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 Meets the Requirements of OSHA Standard 29 CFR 1910.1200 Hazard Communication and EPA Supplier Notification Requirements under Section 313 of Emergency Planning and Community Right-to-Know Act.

MATERIAL SAFETY DATA SHEET (MSDS)

**HIGH-ALLOYED STEEL CASTINGS
 MSDS SC-000-002 Rev. 11**

DATE ISSUED: **10/10**

PART I *What is the material and what do I need to know in an emergency?*

SECTION 1 — PRODUCT IDENTIFICATION & COMPANY INFORMATION

PRODUCT NAME:

HIGH-ALLOYED STEEL CASTINGS

OTHER DESIGNATIONS: **ASTM No's.:**

ACI ALLOY DESIGNATIONS (GRADES)

A297 / A297M-84	HE, HF, HH, HI, HK, HL, HN, HT, HU, HW, HX, HP
A351 / A351M-84	CF3, CF3A, CF8, CF8A, CF3M, CF3MA, CF8M, CF8C, CF-10, CF-10M, CH8, CH10, CH20, CK20, HK30, HK40, HT30, CF10MC, CN7M, CG6MMN, CG8M
A447 / A447M-84	I, II
A451-80	CPF3, CPF3A, CPF3M, CPF8, CPF8A, CPF8M, CPF10, MC, CPH10, CPF8C, CPH8, CPK20, CPH20
A494 / A494M-84	CY-40, CW3-12MW, CW-7M, CW-2M, CW-6MC
A560 / A560-84	50 Cr-50 Ni-Cb, 50 Cr-50 Ni, 60 Cr-40 Ni
A608-79	HE35, HF30, HH30, HH33, HI35, HK30, HK40, HL30, HL40, HN40, HT50, HU50, HW50, HX50
A743 / A743M-84	CF-8, CG-12, CF-20-, CF-8M, CF-8C, CF-16F, CH-20, CK-20, CE-30, CF-3, CF-3M, CG6MMN, CG-8M, CN-7M, CN-7MS, CW-12M, CY-40
A744 / A744M-84	CF-8, CF-8M, CF-8C, CF-3, CF-3M, CG-8M, CN-7M, CN-7NS, CW-12M, CY-40
A890/A890M	CD4MCu, CD4MCuN, CD3MCuN, CE8MN, CD6MN, CD3MN, CE3MN, CD3MWCuN
Mil-S 867 A	I, II, III

MANUFACTURER'S NAME	STREET ADDRESS
EMERGENCY TELEPHONE NO.	MAILING ADDRESS
TELEPHONE NO.	CITY, STATE, ZIP CODE
FAX No.	E-MAIL ADDRESS / WEB SITE

SECTION 2 – HAZARD IDENTIFICATION

OVERVIEW:

There are no health hazards from these castings in solid form. The solid casting is not flammable.

Dust and fume from processing can cause irritation of eyes, skin and respiratory tract; lung disease and other systemic effects.

- Dust or fumes generated by machining, grinding, or welding of the casting may produce airborne contaminants, primarily chromium, manganese, nickel and iron. Also, see the MSDS for the welding rod being used.
- Grinding castings that have not been cleaned or that contain embedded sand may generate significant amounts of dust containing free silica.
- Other metals in the alloy that are present in small amounts should not represent a hazard if chromium, cobalt, copper, manganese, nickel and iron dust and fume are adequately controlled.

POTENTIAL HEALTH EFFECTS:

EYES: Grinding or machining of castings may generate flying metal particles that may cause eye irritation or injury.

SKIN: Dermatitis is possible from skin contact with nickel or chromium.

INGESTION: Ingestion of particulate can occur during activities such as eating, drinking and smoking, etc. Not normally applicable.

INHALATION:

Prolonged or repeated over exposure to dust or fumes from these castings may cause the following health effects:

Chromium, hexavalent: Lung and nasal cancer.

