CROWN ALLOYS COMPANY

SAFETY DATA SHEET

Section 1 – PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME: **Cast Iron Bare Rod**

PRODUCT IDENTIFICATION: **CROWN 6**

SPECIFICATION: RCI (modified)

RECOMMENDED USE: OFW (Oxyfuel Gas Welding)

SUPPLIER: Crown Alloys Company
30105 Stephenson Hwy.
Madison Heights, MI. 48071

TELEPHONE NUMBER: (248) 588-3790

EMERGENCY NUMBER: **Call CHEMTREC Day or Night 1-800-424-9300 / +1 703-527-3887**

WEBSITE: www.crownalloys.com

Section 2 – HAZARDS IDENTIFICATION

2.1 Classification of the mixture

This product is placed on the market in solid form

2.1.1 Classification in accordance with GHS-US

STOT SE 3	H335	STOT RE 1	H372
STOT SE 3	H336	Acute Tox. 4 (oral)	H302

2.2 Label elements

GHS-US labelling

Hazard Pictograms (GHS-US):

GHS07

GHS08

Signal word (GHS-US): Danger

Hazard statements (GHS-US):

H335 – May cause respiratory irritation
H336 – May cause drowsiness or dizziness
H372 – Causes damage to organs through prolonged or repeated exposure
H302 – Harmful if swallowed

Precautionary statements (GHS-US):

P260 – Do not breathe dust/fume/gas/mist/vapors/spray
P261 – Avoid breathing dust/fume/gas/mist/vapors/spray
P264 – Wash thoroughly after handling
P270 – Do not eat, drink or smoke when using this product
P271 – Use only outdoors or in a well-ventilated area
P280 – Wear protective gloves/protective clothing/eye protection/face protection
P304+P340 – IF INHALED: Remove person to fresh air and keep comfortable for breathing
P312 – Call a POISON CENTER or physician if you feel unwell
P314 – Get medical advice and attention if you feel unwell
P403+P233 – Store in a well-ventilated place. Keep container tightly closed
P405 – Store locked up
P501- Dispose of contents/container in accordance with local / regional / national / international regulations

2.3 Other hazards

No additional information available

2.4 Unknown acute toxicity (GHS-US)

No data available

Other hazards which do not result in GHS classification: Heat rays (infrared radiation) from flame or hot metal can injure eyes. Overexposure to brazing/welding fumes and gases can be hazardous. Read and understand the manufacturer's instructions, Safety Data Sheets and the precautionary labels before using these alloys. Refer to Section 8.

Substance(s) formed under the conditions of use: The welding fumes produced from these welding alloys may contain the following constituent(s) and/or their complex metallic oxides as well as solid particles or other constituents from the consumables, base metal, or base metal coating not listed below:

Chemical Identity	CAS-No.	Chemical Identity	CAS-No.	Chemical Identity	CAS-No.
Carbon Dioxide	124-38-9	Ozone	10028-15-6	Manganese	7439-96-5
Carbon Monoxide	630-08-0	Nitrogen Dioxide	10102-44-0	Chromium Oxide	1308-38-9
Chromium (VI)	18540-29-9				

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Section 3 – COMPOSITION / INFORMATION ON INGREDIENTS

3.1 Substances

Not applicable

Full text of H-phrases: See section 16

3.2 Mixture

Reportable Hazardous Ingredients

Chemical Identity	CAS-No.	Weight Percent (%)	GHS-US Classification
Carbon	7440-44-0	3.2 – 3.8	Not classified
Chromium and chromium alloys or compounds (as Cr)	7440-47-3	0.20 max.	Comb. Dust
Iron (Fe)	7439-89-6	90.0 – 95.0	Acute Tox. 4 (Oral), H302
Manganese (Mn)	7439-96-5	0.10 – 0.75	Comb. Dust
Molybdenum (Mo)	7439-98-7	0.35 max.	Not classified
Phosphorus (P)	7723-14-0	0.75 max.	Not classified
Silicon (Si)	7440-21-3	2.40 – 3.50	Not classified

Composition Comments: The term “Hazardous Ingredients” should be interpreted as a term defined in Hazard Communication standards and does not necessarily imply the existence of a welding hazard. These alloys may contain additional non-hazardous ingredients or may form additional compounds under the condition of use. Refer to Sections 2 & 8 for more information.

