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Material Safety Data Sheet

TO: Graham Corporation	BETE PART: 1 1/2SCF20M@7
FROM: BETE FOG NOZZLE,INC	MATERIAL: 316 Stainless Steel
PO#: B192335	QUANTITY: 1
BETE SO#: 406687-5	PROJECT: Job #18310
OTHER REF: 1993150	CUST REF#: 18310-1338

BETE certifies that the material(s) accompanying this certificate is supplied in accordance with our ISO 9001:2015 Certified Quality Management System. The attached Safety Data Sheets (SDS) are typical of the supplied material(s).

CERTIFIED BY: _____ DATE: August 6, 2019

SAFETY DATA SHEET

SECTION 1 – IDENTIFICATION

Product Identifier: Stainless Steel Alloys/ Abrasion Resistant Iron Alloys/ Austenitic Alloyed Iron Alloys

Product Synonyms: Ingot, shot, bar, plate, rod, scrap, revert, solids

Recommended Use and Restrictions: Alloys in various solid forms not intended as final end product.

Manufacturer: **Davis Alloys Manufacturing, LLC.**

295 East High Street, Sharpsville, Pennsylvania 16150

Tel: 724-347-7090 / Fax: 724-347-7091/ Emergency: 724-977-2250

SECTION 2 – HAZARDS IDENTIFICATION

Chemical Classification: The health hazards described in this section do not apply under normal handling of these products and are not hazardous in their solid forms. However, individual customer processes such as cutting, grinding, milling, melting, abrasive blasting, machining and welding may result in the formation of fumes, dust, and/or particulates containing the component elements of these materials with associated health hazards described in this section.

Hazard	GHS Classification	Hazard Statements
DANGER- Carcinogenicity	Category – 1B	May Cause Cancer
DANGER- Respiratory Sensitizer	Category - 1	May cause allergy or asthma symptoms or breathing difficulties if inhaled
DANGER- Specific Target Organ Toxicity (repeated exposure)	Category - 1	May cause damage to organs through prolonged or repeated exposure
DANGER- Toxicity to Reproduction	Category – 1B	Suspected of damaging to unborn child
WARNING- Acute Oral Toxicity	Category- 4	Harmful if swallowed
WARNING- Skin Sensitizer	Category - 1	May cause allergic skin reaction
WARNING- Specific Target Organ Toxicity (single exposure)	Category - 3	May cause respiratory irritation
Eye Irritation	Category – 2B	May cause eye irritations

DANGER

WARNING

Precautionary Statements:
Obtain special instructions before use. Do not handle unless all safety precautions have been read and understood. Do not eat, drink, or smoke when using these products. Avoid breathing dust or fumes. Wash hands thoroughly after contact with the dust that may be created from product. Use only outdoors or in well ventilated areas. Contaminated work clothing should be allowed out of the workplace. Wear protective gloves, clothing, eye and/or face protection. In case of inadequate ventilation, wear appropriate respiratory protection. Molten alloy should not be in contact with moisture or water, explosion hazard can exist.

Arc fumes and gases cannot be classified simply. The composition and quantity of both are dependent upon the sprayed, the process, procedure and materials used. Other conditions which also influence the composition and quantity of the fumes and gases to which workers may be exposed include: coatings on the metal sprayed (such as paint, plating, or galvanizing), the number of arc spray units and the volume of work area, the quality and amount of ventilation, the position of the operator's head with respect to the fume plume, as well as the presence of contaminants in the atmosphere (such as chlorinated hydrocarbon vapors from cleaning and degreasing activities).

Store away from strong acids and in accordance with federal, local, and state regulations. Dispose of in accordance with applicable federal, local, and state regulations.

Hazard not otherwise classified: Not Applicable

SECTION 3 – COMPOSITION/ INFORMATION ON INGREDIENTS

IMPORTANT! This section covers the ingredients from which these mixture products are manufactured.

