GHS SAFETY DATA SHEET

1. PRODUCT AND COMPANY IDENTIFICATION

Manufacturer: US Drop Forge Co.
1366 Auburn Road
Woolwich, Twp., NJ 08085
Emergency Contact: (856)-467-4598

Product Name: Forgings (All Material Grades)
Product Class: Fabricated Metal
Revision Date: November 2013

2. HAZARDS IDENTIFICATION

HEALTH	PHYSICAL	ENVIRONMENTAL
Respiratory Irritant (Dust/Fume)	None	None Known

Forgings pose no health concern in their normal state.
The health effects/signs and symptoms listed below would result primarily through exposure to or inhalation of dust or fumes. Ingestion is highly improbable. Absorption through the skin is virtually impossible except for splinters, which should be removed promptly. Cuts should cleaned and dressed immediately and your physician should be contacted to determine the need for further treatment, ie Tetanus vaccination.

ALUMINUM (Al) All particles of aluminum deposited in the eye may cause irreversible tissue damage to the cornea. Al salts may cause dermatitis, eczema, conjunctivitis and irritation of the mucous membranes of the upper respiratory tract. Long term inhalation exposure to Al dust or fumes has been associated with fibrotic lung condition known as Shaver's Disease; however the evidence for this is not conclusive since affected workers were exposed to other substances (such as silica) as well. Symptoms of the condition may include shortness of breath, cough and fatigue.

CHROMIUM (Cr) The toxicity and health hazards of chromium are heavily dependent upon its oxidation state. The elemental (as in the metal), divalent and trivalent forms are of very low toxicity. The hexavalent form (such as occurs in chromates and chromic acid) is very toxic and can produce both acute and chronic effects. Adverse effects on the respiratory system may include bronchospasm, edema, hypersecretion, bronchitis, irritation, allergic reactions and ulceration and perforation of the nasal septum. Respiratory symptoms may include coughing, wheezing, shortness of breath and nasal itch. Eye irritation or inflammation can also be produced. Exposure to some hexavalent chromium compounds have also been shown to be associated with an increased risk of lung cancer.

COBALT (Co) Cobalt dust and fume is mildly irritating to the eyes, skin and upper respiratory tract. An allergic dermatitis may be produced especially in skin areas subject to friction such as the creases of the elbow, knee, neck and ankles. Inhalation of Co dust and fumes may result in an asthma-like respiratory disease with symptoms such as cough and shortness of breath. In some cases this condition may progress to interstitial pneumonia with marked fibrosis. As a result, permanent disability or even death may occur.

COPPER Cu) Inhalation of Cu fume may cause irritation of the eyes, nose and throat and flu like illness called metal fume fever. Signs and symptoms of metal fume fever include fever, muscle aches, nausea, chills, dry throat, cough and weakness. Cu fume may also produce a metallic or sweet taste. Repeated or prolonged exposure to Cu fume may cause discoloration of the skin and hair.

IRON (Fe) Subjecting iron and alloys containing iron to high temperatures (such as occur during welding) will cause the formation of iron oxide. Long term exposure to iron oxide fumes or dust has been associated with a benign lung condition known as siderosis which is observable as an X-ray change. No physical impairment of lung function has been linked to siderosis.

LEAD (Pb) Chronic or acute inhalation exposures to the fumes of inorganic lead compounds (such as lead oxide) can adversely affect several organ systems including the nervous system, the gastrointestinal system, the hematological system and the renal system. The early effects are characterized by fatigue, constipation, muscle aches, abdominal pains, and decreased appetite. Later signs and symptoms can include anemia, pallor, a "lead-line" on the gums and reduced hand grip strength. Lead colic produces intense abdominal cramping which can be accompanied by constipation, nausea and vomiting. A condition called "wrist-drop" can develop if the peripheral nervous system is affected. Severe central nervous system effects (referred to as lead encephalopathy) usually occur after heavy and rapid lead exposures. Signs and symptoms may include headache, dizziness, convulsions, delirium, coma and possibly death. Long term lead exposures can also produce kidney damage with possible decreased renal function leading to such conditions as uremia.