Section 4 – FIRST AID MEASURES

4.1 Description of first aid measures

Ingestion: Unlikely due to the form of the product. Avoid hand, clothing, food, and drink contact with metal fume or powder which can cause ingestion of particulate during hand to mouth activities such as drinking, eating, smoking, etc. If ingested, do not induce vomiting. Contact a poison control center. Unless the poison control center advises otherwise, wash out mouth thoroughly with water. If symptoms develop, seek medical attention at once.

Inhalation: Move to fresh air if breathing is difficult. If not breathing, perform artificial respiration. Seek medical assistance immediately.

Skin Contact: Flush with soap and water for at least 15 minutes. For reddened or blistered skin, or thermal burns, obtain medical assistance.

Eye Contact: Dust or fume from these alloys should be flushed from the eyes with clean, tepid water until transported to a medical facility. Do not rub eyes or keep eyes tightly closed. Obtain immediate medical assistance.
Arc rays can injure eyes. If exposed, move victim to a dark room, remove contact lenses and cover eyes with a padded dressing and rest. Obtain medical assistance if symptoms persist.

4.2 Most important symptoms/effects, acute and delayed

Symptoms/injuries after inhalation: Short-term (acute) overexposure to the gases, fumes, and dusts may include irritation of the eyes, lungs, nose, and throat. Some toxic gases associated with welding may cause pulmonary edema, asphyxiation, and death.

Acute overexposure may include signs and symptoms such as watery eyes, nose and throat irritation, headache, dizziness, difficulty in breathing, frequent coughing, or chest pain. The presence of chromium/chromate in fume can cause irritation of nasal membranes and skin. Excessive inhalation or ingestion of manganese can produce manganese poisoning. Overexposure to manganese compounds may affect the central nervous system, symptoms of which are languor, sleepiness, muscular weakness, emotional disturbances, and spastic gait resembling Parkinsonism. These symptoms can become progressive and permanent if not treated. Excessive inhalation of fumes may cause “Metal Fume Fever” with Flu-like symptoms such as chills, fever, body aches, vomiting, sweating, etc.

Symptoms/injuries after skin contact: Dusts may cause irritation. Contact with hot, molten metal will cause thermal burns.

Symptoms/injuries after eye contact: Fumes from thermal decomposition may cause eye irritation. Risk of thermal burns on contact with molten product.

Symptoms/injuries after ingestion: Not an anticipated route of exposure during normal product handling. May be harmful if ingested.

4.3 Indication of immediate medical attention and special treatment needed

If exposed or concerned, get medical advice and attention. If medical advice is needed, have product container, label or SDS at hand.

Section 5 – FIRE-FIGHTING MEASURES

General Fire Hazards: *As shipped*, this product is nonflammable. However, welding arc and sparks can ignite combustibles and flammable products. Read and understand American National Standard Z49.1, "Safety In Welding, Cutting and Allied Processes” and National Fire Protection Association NFPA 51B, “Standard for Fire Prevention During Welding, Cutting and Other Hot Work” before using this product.

5.1 Extinguishing media

Suitable extinguishing media: Use extinguishing media appropriate for surrounding fire.

Unsuitable extinguishing media: None known.

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5.2 Special hazards arising from the substance

Fire hazard: Not flammable.

Explosion hazard: Product is not explosive. Ensure proper welding procedures to avoid welding explosions.

5.3 Special protective equipment and precautions for firefighters

Special firefighting procedures: Use standard firefighting procedures and consider the hazards of other involved materials.

Special protective equipment for firefighters: Firefighters should wear full protective gear.

Section 6 – ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures

If airborne dust and/or fume is present, use adequate engineering controls and, if needed, personal protection to prevent overexposure. Refer to recommendations in Section 8.

6.2 Environmental precautions

Avoid release to the environment

6.3 Methods and material for containment and cleaning up

Clean up spills immediately, observing precautions in the personal protective equipment in Section 8. Avoid generating dust. Prevent product from entering any drains, sewers or water sources. Refer to Section 13 for proper disposal. Attempt to reclaim the product if possible.