Components	CAS No.	Wt. %
Iron (Fe)- Base Metal	7439-89-6	40 – 90
Chromium (Cr)	7440-47-3	5 – 35
Nickel (Ni)	7440-02-0	0 – 40
Carbon (C)	7440-44-0	0 - 3
Manganese (Mn)	7439-96-5	0 - 10
Phosphorus (P)	7723-14-0	0 -0.05
Sulfur (S)	7704-34-9	0 – 0.50
Silicon (Si)	7440-21-3	0 – 5
Molybdenum (Mo)	7439-98-7	0 - 10
Nitrogen (N)	7727-37-9	0 – 0.50
Copper (Cu)	7440-50-8	0 – 6
Cobalt (Co)	7440-48-4	0 - 1
Aluminum (Al)	7429-90-5	0 – 0.50
Titanium (Ti)	7440-32-6	0 – 2
Niobium (Nb)	7440-03-1	0 - 2
Tungsten (W)	7440-33-7	0 - 2
Vanadium (V)	7440-62-2	Trace
Lead (Pb)	7439-92-1	Trace

Note: Exact percentages of each ingredient are not specified due to batch to batch variation and this SDS is used for a group of substantially similar mixtures.

SECTION 4 – FIRST AID MEASURES

Eye Contact: Wash with copious amounts of water for 15 minutes. If irritation persists, obtain medical assistance.

Skin Contact: In case of overexposure to dusts or particulates, wash with soap and water. Seek medical attention if irritation develops or persists. If thermal burn occurs, flush area with cold water and seek immediate medical attention.

Inhalation: In case of overexposure to dusts or fumes, remove to fresh air. Seek immediate medical attention if respiratory symptoms occur.

Ingestion: If significant amounts of dust are ingested, seek immediate medical attention

Most Important Symptoms and Effects Including Acute and Delayed: Product as a solid and under normal conditions not likely to produce acute or chronic health effects. However, individual customer processes such as cutting, grinding, milling, melting, abrasive blasting, machining and welding may result in the formation of fumes, dust, and/or particulates containing the component elements of these materials which may cause difficulty in breathing, coughing or wheezing. May cause allergic skin reactions.

Notes to Physician: May cause sensitization by skin contact or inhalation. Inhalation of metal fumes or metal oxides may cause cough, chills, weakness, nausea, vomiting, and muscle cramps. Treatment is symptomatic and condition is usually limited to 24-48 hours, treat accordingly.

SECTION 5 – FIRE FIGHTING MEASURES

Suitable Extinguishing Media: Non-flammable, will not support combustion and not applicable for solid product. Use extinguishers suitable for surrounding materials. Do not use water or carbon dioxide on molten metal. For molten metal, use dry powder, dry sand, or foam suitable for molten metal fire. A fire involving metal dust should be treated as a Class D Combustible Metal fire.

Specific hazards arising from material: Not applicable for solid product

Hazardous Combustion Products: Not applicable for solid product. At temperatures above melting point, fumes containing metal oxides may be liberated. High concentration of combustible metallic fines in the air may present an explosion hazard.

Special Protective Equipment and Fire Fighting Instructions: Firefighters entering confined space should wear self-contained NIOSH/MSHA-approved breathing apparatus and full protective clothing and equipment.

Explosion Data: High concentration of combustible metallic fines in the air may present an explosion hazard.

SECTION 6 – ACCIDENTAL RELEASE MEASURES

In solid form this material poses no special clean-up issues. If this material is in dust form, removal by vacuuming using non-sparking tools or wet sweeping methods are recommended to prevent the spreading of the dust. Ensure proper ventilation. Avoid contamination of air and water. Clean up personnel should be protected against dust inhalation and eye and skin contact.

SECTION 7 – HANDLING AND STORAGE

Precautions for safe handling: Not applicable in solid state. Operations involving the generation of high concentrations of airborne particulates should be evaluated and controlled as necessary. Practice good housekeeping. Avoid breathing metal fumes and/or dust.