Manganese (Mn) Mn intoxication is usually due to the oxide or salts on Mn. Elemental Mn exhibits very low toxicity. The dust or fumes can act as minor irritants to the eyes and respiratory tract. Both acute and chronic exposures may adversely affect the central nervous system (CVN) but symptoms are more likely to occur after at least on or two years of prolonged or repeated exposures. Early symptoms may include weakness in lower extremities, sleepiness, salivation, nervousness and apathy. In more advanced stages, severe muscular in coordination, impaired speech, spastic walking, mask-like facial expression and uncontrollable laughter may occur. Manganese fumes have also been reported to result in metal-fume fever, a flu-like syndrome such as dizziness, chills, fever, headache and nausea. An increased incidence of pneumonia, bronchitis and pneumonitis has been reported in some worker populations exposed to manganese. Animal studies indicate that manganese exposure may increase susceptibility to bacterial and viral infections.

MOLYBDENUM (Mo) Mo and it's compounds generally exhibit a low order of toxicity; however, soluble compounds (such as Mo trioxide) are considerably more toxic. Molybdenum trioxide may produce irritation of the eyes, nose and throat. In animals, soluble Mo compounds have also caused weight loss, diarrhea, loss of coordination, pneumoconiosis (accumulation of particles in in the lungs), breathing difficulties, anemia and colic. Animal data also suggest that repeated exposures might be associated with gout. Pneumoconiosis with X-ray findings and subjective symptoms has been observed in a small number of workers exposed to metallic molybdenum and Mo trioxide; however, no physical impairment of lung function has been linked to this condition.

NICKEL (Ni) Ni fumes and dust are respiratory irritants and may cause a severe pneumonitis. Skin contact with nickel and its compounds may cause an allergic dermatitis. The resulting skin rash is often referred to as " nickel itch". Ni and its compounds may also produce eye irritation, particularly on the inner surfaces of epidemiology studies have linked nickel and certain nickel compounds to an increased incidence of cancer of the lungs and nasal passages.

SILICON (Si) This is considered to be a nuisance particulate by the ACGIH.

TANTALUM (Ta) Metallic tantalum and its oxides have a relatively low order of toxicity. Although some animal experiments have suggested that inhalation of Ta or its oxides may produce benign and non-fibrotic pulmonary effects, no adverse effects have been reported as a result of industrial exposures. There have been some reports of adverse skin reactions due to tantalum; however, most evidence indicate that Ta is relatively inert with respect to skin contact.

TIN (Sn) The toxicity of organic tin compounds is generally low. Exposure to the dust or fumes of tin oxides can result in a benign pneumoconiosis called stannosis. No tissue reaction or pulmonary dysfunction has been associated with lung condition.

TITANIUM (Ti) Titanium and its compounds are in general, considered to be physiologically inert and of very low toxicity. Titanium dioxide dust has been reported to be a mild pulmonary irritant in humans. Most animal experiments have shown that inhalation of Ti and its oxides result in mild or transient effects on the respiratory system. Titanium dioxide is considered to be a nuisance particulate by ACGIH.

Vanadium (V) Vanadium compounds (especially V pentoxide) are irritants to the eyes, respiratory tract, and to a less frequent extent the skin. Eye symptoms may include tearing and a burning sensation. Skin rashes which may be allergic in nature, resemble eczema and may itch intensely. Excessive inhalation exposures, even after brief periods, may result in inflammation of the nasal passages, sore throat, cough, tracheitis, bronchitis, wheezing and chest pain. Excessive long term or repeated exposures may result in more severe effects such as pulmonary edema, pneumonia, chronic bronchitis and recurring episodes of labored breathing. Workers exposed to excessive levels of vanadium often show a greenish discoloration of the tongue.

ZINC (Zn) Subjecting zinc or alloys containing zinc to high temperatures(such as occurs during welding)will cause the formation of zinc oxides. Exposure to zinc oxide fumes or dust can result in a flu like illness called metal fume fever. Early symptoms may include a sweet or metallic taste in the mouth, dryness and irritation of the throat and coughing. These symptoms may progress to shortness of breath, headache, fever, chills, muscle aches, nausea, vomiting, weakness, fatigue and profuse sweating. The symptoms may last 6-48 hours and is more likely to occur after a period away from the job.