Section 7 – HANDLING AND STORAGE

7.1 Precautions for safe handling

Avoid inhaling welding fumes. Keep formation of airborne dusts to a minimum. Provide appropriate exhaust ventilation at places where dust is formed. Read and understand the manufacturer's instruction and the precautionary label on the product. See American National Standard Z49.1, "Safety In Welding, Cutting and Allied Processes" published by the American Welding Society, http://pubs.aws.org and OSHA Publication 2206 (29CFR1910), U.S. Government Printing Office, www.gpo.gov.

Hygiene Measures: Do not eat, drink or smoke when using the product. Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Cosmetics should not be applied in areas where exposures exist! Routinely wash work clothing and protective equipment to remove contaminants.

7.2 Conditions for safe storage, including any incompatibilities

Store in closed original container in a dry place. Store away from incompatible materials. Store in accordance with local/regional/national regulations.

7.3 Specific end use(s)

For welding consumables and related products

Section 8 – EXPOSURE CONTROLS / PERSONAL PROTECTION

8.1 Control parameters

Chemical Identity (CAS-No.)	ACGIH TLV (TWA)	OSHA PEL (TWA)	NIOSH REL	NIOSH STEL
Carbon (7440-44-0)	2.0 mg/m^3	2.5 mg/m^3	N/A	N/A
Chromium (7440-47-3)	0.5 mg/m^3 [metal compound as Cr] 0.05 mg/m^3 [Cr(VI) inorganic compounds as Cr, water soluble] 0.01 mg/m^3 [Cr(VI) inorganic compounds as Cr, water insoluble]	1.0 mg/m^3 [metal compound as Cr) 0.005 mg(**5 µg**)/m^3 [Cr(VI) inorganic compounds as Cr(VI), water soluble] 0.005 mg(**5 µg**)/m^3 [Cr(VI) inorganic compounds as Cr(VI), insoluble]	0.5 mg/m^3	N/A
Iron (7439-89-6)	5.0 mg/m^3 (as Fe_2O_3) respirable fraction	10.0 mg/m^3 (fume, as Fe_2O_3)	N/A	N/A
Manganese (7439-96-5)	0.02 mg/m^3 (elemental and inorganic compounds, as Mn – respirable fraction) 0.1 mg/m^3 (elemental and inorganic compounds, as Mn – inhalable fraction)	5.0 mg/m^3 (fume, as Mn) Ceiling	1 mg/m^3	3 mg/m^3
Molybdenum (7439-98-7)	3.0 mg/m^3 (respirable fraction, as Mo) 10.0 mg/m^3 (inhalable fraction, as Mo)	15.0 mg/m^3 (total dust, as Mo)	N/A	N/A
Phosphorus (7723-14-0)	0.1 mg/m^3	0.1 mg/m^3	N/A	N/A
Silicon (7440-21-3)	Withdrawn	15.0 mg/m^3 (total dust) 5.0 mg/m^3 (respirable fraction)	5.0 mg/m^3 (respirable) 10.0 mg/m^3 (total)	N/A

8.2 Exposure controls

Appropriate Engineering Controls:

Use enough ventilation, local exhaust at the arc, or both to keep the fumes and gases from the worker's breathing zone & the general area. Maintain exposures below acceptable exposure levels (see Section 8.1). Use industrial hygiene air monitoring to ensure that your use of these products does not create exposures that exceed the recommended exposure limits. Always use exhaust ventilation in user operations such as high temperature cutting, grinding, welding and brazing. Train the welder to keep his/her head out of the fume plume. Confined spaces require adequate ventilation and/or air supplied respirators. Read and understand the manufacturer's instructions and the precautionary label on the product. See American National Standard Z49.1, Safety in Welding, Cutting, and Allied Processes, published by the American Welding Society, 8669 Doral Blvd. Suite 130, Doral, FL 33166 and OSHA Publication 2206 (29CFR1910), US Government Printing Office, Washington, D.C. 20402 for more details on many of the following.

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General information: **Exposure Guidelines:** Threshold Limit Values (TLVs) and Biological Exposure Indices (BEIs) are values published by the American Conference of Government Industrial Hygienists (ACGIH). ACGIH Statement of Positions Regarding the TLVs® and BEIs® states that the TLV-TWA should be used as a guide in the control of health hazards and should not be used to indicate a fine line between safe and dangerous exposures. See Section 10 for information on potential fume constituents of health interest. Threshold Limit Values are figures published by the American Conference of Government Industrial Hygienists.