Cobalt: Respiratory sensitization, asthma, scarring of the lungs and damage to the heart muscle.

Copper: Nose and throat irritation, metal fume fever and gastrointestinal tract irritation.

Iron: Overexposure to iron oxide fume over a long time can cause siderosis, sometimes called "iron pigmentation" of the lung. It can be seen on a chest x-ray but causes little or no disability.

Manganese: Central nervous system impairment.

Nickel: Lung and nasal cancer.

Niobium (Columbium): Eye and skin irritation.

Silicon: Nose irritation.

Tantalum: Dermatitis

Tungsten: Irritation of the respiratory tract.

Note: Prolonged breathing of excessive amounts of silica dust, which may be on or embedded in the surface of castings, can cause silicosis or other health effects including lung cancer.

ENVIRONMENTAL EFFECTS:

No known significant environmental effects from a solid casting.

SECTION 3 — COMPOSITION / INFORMATION ON INGREDIENTS**Section 3A—Information on Ingredients**

MATERIAL	Wt %	CAS NUMBER	ACGIH TLV mg/m ³	OSHA PEL mg/m ³
Chromium (Cr)	10.0-52.0	7440-47-3	0.5	1
Cobalt (Co)	0-2.5	7440-48-4		
Metal dust and fume			N/E	0.1
Elemental and inorganic compounds			0.02	N/E
Copper (Cu)	0-4.0	7440-50-8		
Fume			0.2	0.1
Dust			1	1
Iron (Fe)	Remainder	7439-89-6	N/E	N/E
Manganese (Mn)	0.30-6.00	7439-96-5	N/E	N/E
Nickel (Ni)	3.0-72.0	7440-02-0	1.5(I)	1.0
Niobium (Nb) / Columbium	0-1.2	7440-03-1	N/E	N/E
Silicon (Si)	0-3.5	7440-21-3		
Total dust			N/E	15
Respirable dust			N/E	5
Tantalum (as Ta)	0.1-1.0	7440-25-7		
Metal dust and Oxide dust			N/E	5.0
Tungsten (as W)	0-5.25	7440-33-7	N/E	N/E

Section 3B— Potential Byproducts of Welding, Cutting or Other Further Processing

Chromium Compounds (as Cr) Chromium (II) inorganic compounds, as Cr Chromium (III) inorganic compounds, as Cr Chromium (VI) inorganic compounds, certain water insoluble Chromium (VI) inorganic compounds, water soluble Chromium (VI) all forms and compounds			various various various various various	N/E 0.5 0.01 0.5 N/E	0.5 0.5 0.005 0.005 0.005
Copper Compounds Fume, as Cu Dusts and mists, as Cu		7440-50-8 various various		0.2 1	0.1 1
Iron Compounds Iron oxide (Fe ₂ O ₃) fume Iron oxide (Fe ₂ O ₃) respirable		1309-37-1 1309-37-1		N/E 5	10 N/E
Manganese Compounds Manganese fume and inorganic compounds		7439-96-5		0.2	5 (C)
Nickel Compounds (as Ni) Insoluble inorganic compounds Soluble inorganic compounds Nickel oxide		various various 1313-99-1		0.2 (I) 0.1 (I) 0.2 (I)	1 1 1
Tungsten Compounds (as W) Metal & insoluble compounds, as W Soluble compounds, as W		7440-33-7		5 /10 (STEL) 1/3 (STEL)	N/E N/E

