first aid.*****

SECTION VIII – PRECAUTIONS FOR SAFE HANDLING AND USE

VENTILATION

Use enough ventilation when cutting, grinding or welding to keep the dust, fumes and gases in the workers breathing zone below the limits in Sections III and VI. General room exhaust or local exhaust at the arc, or both, may be needed. Train the welder to keep his head out of the fumes.

RESPIRATORY PROTECTION

Use weld fume respirator or air supplied respirator when cutting, grinding or welding in a confined space or where local exhaust or general ventilation does not keep exposure below recommended limits.

Monitor the air quality inside the welder's helmet, if worn, and/or the worker's breathing zone to determine if a respirator is required and the type needed.

Use only NIOSH approved respirators.

EYE PROTECTION

Use OSHA approved goggles, glasses and/or face shield when cutting, grinding or welding. In addition, when hot cutting or welding, wear welding helmet or face shield with filter lens. Select welding lens shade from American Welding Society (AWS) publication F2.2.

SECTION VIII – PRECAUTIONS FOR SAFE HANDLING AND USE (Cont)

PROTECTIVE CLOTHING

Wear gloves and flame retardant clothing when cutting, grinding or welding so as not expose skin to radiation when cutting or welding. Provide protective screens to shield others.

SPILLS, LEAKS AND WASTE DISPOSAL

Clean up any grinding dust or waste residues and place in suitable Department of Transportation (DOT) approved containers and dispose of in full compliance with federal, state and local regulations. Avoid inhalation and skin exposure.

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SECTION IX SARA TITLE III (Section 313, Toxic Chemicals)

NOTIFICATION

The ARCOS Welding Product(s) listed in Section II of the Material Safety Sheet contain toxic chemicals subject to the reporting requirements of Section 313 of TITLE III of the Superfund Amendments and Reauthorization Act of 1986 and 40CFR Part 372 of the Federal Register.

Refer to the following sources for additional important information:

ANSI Z 49.1 The American Welding Society
P.O. Box 351040
Miami, FL 33135

OSHA (29CFR 1910) US Department of Labor
Washington, DC 20210

DISCLAIMER OF LIABILITY

As the conditions or methods of use are beyond our control, we do not assume any responsibility and expressly disclaim any liability for any use of this material. Information contained herein is believed to be true and accurate but all statements or suggestions are made without any warranty, express or implied, regarding accuracy of the information, the hazards connected with the use of the material or the results to be obtained from use thereof.

Purchaser agrees to comply with any rules, regulations, laws or statutes which may apply in the place where the goods are ultimately used or to properly instruct the ultimate user of the goods of any recommendations for their use or provide them with any required information about health hazards associated with their use. Purchaser agrees to indemnify Arcos and hold Arcos harmless from any loss, liabilities, costs, expenses, suits, actions, claims and all other obligations and proceedings, including without limitation, all judgments rendered against and all fines and penalties imposed upon Arcos and all attorney's fees and any other costs of litigation arising from Purchaser's failure to provide such use recommendations and health hazard information.

NOTICE: THIS MATERIAL IS INTENDED FOR COMMERCIAL AND INDUSTRIAL USE ONLY.

Note: Alloys designated with ® are registered trademarks as follows:

Alloy 59	Krupp VDM Technologies Corp
RA85H, RA333	Rolled Alloys, Inc
C276	Haynes International