Eye/face protection: Wear helmet or use face shield with filter lens of appropriate shade number. Shield others by providing screens and flash goggles.

Skin/Hand Protection: Wear protective gloves. Suitable gloves can be recommended by the glove supplier.

Protective Clothing: Wear hand, head, and body protection which help to prevent injury from radiation, sparks, flame and electrical shock. See Z49.1. At a minimum this includes welder's gloves and a protective face shield, and may include arm protectors, aprons, hats, shoulder protection, as well as dark substantial clothing. Wear dry gloves free of holes or split seams. Train the welder not to permit electrically live parts or electrodes to contact skin . . . or clothing or gloves if they are wet. Insulate yourself from the work piece and ground using dry plywood, rubber mats or other dry insulation.

Respiratory Protection: Keep your head out of fumes. Use enough ventilation and local exhaust to keep fumes and gases from your breathing zone and the general area. An approved respirator should be used unless exposure assessments are below applicable exposure limits. Use respirable fume respirator or air supplied respirator when welding in confined space or where local exhaust or ventilation does not keep exposure below TLV's (see Section 8.1). Use only NIOSH approved respirators in accordance with 29 CFR 1910.134 – Respiratory Protection. Oxygen levels below 19.5% are considered IDLH by OSHA. In such atmospheres, use of a full-facepiece pressure/demand SCBA or a full facepiece, supplied air respirator with auxiliary self-contained air supply is required under OSHA's Respiratory Protection Standard (1910.134-1998).

Hygiene measures: Do not eat, drink or smoke when using the product. Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Cosmetics should not be applied in areas where exposures exist! Routinely wash work clothing and protective equipment to remove contaminants.

Determine the composition and quantity of fumes and gases to which workers are exposed by taking an air sample from inside the welder's helmet if worn or in the worker's breathing zone. Improve ventilation if exposures are not below limits. See ANSI/AWS F1.1, F1.2, F1.3 and F1.5, available from the American Welding Society, www.aws.org.

Section 9 – PHYSICAL AND CHEMICAL PROPERTIES

Appearance	Solid cast iron welding rod
Physical state	Solid
Form	Solid
Color	Metallic gray
Odor	None
Odor threshold	No data available
pH	Not applicable
Melting point/freezing point	2795ºF (1535ºC)
Flammability (solid, gas)	No data available
Flash Point	Not applicable
Evaporation rate	Not applicable
Initial boiling point and boiling range	No data available

Flammability limit - upper (%)	No data available
Flammability limit - lower (%)	No data available
Explosive limit - upper (%)	No data available
Explosive limit - lower (%)	No data available
Vapor pressure	Not applicable
Vapor density	Not applicable
Relative density	No data available
Solubility in water	None
Solubility (other)	No data available
Partition coefficient (n-octanol/water)	No data available
Auto-ignition temperature	No data available
Decomposition temperature	No data available
Viscosity	Not applicable

Section 10 – STABILITY AND REACTIVITY

10.1 Reactivity

This product is non-reactive under normal conditions of use, storage and transport.

10.2 Chemical stability

This product is stable under normal conditions.

10.3 Possibility of hazardous reactions

Will not occur.

10.4 Conditions to avoid

Uncontrolled exposure to extreme temperatures and/or contamination.

10.5 Incompatible materials

Strong acids, strong oxidizers, mineral acids, some halogenated compounds.

10.6 Hazardous decomposition products

Welding/brazing fumes and gases can't be classified simply. The composition and quantity of both are dependent upon the metal being welded/brazed and the rods used. Coatings on the metal being welded/brazed (such as paint, plating, or galvanizing), the number of welders, the volume of the work area, the quality and the amount of ventilation, the position of the welder's head with respect to the gas plume, the presence of contaminants in the atmosphere (such as chlorinated hydrocarbon vapors from cleaning and degreasing activities), the process and procedures, as well as the welding/brazing consumables.