Section 3C—Carcinogen Classification of Ingredients/ Potential Byproducts

INGREDIENT/BYPRODUCT	OSHA	NTP	IARC	ACGIH	EPA	TARGET ORGAN
Chromium (metal)	NL	NL	3	A4	NL	Lung, Nasal
Chromium II, inorganic compounds	NL	NL	NL	NL	NL	
Chromium III, inorganic compounds	NL	NL	3	A4	D	
Chromium VI, (hexavalent)	Y	K	1	A1	NL	
Cobalt Alloys Cobalt and compounds Cobalt and inorganic compounds, as Co	NL NL NL	NL NL NL	NL 2B NL	NL NL A3	NL NL NL	Lung
Copper	NL	NL	NL	NL	D	GI tract
Iron	NL	NL	3	A4	NL	Lung
Manganese	NL	NL	NL	NL	D	Central Nervous System
Nickel (metal) Nickel, insoluble compounds Nickel, soluble compounds Nickel oxide	NL NL NL NL	R K K K	2B NL NL 1	A5 A1 A4 A1	NL NL NL NL	Lung, Nasal

Niobium / Columbium	NL	NL	NL	NL	NL	
Silicon	NL	NL	NL	NL	NL	
Tantalum	NL	NL	NL	NL	NL	
Tungsten	NL	NL	NL	NL	NL	
<p>Legend NL = Not Listed N/E = None Established TLV = Threshold Limit Value/American Conference of Industrial Hygienists (ACGIH) 8-hr time weighted average PEL = Permissible Exposure Limit / OSHA 8-hr time weighted average mg/m³ = milligrams per cubic meter µg/m³ = micrograms per cubic meter STEL = Short Term Exposure Limit (C) = Ceiling Limit (I) = Inhalable fraction (R) = Respirable fraction</p> <p>OSHA – Occupational Safety & Health Administration Y = Listed as a Human Carcinogen</p> <p>NTP – National Toxicology Program K = Know to be a Human Carcinogen R = Reasonably Anticipated to be a Human Carcinogen (RAHC)</p>			<p>ACGIH – American Conference of Governmental Industrial Hygienists A1 = Confirmed Human Carcinogen A2 = Suspected Human Carcinogen A3 = Confirmed Animal Carcinogen A4 = Not Classifiable as a Human Carcinogen A5 = Not Suspected as a Human Carcinogen</p> <p>EPA – U.S. Environmental Protection Agency A = Human Carcinogen K = Known Human Carcinogen D = Not Classified as to Human Carcinogenicity. No Data Available B1 = Probable Human Carcinogen. Sufficient Evidence from Epidemiology Studies L = Likely to Produce Cancer in Humans B2 = Probable Human Carcinogen. Sufficient Evidence from Animal Studies</p> <p>IARC – International Agency for Research on Cancer 1 = Carcinogen to Humans 2A = Probably Carcinogenic to Humans 2B = Possibly Carcinogenic to Humans 3 = Unclassified as Carcinogenicity in Humans 4 = Probably not Carcinogenic to Humans</p>			

PART II *What should I do if a hazardous situation occurs?*

SECTION 4 — FIRST AID MEASURES	
EYES:	Flush eyes with plenty of water or eye wash solution. Embedded metal particles should be removed by a trained individual such as a nurse or physician.
SKIN:	If a rash develops, seek medical attention.
INGESTION:	Not normally applicable.
INHALATION:	If problems develop move to fresh air and seek medical attention.
SECTION 5 — FIRE & EXPLOSION DATA	
FLAMMABLE PROPERTIES:	Castings in a solid form will not burn or explode.
EXTINGUISHING MEDIA :	Use fire-extinguishing media that are appropriate for fire in surrounding area.
PROTECTION OF FIREFIGHTERS:	Firefighters should wear NIOSH approved, positive pressure, self-contained breathing apparatus and full protective clothing when appropriate for the surrounding fire.
SECTION 6 — ACCIDENTAL RELEASE MEASURES	
Accidental release measures do not apply to solid castings. Dust collected from machining, welding, etc. may be classified as a waste. Consult federal, state and local regulations.	

PART III *How can I prevent hazardous situations from occurring?*

SECTION 7 — HANDLING & STORAGE	
RECOMMENDED STORAGE:	No special storage requirements needed.
PROCEDURES FOR HANDLING:	For castings with sharp edges, wear appropriate work gloves. When handling heavy castings wear appropriate foot protection.

