

MATERIAL SAFETY DATA SHEET

SECTION 1 - PRODUCT IDENTIFICATION AND USE

GENERIC MSDS FOR:

Cobalt-Base Alloys

PRODUCT IDENTIFIER:

Co 100

SUPPLIER & MANUFACTURER:

*Deloro Stellite Inc.
471 Dundas Street E.
Belleville, Ontario
Canada K8N 1G2*

These metal products have a common physical nature and similar composition; the physical data applies to the indicated concentration ranges. However, the degree of health risk depends on the manner of use, the specific composition of the alloy, and how the manner of use results in the exposure of the user to the various components. This needs to be evaluated in the user's workplace, considering the potential simultaneous exposure to many constituent metals.

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SECTION 2 - HAZARDOUS INGREDIENTS

Hazardous Ingredient	Symbol	CAS Number	NIOSH RTECS No.	LD50 - mg/Kg	LC50
Boron	B	7440-42-8	ED 7350000	300, Mammal, Oral	Not Available
Carbon	C	7440-44-0	FF 5250100	440, Mouse, Intravenous	Not Available
Cobalt	Co	7440-48-4	GF 8750000	6,170, Rat, Oral	Not Available
Chromium	Cr	7440-47-3	GB 4200000	None available	Not Available
Copper	Cu	7440-50-8	GL 5325000	3.5, Mouse, Intraperitoneal	Not Available
Iron	Fe	7439-89-6	NO 4565500	20,000, Guinea Pig, Oral	Not Available
Manganese	Mn	7439-96-5	OO 9275000	9,000, Rat, Oral	Not Available
Molybdenum	Mo	7439-98-7	QA 4680000	None available	Not Available
Nickel	Ni	7440-02-0	QR 5950000	250, Rat, Intraperitoneal	Not Available
Silicon	Si	7440-21-3	VW 0400000	3,160, Rat, Oral	Not Available
Vanadium	V	7440-62-2	YW 1355000	59, Rabbit, Subcutaneous	Not Available
Tungsten	W	7440-33-7	YO 7175000	2,000, Rat, Unreported	Not Available

NOTE:

Even where there are no reported LD50 or LC50 values, there can be toxic effects from these elements. See Section 6.

PERCENTAGE OF HAZARDOUS INGREDIENTS IN VARIOUS ALLOYS:

Alloy Designations

Elements	Alloy Designations								
	Stellite: 1, 2, 2N, 3, 4, 5, 6, 6B, 6K, 7, 12, 12P, 19, 20, 33, 35, 95, 100, 314, Star J.	Stellite: 8, 21, 8-50. Denertia: C1, C2, C3, C4. Nobilium: 1, 2. ASTM F75.	Tribaloy: 400, 800.	Stellite: 31, X-45, FSX 414.	Stellite: D6, D7, D12, 25, 188, 209.	Stellite 250.	Stellite 98M2, PWA 694.	Composite #2 Rod.	Stellite: 703, 704, 706, 712, 720.
B	0 - 1	-	-	-	-	0 - .8	.1 - 1	< .5	
C	.5 - 3	.1 - .8	-	.1 - 1	.1 - 1.5	.05 - .15	.5 - 2	.5 - 3	
Co	40 - 65	55 - 65	50 - 65	45 - 55	30 - 60	45 - 55	30 - 35	40 - 65	
Cr	23 - 34.5	25 - 30	8 - 18	24 - 30	18 - 25	26 - 30	10 - 20	27 - 34	
Cu	0 - 2	-	-	-	-	-	-	-	
Fe	0 - 3	.1 - 3	.5 - 1.5	1 - 2	3 - 7	17 - 24	.5 - 1.5	< .3	
Mn	.5 - 1.5	.1 - 1	-	.1 - 1	.5 - 1.5	.1 - 1	.1 - 1	< 1.25	
Mo	.1 - 1.5	4 - 7	25 - 30	-	.1 - 1	-	.1 - 1	3 - 19	
Ni	0 - 7	.1 - 4	.5 - 1.5	9 - 12	10 - 24	-	.5 - 1.5	< 3	
Si	0 - 2	.1 - 1	2 - 3	.1 - 1	.5 - 1.5	.1 - 1	.1 - 1	< 1.5	
V	-	-	-	-	-	-	-	-	
W	3 - 20	-	-	6 - 8	9 - 19	-	17 - 20	50 - 60	