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When Crown 6 is consumed, the fume and gas decomposition products generated are different in percent and form from the ingredients listed in Section 3. Decomposition products of normal operation include those originating from the volatilization, reaction, or oxidation of the materials shown in Section 3, plus those from the base metal, coatings, etc., as noted above. Gaseous reaction products may include carbon monoxide and carbon dioxide. Ozone and nitrogen oxides may be formed by the radiation from an arc, in addition to the shielding gases like argon and helium, whenever they are employed. Reasonably expected fume constituents of Crown 6 would include: Complex oxides of iron, manganese, silicon, chromium, carbon dioxide, carbon monoxide, ozone and nitrogen oxides. The fume limit for chromium, manganese, molybdenum and/or phosphorous may be reached before the general welding fume limit of 5 mg/m^3 is reached. One recommended way to determine the composition and quantity of fumes and gases to which workers are exposed is to take an air sample inside the welder's helmet if worn or in the worker's breathing zone. See ANSI/AWS F1.1 *"Method for Sampling Airborne Particles Generated by Welding and Allied Processes"* and *"Characterization of Arc Welding Fume"* available from the American Welding Society, 8669 Doral Blvd. Suite 130, Doral, FL 33166.

A SIGNIFICANT AMOUNT OF THE CHROMIUM IN THE FUMES CAN BE HEXAVALENT CHROMIUM , ALSO KNOWN AS Cr(VI), WHICH HAS A VERY LOW EXPOSURE LIMIT OF 0.005 mg/m^3 (5 µg/m^3).

Monitor fume levels and Cr(VI) level. Train workers about the hazards of Cr(VI). **Read and comply with OSHA's permissible exposure limits for hexavalent chromium Cr(VI), Fed. Reg. 71 – 10099 (specifically 29 CFR 1910.1026, 29 CFR 1915.1026, and 29 CFR 1926.1126).** For Cr(VI), OSHA requires: "The employer shall perform initial monitoring to determine the 8-hour TWA exposure for each employee on the basis of a sufficient number of personal breathing zone air samples to accurately characterize full shift exposure on each shift, for each job classification, in each work area". Specialized equipment is required for monitoring Cr(VI) concentration in the workplace. OSHA Analytical Method Number ID-215 for area and breathing zone sampling and OSHA Analytical Method Number W4001 for wipe samples are listed on the OSHA website – www.osha.gov – as methods for measuring Cr(VI). This standard is complex and the employer should contact an occupational health professional for doing the Cr(VI) monitoring and all other fume monitoring.

EU RoHS (European Union Restriction of Hazardous Substances): Crown 6 contains a minimal amount of Chromium. During welding Crown 6 will produce Cr(VI) (hexavalent chromium), however, the weld deposit does not contain Cr(VI) as it will all be in the zero valent state or as Cr(III) as an oxide. FINISHED PRODUCTS MANUFACTURED USING THE CROWN 6 RODS WILL NOT CONTAIN ANY Cr(VI).

Section 11 – TOXICOLOGICAL INFORMATION

11.1 Information on the likely routes of exposure (inhalation, ingestion, skin and eye contact)

Ingestion: Health injuries from ingestion are not known or expected under normal use.

Inhalation: Potential chronic health hazards related to the use of welding consumables are most applicable to the inhalation route of exposure. Refer to Inhalation statements in this section.

Skin Contact: Arc rays can burn skin. Skin cancer has been reported (from arc rays). Contact of the rod form of the Crown 6 is not anticipated to be irritating. Fumes generated during welding operations can be irritating to the skin. Symptoms of skin overexposure may include irritation and redness. Prolonged or repeated skin overexposure may lead to allergic contact dermatitis. Contact with molten metal will burn contaminated skin. Skin absorption is not known to be a significant route of overexposure for any component of the Crown 6.

Eye contact: Arc rays can injure eyes. Contact with the rod form of the Crown 6 can be physically damaging to the eye (i.e. foreign object). Fumes generated during welding operations can be irritating to the eyes. Contact with the molten metal will burn the contaminated eyes.

11.2 Symptoms related to the physical, chemical and toxicological characteristics

Inhalation: Short-term (acute) overexposure to welding fumes may result in discomfort such as metal fume fever, dizziness, nausea, or dryness or irritation of nose, throat, or eyes. May aggravate pre-existing respiratory problems (e.g. asthma, emphysema). Long-term (chronic) overexposure to welding fumes can lead to siderosis (iron deposits in lung), central nervous system effects, bronchitis and other pulmonary effects.