Precautions for safe storage: Do not store near strong acids and incompatible materials.

SECTION 8 – EXPOSURE CONTROLS/ PERSONNEL PROTECTION

Control Parameters: There are no exposure limits for this product in solid form. The exposure limit for iron-containing fumes has been established at 5 mg/ m3 with ACGIH's TWA. The individual complex compounds with the fume may have lower exposure limits than that of the general fume.

				Exposure Limits		
			ACGIH TLV		OSHA PEL	
Components	**CAS No.**	**Wt. %**	**mg/m3**	**Form**	**Mg/m3**	**Form**
Iron (Fe)- Base Metal	7439-89-6	40 – 90	5	Iron Oxide Dust/Fume	10	Iron Oxide fume
Chromium (Cr)	7440-47-3	5 – 35	0.50 0.05 0.01	Metal and Cr III Cr VI Sol. Comps. CrV1 Insol. Comps.	1 0.50 5 ug/m3 2.5 ug/m3	Metal Cr III Cr VI Action Level Cr
Nickel (Ni)	7440-02-0	0 – 40	1.5 0.1 0.2	Metal Sol. Comps. Insol. Comps.	1	Metal
Carbon (C)	7440-44-0	0 - 3		Not Established		Not Established
Manganese (Mn)	7439-96-5	0 - 10	0.2	Elemental Mn & Inorganic Comps.	5	Fume (Ceiling)
Phosphorus (P)	7723-14-0	0 -0.05	0.1	Phosphorus	0.1	Phosphorus
Sulfur (S)	7704-34-9	0 – 0.50	5.2 13	Sulfur Dioxide Sulfur Dioxide(STEL)	13	Sulfur Dioxide
Silicon (Si)	7440-21-3	0 – 5	10	Total Dust	15 5	Total Dust Respirable Dust
Molybdenum (Mo)	7439-98-7	0 - 10	5 10	Sol. Comps. Mo Insol. Comps. Mo	5 15	Sol. Comps. Mo Insol. Comps. Mo
Nitrogen (N)	7727-37-9	0 – 0.50		Simple Asphyxiant		Simple Asphyxiant
Copper (Cu)	7440-50-8	0 – 6	0.2 1.0	Fume Dust & Mist	0.1 1.0	Fume Dust & Mist
Cobalt (Co)	7440-48-4	0 - 1	0.02	Metal, Dust & Fume	0.1	Metal, Dust,&Fume
Aluminum (Al)	7429-90-5	0 – 0.50	1 5	Respirable Dust Welding Fume	15 5	Metal & Total Dust Respirable Dust
Titanium (Ti)	7440-32-6	0 – 2	10	Ti Dioxide Total Dust	15	Ti Dioxide Total Dust
Niobium (Nb)	7440-03-1	0 - 2		Not Established		Not Established
Tungsten (W)	7440-33-7	0 - 2	5 10	Insol. Comps. W Sol. Comps. W (STEL)	15 5	Total Dust Respirable Dust
Vanadium (V)	7440-62-2	Trace	0.05	Oxide Dust & Fume	0.5 0.1	Oxide Dust-ceiling Oxide Fume-ceiling
Lead (Pb)	7439-92-1	Trace	0.05	Dust/Fume (A3 Carcinogen)	0.05	Dust/ Fume
Zinc (Zn)	7440-66-6	Trace	10 5 10	Oxide Dust Oxide Fume Oxide Fume (STEL)	5 10	Oxide Fume Oxide Dust

Note: OSHA PEL's (Permissible Exposure Limit) and Threshold Limit Values (TLV) established by the Occupational Health and Safety Administration (OSHA) and the American Conference of Governmental Industrial Hygienists (ACGIH) are 8 hour time weighted averages (TWA) concentrations unless otherwise noted. STEL relates to ACGIH's short term exposure limit.