SECTION 8 — EXPOSURE CONTROLS & PERSONAL PROTECTION

ENGINEERING CONTROLS:

No specific controls are needed when the casting is in a solid state. If welding, grinding or machining provide sufficient general ventilation and/or local exhaust to maintain concentrations below PEL's and TLV's. Refer to Section 3 for exposure guidelines.

If ventilation is not adequate, wear a NIOSH approved dust and fume respirator.

If work is to be done in a confined space use appropriate confined space procedures. Refer to OSHA Standard 29 CFR 1910.146.

Grinding castings that have not been cleaned or that contain embedded sand may generate significant amounts of dust containing free silica, which can cause silicosis. Good local ventilation is frequently required to prevent over-exposure in this situation. If good ventilation is not available, use a NIOSH approved respirator.

Other toxic metals in the alloy that are present in small amounts should not present a hazard if chromium, cobalt, copper, iron, manganese and nickel dust and fume are adequately controlled.

PERSONAL PROTECTION:

Gloves:

Work gloves are advisable for handling castings.

Eye:

Safety glasses with side shields and/or face shield for particles (grinding). Welding goggles or welding helmet for cutting or welding.

Respiratory:

Wear NIOSH approved respirator for dusts or fumes if concentrations exceed the PEL or TLV.

Footwear:

Foot protection must be worn to protect against foot injury when heavy castings are handled.

Clothing:

Wear appropriate protective clothing if arc-air gouging, cutting or welding castings.

Other:

If noise is at or above 85dBA, hearing protection should be worn. Refer to OSHA Standard 29 CFR 1910.95.

SECTION 9 — PHYSICAL & CHEMICAL PROPERTIES

APPEARANCE /PHYSICAL STATE:

Solid, silver gray in color.

ODOR:

None

VAPOR DENSITY:

Not Applicable

MELTING POINT:

2744-3199F (1504-1704C)

SPECIFIC GRAVITY:

0.28 lb/in³ (7.74g/cm³) for cast alloy steels

BOILING POINT:

Variable depending on casting grade.

VAPOR PRESSURE:

Not applicable

FLASH POINT:

Not applicable for castings in solid form

EVAPORATION RATE:

Not applicable

FLAMMABILITY:

Not flammable

SOLUBILITY IN WATER:

Insoluble

UPPER AND LOWER FLAMMABILITY LIMITS:

Not applicable for castings in solid form

pH:

Not Applicable

AUTO IGNITION TEMPERATURE:

Not applicable

PERCENT VOLATILE BY VOLUME:

Not applicable

DECOMPOSITION TEMPERATURE:

Not applicable

PARTITION COEFFICIENT:

Not applicable

SECTION 10 — STABILITY & REACTIVITY

CHEMICALLY STABLE?

Yes

CONDITIONS TO AVOID:

None

INCOMPATIBILITY: Metal dust can burn or explode and must be protected from ignition sources such as grinding sparks, etc. Under some conditions, metal dust is incompatible with some oxidizing conditions and may be incompatible with oxidizers, acids and water and may ignite or explode.	
CONDITIONS OF REACTIVITY: None	IMPACT/SHOCK SENSITIVITY: Not applicable
HAZARDOUS DECOMPOSITION PRODUCTS: None	HAZARDOUS POLYMERIZATION: Not applicable

PART IV *Is there any other useful information about this material?*

SECTION 11 — TOXICOLOGICAL INFORMATION

No toxicological information is available for solid castings. There are extensive toxicological data available on the various components of this material. An adequate representation of all these data is beyond the scope of this document.

SECTION 12 — ECOLOGICAL INFORMATION

No ecological information is available for solid castings. There are extensive ecological data available on the various components of this material. An adequate representation of all these data is beyond the scope of this document.

SECTION 13 — DISPOSAL CONSIDERATIONS

Recover or recycle if possible. Dispose of according to federal, state and local regulations.