Information on toxicological effects

Acute toxicity (list all possible routes of exposure): Harmful if swallowed or inhaled

Information on Toxicological Effects - Ingredients

Specified substance: PHOSPHORUS (yellow) LDLO (oral, woman) = 22 mg/kg; cardiovascular effects TDLO (oral, woman) = 11 mg/kg LDLO (oral, woman) = 1400 ∝g/kg TDLO (oral, woman) = 2600 ∝g/kg LDLO (oral, woman) = 4600 ∝g/kg; pulmonary system, gastrointestinal tract, skin effects	**Specified substance: IRON** LD50 (oral, rat) = 98.6 g/kg ATE (oral) = 984.00 mg/kg LDLO (intraperitoneal, rabbit) = 20 mg/kg – no toxic effect noted TDLO (oral, child) = 77 mg/kg; brain, gastrointestinal tract, blood effects	
Specified substance: MANGANESE LD50 (oral, rat) = 9000 mg/kg ATE (oral) = 9000000.0 mg/kg TCLO (inhalation, man) = 2300 ∝g/m^3; brain, central nervous system effects	**Specified substance: SILICON** ATE (oral) = 3160.0 mg/kg LD50 (oral, rat) = 3160 mg/kg	**Specified substance: CARBON** LD50 (oral, rat) > 10000 mg/kg ATE (oral) = 500 mg/kg

Repeated dose toxicity (product): Harmful if swallowed

Skin corrosion/irritation (product): Not classified

Serious eye damage/irritation (product): Not classified

Respiratory or skin sensitization (product): May cause an allergic skin reaction

Germ cell mutagenicity (product): Not classified

Carcinogenicity (product): May cause cancer

Chromium (7440-47-3)	
International Agency for Research on Cancer (IARC) Monographs	3

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11.2 Symptoms related to the physical, chemical and toxicological characteristics (cont.)

Reproductive toxicity (product): Not classified
Specific target organ toxicity - single exposure (product): Not classified
Specific target organ toxicity - repeated exposure (product): Not classified
Aspiration hazard (product): Not classified

Irritancy of product: Dusts or fumes of this product may be irritating to contaminated skin and eyes. Fumes may be irritating to the respiratory system.

Sensitization to the product: This product is not known to be skin or respiratory sensitizer.

Reproductive toxicity information: Listed below is information concerning the effects of this product ***and*** its components on the human reproductive system.

Mutagenicity: These components are not reported to produce mutagenic effects in humans.
Embryotoxicity: These components are not reported to produce embryotoxic effects in humans.
Teratogenicity: These components are not reported to cause teratogenic effects in humans.
Reproductive Toxicity: These components are not reported to cause reproductive effects in humans. Clinical studies on test animals exposed to relatively high doses of the phosphorus component of this product indicate adverse reproductive effects.

Biological exposure indices: Not available

Symptoms related to the physical, chemical and toxicological characteristics under the condition of use:

Specified substance: CHROMIUM (VI) **Inhalation:** Chromates may cause ulceration, perforation of the nasal septum, and severe irritation of the bronchial tubes and lungs. Liver damage and allergic reactions, including skin rash, have been reported. Asthma has been reported in some sensitized individuals. Skin contact may result in irritation, ulceration, sensitization, and contact dermatitis. Chromates contain the hexavalent form of chromium [Chromium (VI)]. Hexavalent chromium and its compounds are on the IARC and NTP lists as posing a cancer risk to humans.	**Specified substance: MANGANESE** **Inhalation:** Overexposure to manganese fumes may affect the brain and central nervous system, resulting in poor coordination, difficulty speaking, and arm or leg tremors. This condition can be irreversible.

Additional toxicological information under the conditions of use:

Acute toxicity

Specified substance: CHROMIUM (VI) LD50 (oral, rat) = 27 – 59 mg/kg LC50 (inhalation, rat) = 33 – 70 mg/m^3 /4h	**Specified substance: CARBON DIOXIDE** LCLo (inhalation, human) = 90000 ppm/5 min. **Specified substance: CARBON MONOXIDE** LC50 (inhalation, rat) = 1300 mg/l /4h	**Specified substance: NITROGEN DIOXIDE** LC50 (inhalation, rat) = 88 ppm/4h **Specified substance: OZONE** LCLo (inhalation, human) = 50 ppm/30 min.