Appropriate Engineering Controls: Local and/ or general exhaust ventilation should be used to ensure worker exposure below applicable exposure limits during cutting, grinding, milling, melting, abrasive blasting, machining and welding, and any other process which may generate airborne contaminants.

Individual Protective Measures: Dependent upon process being performed on material each operation must be addressed for suitable equipment.

Wear gloves as required and suitable for protection against injury and skin contact. For eye protection, safety glasses, face shield or goggles as required should be worn. Protective clothing and footwear as required to minimize skin exposure to dust and/or molten metal. If concentrations exceed established limits, use NIOSH/MSHA approved particulate respirators (dust & fume or high efficiency dust & fume).

SECTION 9 – PHYSICAL AND CHEMICAL PROPERTIES

Physical State	Solid	*Appearance*	Solid, Silver Grey Metallic
Odor	Odorless	*Odor Threshold*	Not Applicable
pH	Not Applicable	*Melting Point*	2500- 2900 F
Boiling Point	Not Applicable	*Flash Point*	Not Applicable
Evaporation Point	Not Applicable	*Flammability (solid,gas)*	Not Flammable
Upper Flammable Limits	Not Applicable	*Lower Flammable Limit*	Not Applicable
Vapor Pressure	Not Applicable	*Vapor Density*	Not Applicable
Relative Density	Not Applicable	*Specific Gravity*	7.6 – 7.9
Solubility	Not Applicable	*Partition Coefficient*	No data
Auto-Ignition Temp (C)	Not Applicable	*Decomposition Temperature*	No data
Viscosity	Not Applicable		
Other Information	Not Applicable		

SECTION 10 – STABILITY AND REACTIVITY

Reactivity: Not determined in solid form- stable.
Chemical Stability: Yes, solid stable under normal storage and handling conditions.
Possibility of Hazardous Reactions: Hazardous polymerization will not occur.
Conditions to Avoid and Incompatible Materials: Contact with acids to form hydrogen gas, do not store near strong oxidizers. Dust formation.
Hazardous Decomposition Products: Metallic fumes may be generated during certain operations such as cutting, grinding, milling, melting, abrasive blasting, machining and welding.

SECTION 11 – TOXICOLOGY INFORMATION

Components	CAS No.	Ingestion/Oral
Iron (Fe)- Base Metal	7439-89-6	LD_{50} - 30,000 mg/kg - Rat
Chromium (Cr)	7440-47-3	LD_{LO} – 71 mg/kg - Human
Nickel (Ni)	7440-02-0	LD_{50} - >9,000 mg/kg – Rat; LD_{LO} – 5 mg/kg – Guinea Pig
Carbon (C)	7440-44-0	LD_{LO} – 71 mg/kg- Human
Manganese (Mn)	7439-96-5	LD_{50} – 9,000 mg/kg - Rat
Phosphorus (P)	7723-14-0	No data available
Sulfur (S)	7704-34-9	No data available
Silicon (Si)	7440-21-3	LD_{50}- >50,000 mg/kg – Rabbit (Silicon Oxide)
Molybdenum (Mo)	7439-98-7	No data available
Nitrogen (N)	7727-37-9	No data available
Copper (Cu)	7440-50-8	TD_{LO} – 120 ug/kg - Human
Cobalt (Co)	7440-48-4	LD_{50} – 750 mg/kg – Rabbit; LD_{50} – 6171 mg/kg - Rat
Aluminum (Al)	7429-90-5	No data available
Titanium (Ti)	7440-32-6	LD_{50} - >5,000 mg/kg
Niobium (Nb)	7440-03-1	No data available
Tungsten (W)	7440-33-7	No data available
Vanadium (V)	7440-62-2	No data available
Lead (Pb)	7439-92-1	No data available
Zinc (Zn)	7440-66-6	No data available

Likely Routes of Entry: None in its natural solid state

Eyes- High concentrations of dust may cause irritation to the eyes.