SECTION 3 - PHYSICAL DATA

Alloy Designations

	Stellite: 1, 2, 2N, 3, 4, 5, 6, 6B, 6K, 7, 12, 12P, 19, 20, 33, 35, 95, 100, 314, Star J.	Stellite: 8, 21, 8-50. Denertia: C1, C2, C3, C4. Nobilium: 1, 2. ASTM F75.	Triballoy: 400, 800.	Stellite: 31, X-45, FSX 414.	Stellite: D6, D7, D12, 25, 188, 209.	Stellite 250.	Stellite 98M2, PWA 694.	Composite #2 Rod.	Stellite: 703, 704, 706, 712, 720.
<u>Density:</u> - lb/in ³ - gm/cm ³	.314-.316 8.69-8.75	.299-.302 8.28-8.36	.325 9.00	.310-.311 8.58-8.61	.310-.330 8.58-9.13	.291 8.05	.312-.326 8.64-9.02	.365 10.10	.308-.316 8.53-8.75
<u>Melting Point:</u> - °F - °C	2100-2600 1149-1427	2200-2500 1204-1371	2300-2400 1260-1316	2300-2600 1260-1427	2400-2600 1316-1427	2500-2600 1371-1427	2100-2400 1149-1316	2300-2500 1260-1371	2200-2600 1204-1427

Physical State - Solid; Colour - Grey; Odour - None.

SECTION 4 - FIRE AND EXPLOSION DATA

Non-Flammable; Flashpoint - None.

**HAZARDOUS
COMBUSTION PRODUCTS:**

Various elemental metals and metal oxides may be generated during welding or other melting operations. Refer to Section 6 for permissible exposure limits.

SECTION 5 - REACTIVITY DATA

These alloys are stable materials. However, contact with mineral acids and oxidizing agents should be avoided, as this may cause hydrogen gas to be generated, and hydrogen may be an explosion hazard.

SECTION 6 - TOXICOLOGICAL PROPERTIES

**GENERAL
HEALTH
HAZARDS:**

Under normal handling and use of this material, there are few health hazards. However, machining, welding, etc., of this material can produce dust, fume, or particulate containing the component alloy elements. Particulates may present health hazards if they enter the body by one of the listed routes in amounts exceeding the exposure limits.

**PRIMARY
ROUTE(S)
OF EXPOSURE:**

INHALATION: Inhalation of metal particulates may result from welding, grinding or similar operations which generate airborne material.
INGESTION: This is not a normal route of entry. Hand, clothing and food or drink contaminated with metal dust or particulate can cause metal ingestion during hand-to-mouth activities such as eating, drinking smoking and nail biting.
SKIN: Irritation, allergic dermatitis or sensitization may occur from some components.
EYE: Contamination by airborne particulates or soiled fingers may result in abrasion or irritation.

**EFFECTS
OF OVER-
EXPOSURE:**

ACUTE:
Inhalation: Short, intensive exposure to copper, chromium and manganese may cause metal fume fever – a flu-like illness. Some forms of chromium, nickel, cobalt and tungsten carbides may cause asthma. Cobalt, chromium, boron, copper, vanadium, molybdenum, nickel and manganese are respiratory irritants.

Ingestion: Although an unlikely route of over-exposure, ingestion of cobalt, copper and vanadium may cause nausea, vomiting, diarrhea and abdominal pain.

Skin: Contact with copper, vanadium and nickel may cause dermatitis. Exposure to cobalt may cause dermatitis and other allergic skin reactions. Dermal exposure to manganese may result in increased sweating. Boron and vanadium exposure may cause irritation.

Eye: Particulates may cause irritation due to mechanical abrasion. Severe irritation or allergic conjunctivitis may result from contact with cobalt. Exposure to copper may irritate the eyes.

CHRONIC: Chronic health effects specific to an element may be difficult to detect due to the numerous elements in this alloy. Chronic inhalation effects may include chronic obstructive lung disease, pulmonary fibrosis, rhinitis and/or bronchitis. Chronic occupational exposure to cobalt has been associated with polycythemia (an increase in the total cell mass of the blood), bloody urine, and goitre (enlargement of the thyroid gland).