Carcinogenicity:

Specified substance: Chromium (VI) or Hexavalent Chromium	
International Agency for Research on Cancer (IARC) Monographs	1 (Carcinogenic to humans)
National Toxicology Program (NTP) Status	Known to be human carcinogen
US OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)	Cancer

Specified substance: Chromium Oxide	
International Agency for Research on Cancer (IARC) Monographs	3 (Not classifiable as to its carcinogenicity to humans)

Section 12 – ECOLOGICAL INFORMATION

Ecotoxicity

Acute hazards to the aquatic environment:

Fish

Specified substance: MANGANESE and/or manganese alloys (as Mn) NOEC (Oncorhynchus mykiss), 96 h): 3.6 mg/l	**Specified substance: MOLYBDENUM** LC50 (Rainbow trout (Oncorhynchus mykiss), 96 h): 800 mg/l
Specified substance: IRON and/or iron alloys (as Fe) LC50 (Cyprinus carpio) [semi-static], 96 h): 0.56 mg/l	

Aquatic Invertebrates

Specified substance: MANGANESE EC50 (Water flea (Daphnia magna), 48 h): 40 mg/l

Chronic hazards to the aquatic environment:

Fish (product): Not classified
Aquatic Invertebrates (product): Not classified

Persistence and Degradability

Biodegradation (product): The components of this product are expected to persist in the environment for an extended period of time.

Environmental Stability: Iron, the main component of this product will react with water and air to form a variety of stable iron oxides.

Bioaccumulative Potential

Bioconcentration Factor (BCF) (product): No data available

Mobility in Soil: No data available

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Section 13 – DISPOSAL CONSIDERATIONS

Sewage Disposal Recommendations: Do not empty into drains; dispose of this material and its container in a safe way.

Waste disposal recommendations: Prevent waste from contaminating surrounding environment. Discard any product, residue, disposable container or liner in an environmentally acceptable manner, in full compliance with international/federal/state/local regulations. However, alloy wastes are normally collected to recover metal values.

EPA Waste Number: No additional information available

Section 14 – TRANSPORT INFORMATION

In accordance with DOT / ADR / RID / ADNR / IMDG / ICAO / IATA

14.1 UN number

Not a dangerous good in sense of transport regulations

14.2 UN proper shipping name

Not applicable

14.3 Additional information

Other information: No supplementary information available

Overland transport:

No additional information available

Transport by sea:

No additional information available

Air transport:

No additional information available

Section 15 – REGULATORY INFORMATION

15.1 US Federal regulations

Chromium (7440-47-3)	**Silicon (7440-21-3)**
Listed on the United States TSCA (Toxic Substances Control Act) inventory Listed on SARA Section 313 (Specific toxic chemical listings)	Listed on the United States TSCA (Toxic Substances Control Act) inventory Listed on the Canadian DSL (Domestic Substances List) WHMIS Classification: Uncontrolled product according to WHMIS classification criteria
SARA Section 313 - Emission Reporting: **1.0 %**	

Manganese (7439-96-5)
Listed on the United States TSCA (Toxic Substances Control Act) inventory Listed on SARA Section 313 (Specific toxic chemical listings)
SARA Section 313 - Emission Reporting: **1.0 %**
Listed on the Canadian DSL (Domestic Substances List); Listed on the Canadian IDL (Ingredient Disclosure List) IDL Concentration: **1.0 %** WHMIS Classification: Uncontrolled product according to WHMIS classification criteria

Iron (7439-89-6)	**Carbon (7440-44-0)**
Listed on the United States TSCA (Toxic Substances Control Act) inventory WHMIS Class B-4	Listed on the United States TSCA (Toxic Substances Control Act) inventory

15.2 US State regulations

California Proposition 65
No ingredient regulated by CA Prop 65 present
WARNING: 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.)