ZIRCONIUM (Zr) Zirconium compounds (silicate) have been reported to cause radiographic changes in animals due to pulmonary retention. Zr hexachloride may be irritating to the mucous membranes of the respiratory tract.

3. COMPOSITION / INFORMATION ON INGREDIENTS

COMPONENT	CAS NUMBER	EXPOSURE FORM	OSHA PEL 8hr. (mg/m3)	ACHIH-TLV TWA 8 HR (mg/m3)	ACGIH-STEL 8 HR TWA (mg/m3)
Aluminum (Al)	(7429-90-5)	Dust	-	10.0	20.0
		Fume	-	5.0	-
Cadmium (Cd)	(7440-43-9)	Dust	0.2	0.1	0.2
		Fume	0.1	0.05*	-
(Carbon) (C)	(7440-44-0)	As Carbon Black	3.5	3.5	7.0
Chromium (Cr)**	(7440-47-3)	As soluble Cr salts	0.5	0.5	-
		As soluble Cr salts	1.0	0.5	-
Cobalt (Co)	(7440-48-4)		0.1	0.1a	0.1
Copper (Cu)	(7440-50-8)	Dust	1.0	1.0	2.0
		Fume	0.1	0.2	-
Iron (Fe)	(7439-89-6)	As Iron	-	5.0	-
		As Iron oxide fume	10.0	5.0	10.0
Lead (Pb)	(7439-92-1)		0.1	0.15	0.45
Magnesium (Mg)	(7439-95-4)	As magnesium oxide fume	15.0	10.0	-
Manganese (Mn)	(7439-95-5)	Dust	5.0*	5.0*	-
		Fume	5.0*	1.0	3.0
Molybdenum (Mo)	(7439-98-7)	Soluble compounds	5.0	5.0	-
		Insoluble compounds	15.0	10.0	20.0
Nickel (Ni)	(7440-02-0)		1.0	1.0	0.3
Nitrogen (N)	(7727-37-9)		5ppm	9.0	-
Phosphorus (P)	(7723-14-0)		0.1	0.1	-
Silicon (Si)	(7740-21-3)	Total Dust	15.0	10.0	20.0
		Respirable Dust	5.0	5.0	20.0
Silver (Ag)	(7440-22-4)		0.0	0.1	-
Sulphur	((7704-34-9)	As sulphur dioxide	13.0	5.0	-
Tantalum (Ta)	(7440-25-7)		5.0	5.0	-
Tin (Sn)	(7440-31-5)		2.0	2.0	4.0
Titanium (Ti)	(7440-32-6)	As titanium dioxide	15.0	10.0	-
Tungsten	(7440-33-7)	Insoluble compounds	-	5.0	-
Vanadium	(7440-62-2)	As vanadium pentoxide , Du	0.5	0.05	-
		Fume	0.1	0.05	-
Zinc (Zn)	7440-66-6)	As zinc oxide, Dust	-	b	-
		Fume	5.0	5.0	10.0
Zirconium (Zr)	7440-67-7	Dust	5.0	5.0	-

Notes: a- ACGIH has published a TLV of 0.05 mg/m3 in their notice of intended changes.
b- TLV = 5.0 mg/m3 respirable dust, 10.0 mg/m3 total dust
*- Denotes ceiling limit
**- Known or suspected carcinogen in the form of fume or dust.

No permissible exposure limits (PEL), threshold limit value (TLV), or short term exposure levels (STEL) exist for forgings in their supplied form. The values shown above are applicable to the component elements only. Various combinations of some of these elements are present in all grades of forgings to various degrees. More specific information on a particular grade may be obtained by contacting US Drop Forge Co.

4- FIRST AID MEASURES

EYE CONTACT : Flush well with running water. Get medical attention
SKIN CONTACT: Wash exposed area well with soap and water.
INHALATION: Remove to fresh air. Provide artificial respiration or oxygen if necessary. Get medical attention.
Ingestion: Get medical attention.