Skin- Prolonged skin contact with generated dust may cause skin irritation and short term skin exposure to molten metal may cause severe burns.

Inhalation: Inhalation of metal particulate or elemental oxide fumes generated during processing may pose acute or chronic health conditions.

Symptoms Related to the Physical, Chemical, and Toxicological Characteristics: None in its natural solid state

Effects of Acute Exposure to Material: Manganese and Copper- Inhalation overexposure to manganese or copper may cause metal fume fever characterized by fever and chills after exposure with no long term effects.

Effects of Chronic Exposure to Material:

Chromium- IARC lists certain hexavalent chromium compounds under its Group 1 category- "confirmed human carcinogens" and metallic chromium under its Group 3 category- "not classifiable as to their carcinogenicity to humans". Chromium metal is classified as carcinogenic by NTP.

Nickel- IARC lists metallic nickel under its Group 2B category- "possibly carcinogenic to humans". Nickel may cause skin sensitivity.

Cobalt- Cobalt dust may result in an asthma-like condition (cough, shortness of breath). IARC lists metallic cobalt under its Group 2B category- "possibly carcinogenic to humans".

Iron- Inhalation overexposure may cause a benign pneumoconiosis (siderosis) with few or no symptoms.

Manganese- Existing studies are inadequate to assess its carcinogenicity. Susceptible to Parkinson's disease, metal fume fever, and kidney damage.

STOT (Single Exposure): No data

STOT (Repeated Exposures): Respiratory system. Allergic skin reactions.

Mutagencity of Material: Not Applicable

Reproductive Effects: Not Applicable

Teratogenicity of Material: Not Applicable

Carcinogenicity of Material: Chromium- IARC lists certain hexavalent chromium compounds under its Group 1 category- "confirmed human carcinogens" and metallic chromium under its Group 3 category- "not classifiable as to their carcinogenicity to humans". Chromium metal is classified as carcinogenic by NTP.
Nickel- IARC lists metallic nickel under its Group 2B category- "possibly carcinogenic to humans". IARC lists metallic cobalt under its Group 2B category- "possibly carcinogenic to humans".
Synergistic Materials: Not applicable
Aspiration Hazard: No data available
Sensitization of Material: Not Applicable

Notes:
STOT- Specific Target Organ Toxicity
International Agency for Research on Cancer (IARC)- Summaries & Evaluations (2008).
3rd Annual Report on Carcinogens as prepared by the National Toxicology Program (NTP).

SECTION 12 – ECOLOGICAL INFORMATION

Aquatic Ecotoxicological Data –No specific information is available for this product
Environmental Fate Data – No specific information is available for this product

SECTION 13 – DISPOSAL CONSIDERATIONS

Waste Disposal Methods- Scrap should be recycled when possible
Container Cleaning and Disposal- Dispose of in accordance with applicable federal, state, and local regulations.

SECTION 14 – TRANSPORT INFORMATION

General Shipping Information- This product is not regulated for shipping
Shipping Name and Description: Not Applicable
UN Number: Not Applicable
Hazard Class: Not Applicable
Packing Group/Risk Group: Not Applicable
Transport Regulations- Canadian Transportation of Dangerous Goods Regulations (TDG) March 2011
US Dept. of Transport (DOT) Hazardous Materials shipping information (Title 49- Transportation March 2011)

SECTION 15 – REGULATORY INFORMATION

Hazard Label Rating System
Health rating= 0, Fire rating=0, Reactivity rating=0 (solid state)

Hazardous Materials Identification System
Health=1*, Flammability=0, Reactivity=0
*Denotes possible chronic hazard if airborne dust or fumes are generated- see Section 8.

SECTION 16 – OTHER INFORMATION

Issue Date – June 1, 2015

Revision Date – August 26, 2015 – Changed facility location/ address

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