Chromium (7440-47-3)	**Manganese (7439-96-5)**
U.S. - Massachusetts - Right To Know List U.S. - Minnesota - Hazardous Substance List U.S. - New Jersey - Right to Know Hazardous Substance List U.S. - Pennsylvania - RTK (Right to Know) List	U.S. - Massachusetts - Right To Know List U.S. - Minnesota - Hazardous Substance List U.S. - New Jersey - Right to Know Hazardous Substance List U.S. - Pennsylvania - RTK (Right to Know) List

Silicon (7440-21-3)	
U.S. - Massachusetts - Right To Know List U.S. - Minnesota - Hazardous Substance List	U.S. - New Jersey - Right to Know Hazardous Substance List U.S. - Pennsylvania - RTK (Right to Know) List

Section 16 – OTHER INFORMATION

SUPERSEDES LAST REVISION: 03/15/2018 (SDS)

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CROWN ALLOYS COMPANY

HMIS RATING (Hazardous Materials Information System)			
Health (blue) - 2	**Flammability (red) - 0**	**Reactivity (yellow) - 0**	**Protective Equipment - X** (See Sections 4, 8 & 10)

Health Hazard: **0** (minimal acute or chronic exposure hazard); **1** (slight acute or chronic exposure hazard); **2** (moderate acute or significant chronic exposure hazard); **3** (severe acute exposure hazard; one time overexposure can result in permanent injury and may be fatal); **4** (extreme acute exposure hazard; onetime overexposure can be fatal).

Flammability Hazard: **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: **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).

Caution: HMIS® ratings are based on a 0-4 rating scale, with 0 representing minimal hazards or risks, and 4 representing significant hazards or risks. Although HMIS® ratings are not required on SDS's under 29 CFR 1910.1200, the preparer may choose to provide them. HMIS® ratings are to be used only in conjunction with a fully implemented HMIS® program by workers who have received appropriate HMIS® training. HMIS® is a registered trade and service mark of the NPCA.

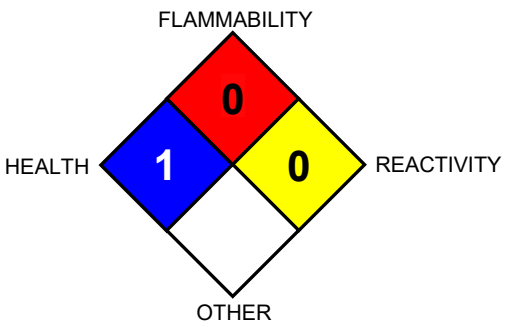
NATIONAL FIRE PROTECTION ASSOCIATION:

Health Hazard: **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 cause serious temporary or residual injury); **4** (materials that under very short exposure causes death or major residual injury).

Flammability Hazard: Refer to definitions for "HMIS RATING (Hazardous Materials Information System)"

Reactivity Hazard: Refer to definitions for "HMIS RATING (Hazardous Materials Information System)"

NFPA RATING



DEFINITIONS OF TERMS

ACGIH - American Conference of Governmental Industrial Hygienists
CAS No. - Chemical Abstracts Service Number
EPA - Environmental Protection Agency
GHS - Globally Harmonized System
IARC - International Agency for Research on Cancer
LC50 - Lethal Concentration (50 percent kill)
LCLO - Lowest published lethal concentration
LD50 - Lethal dose (50 percent kill)
LDLO - Lowest published lethal dose
NIOSH - National Institute of Occupational Safety and Health
NTP - National Toxicology Program
OSHA - U.S. Occupational Safety and Health Administration
PEL - Permissible Exposure Limit
SARA - Superfund Amendments and Reauthorization Act
STEL - Short Term Exposure Limit
TCLo - the lowest concentration to cause a symptom
TDLo - the lowest dose to cause a symptom
TLV - Threshold Limit Value
TSCA - Toxic Substances Control Act
TWA - Time Weighted Average

Full text of H-phrases (from Section 2)

Acute Tox. 4 (oral)	Acute toxicity (oral), Category 4
STOT SE 3	Specific target organ toxicity — Single exposure, Category 3, Respiratory tract irritation
STOT SE 3	Specific target organ toxicity — Single exposure, Category 3
STOT RE 1	Specific target organ toxicity — Repeated exposure, Category 1
H302	Harmful if swallowed
H335	May cause respiratory irritation
H336	May cause drowsiness or dizziness
H372	Causes damage to organs through prolonged or repeated exposure