5- FIRE FIGHTING MEASURES

Forgings are not considered to be combustible in the forms supplied. During subsequent processing (welding, burning, grinding, cutting, abrasive blasting, heat treatment, pickling or similar operations), the generation of dust or fumes in extremely high concentrations under severe conditions may or may not present fire and / or explosion hazards. Such processing should be preformed in well-ventilated areas to minimize any potential hazards.

Flammable Limits :N/A
Flash Point :N/A
Unusual Fire or Explosion Hazard :Always avoid pouring water or other liquids on molten metal
Extinguishing Media :Methods/materials applicable to surrounding area.
Special Fire Fighting Procedures :Use self contained breathing apparatus for protection against products. Use fire fighting techniques/media applicable to surrounding materials.

ALUMINUM & ZIRCONIUM: small chips, fine turnings and dust may ignite readily. Smoother fires with dry sand, dry salt or CLASS D fire extinguishing agents.
DO NOT use halogenated extinguishing agents on small chips or fines. Dust clouds may be explosive. Molten aluminum may explode on contact with water or other liquids.

6- ACCIDENTIAL RELEASE MEASURES

No special precautions are necessary for spills of bulk material. If large quantities of dust are spilled, remove by vacuuming or wet sweeping to prevent heavy concentrations of airborne dust. Cleanup personnel should wear respirators and protective clothing when dust is involved.
Dispose of material in accordance with local, state and federal regulations. Many steel products may be salvaged for re-use or recycling.

7- HANDLING AND STORAGE

No special precautions are necessary.

8- EXPOSURE CONTROLS / PERSONAL PROTECTION

RESPIRATORY PROTECTION: Use general and local exhaust ventilation to keep airborne dust or fumes below established TLV's. Employee should wear NIOSH approved respirators for protection against dust or fumes when established TLV's are exceeded. The TLV for total dust is 10mg/m3 and for respirable dust the TLV is 5mg/m3.

PROTECTIVE EQUIPMENT: Approved safety goggles should be worn during operations creating eye hazards. A welding hood should be worn when welding or burning. Use gloves and other protective clothing as required.

OTHER: Principles of good hygiene should be followed prior to changing into street clothes or eating. Food should not be consumed in the work area.

9- PHYSICAL AND CHEMICAL PROPERTIES

Carbon steel forgings turn reddish brown as a result of oxidation.

Melting Point	:Aluminum Alloys - 1000 Deg F min. : Copper Alloys- 2010 Deg F min, :Zirconium - 3365 Deg F min. :All other grades - 2350 Deg F min.
Boiling Point	: Extremely high (Aluminum Alloys - 4000 Deg F min.) :Copper Alloys- Not Determined :Zirconium- 7910 Deg F
Specific Gravity	: Aluminum Alloys - Approximately 3 :All other grades -approximately 6.4 - 8.5
Vapor Pressure	: 1mmHg@2340 Deg f (Aluminum)
Percent Volatile by volume	: N/A
Solubility in water	:Negligible
Appearance	: Solid metallic articles with gray, silver, copper, brass, or blackish color
Odor	: Odorless

10- STABILITY AND REACTIVITY

Stability	:Considered stable
Hazardous Decomposition	:Metallic oxides
Hazardous Polymerization	: Will not occur
Materials to avoid	:Strong acids, bases and oxidizers. Molten metal will react violently with water.
Conditions to avoid	: Excessive generation of airborne dust, which may pose moderate fire and / or explosion.

11- TOXICOLOGY INFORMATION

ACUTE: Excessive inhalation of metallic dusts or fumes may result in irritation of the eyes, nose and throat. Refer to section 1

CHRONIC: Refer to section 1

OCCUPATIONAL EXPOSURE LIMITS: Refer to section 3

12- ECOLOGICAL INFORMATION

ECOTOXICITICY: None Known

13- WASTE DISPOSAL CONSIDERATION

Follow al local, state and federal regulations

14- TRANSPORTATION INFORMATION

No recommendation

15- REGULATORY INFORMATION

Not applicable

16- OTHER INFORMATION

Note: Forgings may have one or more of the following surface treatments:
Shot peened
Electro-polished finish