SECTION 14 — TRANSPORTATION INFORMATION

USA DEPARTMENT OF TRANSPORTATION (DOT) - HM181:
Not regulated

CANADIAN TRANSPORT DANGEROUS GOODS (TDG):
Not regulated

SHIPPING NAME:
Not regulated

HAZARD CLASS:
Not regulated

UN (United Nations) / NA (North American) #:
Not regulated

LABEL(S) REQUIRED?
No

PACKING GROUP:
Not regulated

INTERNATIONAL TRANSPORTATION REGULATIONS:
Not applicable

SPECIAL SHIPPING INFORMATION:
Not applicable

SECTION 15 — REGULATORY INFORMATION

USA - OSHA (Hazard Communication Standard):

Reference 29 CFR 1910.1200 and 1910.1000. A finished casting is an article as defined in the OSHA Hazard Communication Standard 29CFR 1910.1200 (c). Dust or fumes generated by cleaning, machining, grinding, or welding of the casting may produce airborne contaminants, such as chromium, cobalt, copper, iron, manganese, nickel, silicon, tantalum and silica. For chromium references see 29 CFR 1910.1026.

USA – EPA (Toxic Substances Control Act – TSCA):

All components of these products are on the TSCA inventory list or are excluded from listing.

USA – EPA (SARA Title III)

The following components, **Chromium, Cobalt, Copper, Manganese, and Nickel** make this product subject to reporting Requirements of Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR Part 72. Quantity threshold amounts are 25,000 pounds for manufacturing, importing or processing and 10,000 pounds for otherwise used.

CANADA - WHMIS (Workplace Hazardous Materials Information System):

This MSDS has been prepared according to the hazard criteria of the Controlled Product Regulations (CPR) and the MSDS contains the information required by the CPR.

CANADIAN DSL (Domestic Substance List) Inventory Status

All components of these products are on the DSL Inventory.

CEPA (Canadian Environmental Protection Act):

The components of these products are not on the CEPA Priorities Substances Lists

EINECS No. (European Inventory of Commercial Chemical Substances):

All components of these products are on the EINECS list.

RoHS (Restriction of Certain Hazardous Substances) Compliance

Castings comply with RoHS

CALIFORNIA PROPOSITION 65 Compliance

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 & Safety Code 25248.5 et seq.)

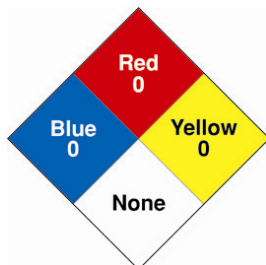
U.S. STATE REGULATORY INFORMATION

Some of the components listed in Section 3 above may be covered under specific state regulations.

SECTION 16 — OTHER INFORMATION

**National Fire Protection Association (NFPA) RATINGS:
For Castings in Solid Form**

Health: 0 Fire: 0 Reactivity: 0 Specific Hazard: None



Health Hazard: (Blue)

- 0—(material that on exposure under fire conditions would offer no hazard beyond that of ordinary combustible materials);
- 1—(materials that on exposure under fire conditions could cause irritation or minor residual injury);
- 2—(materials that on intense or continued exposure under fire conditions could cause temporary incapacitation or possible residual injury);
- 3—(materials that can on short exposure could cause serious temporary or residual injury);
- 4—(materials that under very short exposure causes death or major residual injury).

Flammability Hazard: (Red)

- 0—minimal hazard);
- 1—(materials that require substantial pre-heating before burning);
- 2 (combustible liquid or solids; liquids with a flash point of 38-93°C [100-200°F]);
- 3—(Class IB and IC flammable liquids with flash points below 38°C [100°F]);
- 4—(Class IA flammable liquids with flash points below 23°C [73°F] and boiling points below 38°C [100°F]).

