



### SECTION 3 - PHYSICAL DATA

#### Alloy Designations

	Delcrome 93	Delcrome W & 90	SS: 304, 309, 310. ASTM: CF-8, CF-16, CH-20 CK-20 CF-8C	Tristelle TS-1 TS-2 TS-3	SS: 316, 317. ASTM: CF-3M CF-8M CG-8M CG-3M	SS: 20-CB-3 & ASTM: CN-7M	Ferrallium 255. CD 4MCu. 17-4PH 15-4PH AMS: 5342, 5355.	Norem: 02, B1, B4.	SS: 410, 440C. ASTM: CA-15, CA-40. AMS: 5350, 5352.	Mul- timet N155 & 716.	ASTM: CA- 6NM
<b>Density:</b> - lb/in <sup>3</sup> - gm/cm <sup>3</sup>	.281 7.78	.274 7.58	.280 7.75	.26 7.20	.280 7.75	.289 8.00	.282 7.81	.281 7.81	.275-.280 7.61-7.75	.295 8.17	.278 7.70
<b>Melting Point:</b> °F °C	2080-2200 1138-1204	2500-2550 1371-1399	2500-2650 1371-1454	2300- 2600 1260-1427	2550 1399	2650 1454	2550-2650 1399-1454	2400- 2600 1316-1427	2650-2800 1454-1538	2350-2500 1288-1371	2750 1510

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, 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. 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 <sup>3</sup> )	ACGIH	IARC
C	Carbon	Black	3.5	A4	2B
Co	Cobalt	Metal and Compounds	0.02	A3	2B
Cr	Chromium	Metal Hexavalent (Insoluble)	0.5 0.01	A4 A1	3 1
Cu	Copper	Oxide/Fume Dusts	0.2 1	– –	– –
Fe	Iron	Oxide	5	A4	–
Mn	Manganese		0.2	–	–
Mo	Molybdenum	Metal, Insoluble Compounds	10 NoIC: I - 10, R - 3	–	–
Ni	Nickel	Metal Insoluble Compounds Soluble Compounds	1.5 - I 0.2 - I 0.1 - I	A5 A1 A4	2B 1 1
Si	Silicon		10	–	–
V	Vanadium	Pentoxide	0.05 - R As the Pentoxide	A4	–
W	Tungsten	Metal and Insoluble Compounds Soluble Compounds	5 (STEL = 10) 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  
**TELEPHONE:** (613) 968-3481.  
**DATE PREPARED:** January, 2001