EXPOSURE LIMITS (ACGIH TLV) and CARCINOGENICITY CLASSIFICATIONS (ACGIH and IARC):

Symbol	Constituent	Form	ACGIH TLV-TWA	Carcinogen Designation	
			(mg/m ³)	ACGIH	IARC
B	Boron	Oxide	10	-	-
C	Carbon	Black	3.5	A4	2B
Co	Cobalt	Metal and Compounds	0.02	A3	2B
Cr	Chromium	Metal	0.5	A4	3
		Hexavalent (Insoluble)	0.01	A1	1
Cu	Copper	Oxide/Fume	0.2	-	-
		Dusts	1	-	-
Fe	Iron	Oxide	5	A4	-
Mn	Manganese		0.2	-	-
Mo	Molybdenum	Metal, Insoluble Compounds	10 NoIC: I - 10, R - 3	-	-
Ni	Nickel	Metal	1.5 - I	A5	2B
		Insoluble Compounds	0.2 - I	A1	1
		Soluble Compounds	0.1 - I	A4	1
Si	Silicon		10	-	-
V	Vanadium	Pentoxide	0.05 - R As the Pentoxide	A4	-
W	Tungsten	Metal and Insoluble Compounds	5 (STEL = 10)	-	-
		Soluble Compounds	1 (STEL = 3)	-	-

I = "Inhalable"; R = "Respirable".

ACGIH TLV: American Conference of Governmental Industrial Hygienists - Threshold Limit Value;

TWA = Time-Weighted Average; STEL = Short-Term Exposure Limit.

IARC: International Agency for Research in Cancer.

ACGIH Classification:

A1 - Confirmed Human Carcinogen.

A2 - Suspected Human Carcinogen.

A3 - Confirmed Animal Carcinogen With Unknown Relevance to Humans.

A4 - Not Classifiable as to Human Carcinogen.

A5 - Not Suspected as a Human Carcinogen.

IARC Classification:

Group 1 - Carcinogenic to Humans.

Group 2A - Probably Carcinogenic to Humans.

Group 2B - Possibly Carcinogenic to Humans.

Group 3 - Not Classified as to Human Carcinogenicity.

Group 4 - Probably Not Carcinogenic to Humans.

CARCINOGENICITY: Some of the elements in this alloy have been identified as a cancer risk by The International Agency for Research on Cancer (IARC). Exposure to cobalt, cobalt compounds, nickel, nickel compounds, and hexavalent chromium may cause or contribute to an increased risk in cancer among workers.

**MEDICAL
CONDITIONS
AGGRAVATED
BY EXPOSURE:**

Individuals who may have had allergic reaction or sensitivity to metals such as chrome, copper, cobalt and nickel may encounter skin rash or dermatitis if skin contact with this product occurs. Persons with impaired pulmonary function, airway diseases and conditions such as asthma, emphysema, chronic bronchitis, etc., may incur further disability if excessive concentrations of dust or fumes are inhaled. If prior damage or disease to the Neurologic (nervous), Circulatory, Hematologic (blood) or Renal (kidney) systems has occurred, proper screening or examinations should be conducted on individuals who may be exposed to further risk if handling and use of this material causes excessive exposure.

SECTION 7 - PREVENTATIVE MEASURES

VENTILATION:

To control exposure to airborne dust, fume and particulate, maintain the working environment below the recommended exposure limits by use of adequate ventilation.

RESPIRATORY:

If ventilation is not adequate to maintain levels below the exposure limits, respiratory protection should be used. NIOSH-approved respirators with a high efficiency particulate air purifying filter are recommended.

SKIN:

Leather or rubber gloves are recommended to avoid prolonged contact with the skin, and to prevent metal cuts and abrasions. Skin contact can be minimized by the use of clean, protective coveralls.

EYE:

Wear safety glasses or goggles when particulates are generated.

**RECOMMENDED
MONITORING
PROCEDURES:**

ENVIRONMENTAL SURVEILLANCE: Exposure to the elements identified in Section 2 can be best determined by having air samples taken in the employee breathing zone, work area or department.

MEDICAL SURVEILLANCE: Lung function tests, chest x-rays, and routine physical examinations may be useful to determine effects of dust or fume exposure.

WASTE DISPOSAL:

It is the ultimate responsibility of the waste generator to determine at the time of disposal whether the product meets any hazardous waste criteria. Follow all applicable Federal, Provincial and Local regulations regarding waste management methods.

SECTION 8 - FIRST AID MEASURES

INHALATION:

Breathing difficulty caused by inhalation of dust, fumes or particulate requires removal to fresh air. If breathing does not improve, contact a physician.

INGESTION:

If conscious, have the person swallow copious amounts of water. Contact a physician.

SKIN:

Wash contaminated area with water; remove contaminated clothing, and shower. If irritation persists, seek medical attention.

EYE:

Irrigate with copious amounts of water. If irritation persists, seek medical assistance. Contact lenses should not be worn if working with metal dusts and powders.

SECTION 9 - PREPARATION DATE OF MSDS

PREPARED BY: J. Davies - Engineering Manager
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DATE PREPARED: January, 2001