Reactivity Hazard: (Yellow)

- 0—(normally stable);
- 1—(material that can become unstable at elevated temperatures or which can react slightly with water);
- 2—(materials that are unstable but do not detonate or which can react violently with water);
- 3—(materials that can detonate when initiated or which can react explosively with water);
- 4—(materials that can detonate at normal temperatures or pressures).

Specific Hazard: (White)

- Oxidizer OXY
- Acid ACID
- Alkali ALK
- Corrosive COR
- Use No Water
- Radioactive
- Polymerizes P

**Hazardous Materials Information System (HMIS) RATINGS
For Castings in Solid Form**

Health: 0 Flammability: 0 Physical Hazards: 0



Health Hazard: (Blue)

- 0—(no significant risk to health);
- 1—(irritation or minor reversible injury possible);
- 2—(temporary or minor injury may occur);
- 3—(major injury likely unless prompt action is taken and medical treatment is given);
- 4—(life-threatening, major or permanent damage may result from single or repeated overexposures);
- *—chronic health hazard.

Flammability: (Red)

- 0—(materials that will not burn);
- 1—(materials that must be preheated before ignition will occur);
- 2—(materials which must be moderately heated or exposed to high ambient temperatures before ignition will occur);
- 3— materials capable of ignition under almost all normal temperature conditions);
- 4—(flammable gases, or very volatile flammable liquids with flash points below 23°C [73°F] and boiling points below 38°C [100°F]. Materials may ignite spontaneously with air. (Class IA)).

Physical Hazards: (Orange)

- 0— (materials that are normally stable, even under fire conditions and will **not** react with water, polymerize, decompose, condense, or self-react. Non-explosives);
- 1—(materials that are normally stable but can become unstable (self-react) at high temperatures and pressures. Materials may react non-violently with water or undergo hazardous polymerization in the absence of inhibitors);
- 2—(materials that are unstable and may undergo violent chemical changes at normal temperature and pressure with low risk for explosion. Materials may react violently with water or form peroxides upon exposure to air);
- 3—(materials that may form explosive mixtures with water and are capable of detonation or explosive reaction in the presence of a strong initiating source. Materials may polymerize, decompose, self-react, or undergo other chemical change at normal temperature and pressure with moderate risk of explosion);
- 4—(materials that are readily capable of explosive water reaction, detonation or explosive decomposition, polymerization, or self-reaction at normal temperature and pressure).

LABEL INFORMATION: The following hazard information is required for labels under OSHA Standard 29 CFR 1910.1200. Other label information may be added.

High-Alloyed Steel Castings

—CAUTION—

Grinding, welding or arc gouging of this casting creates dust or fumes containing substances listed below with corresponding possible health effects after prolonged or repeated overexposure.

Chromium, hexavalent: Dermatitis, lung and nasal cancer

Cobalt: Asthma, respiratory sensitization, damage to the heart muscle

Copper: Nose and throat irritation, metal fume fever

Iron: Overexposure to iron oxide fume over a long time can cause siderosis, sometimes called "iron pigmentation" of the lung. It can be seen on a chest x-ray but causes little or no disability.

Manganese: Central nervous system impairment.

Nickel: Dermatitis, lung and nasal cancer

Niobium / Columbium: Eye and skin irritation

Silicon: Skin, eye and nose irritation.

Tantalum: Dermatitis, upper respiratory irritation

Tungsten: Lower respiratory irritation, central nervous system impairment, pulmonary fibrosis

Wear eye protection

Wear a NIOSH approved respirator if dust or fume concentrations are excessive.

NOTE:

This data is offered in good faith as typical values and not as a product specification. No warranty either expressed or implied is hereby made. The recommended industrial hygiene and safe handling procedures are believed to be generally applicable. However, each user should review the recommendations in specific context of the intended use and determine if they are appropriate.

MSDS SHEET PREPARED BY:
American Foundry Society, Inc.
Occupational Safety & Health Committee (10-Q)

DATE:
10/10