HEALTH 0
FIRE 3
REACTIVITY 0

**TUNGSTEN (W)**
7440-33-7 1-20 15 5

NPPA HAZARD RATING SCALE
0-4
HEALTH 1
FIRE 3
REACTIVITY 6

Molybdenum (Mo)
7440-28-7 0.5-10 15 10

NPPA HAZARD RATING SCALE
0-4
HEALTH 1
FIRE 1
REACTIVITY 0

**CHROMIUM (Cr)**
7495-61-0 1-5 1 0.5

NPPA HAZARD RATING SCALE
0-4
HEALTH 2
FIRE 1
REACTIVITY 1

Vanadium (V)
7440-62-2 1-5 5 5

NPPA HAZARD RATING SCALE
0-4
IRRITANT.

ACUTE OVEREXPOSURE:
MAY CAUSE IRRITATION.

CHRONIC OVEREXPOSURE:
MAY CAUSE INFLAMMATION AND/OR RASH (IRRITANT OR ALLERGIC CONTACT DERMATITIS).

EYE CONTACT:
IRRITANT.

ACUTE OVEREXPOSURE:
MAY CAUSE IRRITATION WITH REDNESS, PAIN, AND ITCHING. CHRONIC OVEREXPOSURE:
MAY CAUSE CONJUNCTIVITIS.

INHALATION:
IRRITANT.

ACUTE OVEREXPOSURE:

OF TITLE III OF SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT OF 1986 AND 40
CFR PART 722.

**THIS SUBSTANCE IS REGULATED BY OSHA AS A PARTICULATE NOT OTHERWISE
REGULATED (PNSR). THE EXPOSURE LIMIT LISTED FOR OSHA REFERS TO TOTAL DUST.
THE OSHA PEL FOR THE RESPIRABLE FRACTION IS 5 MG/M3.**

SECTION 3 - HAZARDS IDENTIFICATION

OPERATIONS SUCH AS WELDING, GRINDING, POLISHING, MELTING, AND BRAZING MAY
CAUSE DUST OR FUME GENERATION WHICH CAN RESULT IN EXPOSURE TO THE ELEMENTS
PRESENT IN THE ALLOY.

NOTE:
HEALTH EFFECTS LISTED ARE FOR EXPOSURE TO METALLURGICAL POWDERS, DUST, OR
MIST FROM ALTERING THE TOOL. NO HEALTH EFFECTS HAVE BEEN REPORTED FOR
EXPOSURE TO THIS MATERIAL IN SOLID FORM.

INHALATION:
IRRITANT/SENSITIZER: 260 MG/CU/M3. 35 MG(V)/M3 OR 10 MG(CO)/M3 IS
IMMEDIATELY DANGEROUS TO LIFE AND HEALTH.

ACUTE OVEREXPOSURE:
SYMPTOMS OF METAL FUME FEVER INCLUDING CHILLS, FEVER, SWEATING, NAUSEA, AND
COUGH MAY APPEAR. METAL FUME FEVER RECOVERS 4 TO 10 HOURS AFTER EXPOSURE AND
LASTS 24 HOURS WITHOUT CAUSING PERMANENT DAMAGE. OTHER EFFECTS CAUSED BY
DUST AND FUME INHALATION INCLUDE METALLIC TASTES, EYES, NOSE, AND THROAT
IRRITATION, WEezING, DIFFICULTY BREATHING, AND CHEST PAIN.

CHRONIC OVEREXPOSURE:
MAY CAUSE RESPIRATORY IRRITATION, BRONCHITIS, ALLERGIC RESPIRATORY REACTION.
OBSTRUCTED AIRWAYS, BUILD-UP OF DUST IN THE LUNGS, DAMAGE TO LUNG TISSUE,
AND LUNG DISEASES, WITH SYMPTOMS AS DESCRIBED IN ACUTE OVEREXPOSURE,
ESPECIALLY INFLAMMATION OF THE RESPIRATORY TRACT, NOSE AND THROAT
IRRITATION, VIOLENT COUGHING, WEezING, KASHING, AND SHORTNESS OF BREATH.
THERE MAY ALSO BE BLOOD CHANGES, LIVER AND KIDNEY DAMAGE, AND AN INCREASED
SUSCEPTIBILITY TO RESPIRATORY INFECTIONS.

SKIN CONTACT:

FIRE AND EXPLOSION HAZARDS:
FIRE METAL PARTICLES PRODUCED WHEN GROUND, SAWED, ETC. CAN BURN. HIGH
CONCENTRATIONS OF THESE PARTICLES IN THE AIR MAY PRESENT AN EXPLOSION
HAZARD.

FLASH POINT:
NONE REPORTED.

EXTINGUISHING MEDIA:
IN SOLID FINISHED FORM, WILL NOT BURN. USE WATER TO COOL.

SPECIAL FIRE FIGHTING PROCEDURES:
DO NOT RELEASE WASTE FROM FIRE CONTROL METHODS TO SEWERS OR WATERSHOPS.
BECAUSE FIRE MAY PRODUCE TOXIC THERMAL DECOMPOSITION PRODUCTS, WEAR A SELF-
CONTAINED BREATHING APPARATUS (SCBA) WITH A FULL FACEPIECE OPERATED IN
PRESSURE-VENTED OR POSITIVE-PRESSURE MODE.

SECTION 6 - ACCIDENTAL RELEASE MEASURES
Ingestion of large amounts of steel dust is highly unlikely. However, ingestion of small amounts may occur by eating or smoking with contaminated hands.

Chronic Overexposure:
May produce the same symptoms as for acute exposure. May also adversely affect the pancreas, thyroid gland, heart, or bone marrow.

-----Section 4 - First Aid Measures-----

Inhalation:
If symptoms of pulmonary involvement develop (coughing, wheezing, Soreness of Breathing), remove from exposure area to fresh air immediately. If breathing has stopped, perform artificial respiration. Keep affected person warm and at rest. Get medical attention immediately.

Skin Contact:
If irritation or rash occurs, remove contaminated clothing and shoes immediately. Wash affected area with soap or mild detergent and large amounts of water until no evidence of material remains (Approximately 15-30 minutes). Get medical attention.

Eye Contact:
If irritation occurs, wash eyes immediately with large amounts of water, occasionally lifting upper and lower lids. Until no evidence of material remains (Approximately 15-30 minutes). Get medical attention immediately.

Ingestion:
If this material has been swallowed and person is conscious, immediately give person large amounts of water. Do not attempt to make an unconscious person vomit. Get medical attention immediately. Induce vomiting only if specifically instructed by a physician.

-----Section 5 - Fire Fighting Measures-----

Fire Fighting:
10 mg (CO)/m³ - Powered Air-Shift Air Respirator with a High Efficiency Filter with a Full Face Piece. Type C or Supplied Air Respirator with a Full Face Piece operated in pressure-demand or other positive-pressure mode.

Firefighting:
Self-contained Breathing Apparatus with a Full Face Piece operated in pressure-demand or other positive-pressure mode.

Clothing:
Employee must wear appropriate protective clothing and equipment to prevent repeated or prolonged skin contact with this substance. Soiled clothing should be laundered separately.

Gloves:
Employee must wear appropriate protective gloves or barrier creams to prevent contact with this substance.

Eye Protection:
Safety glasses with side shields or goggles are recommended. Where there is any possibility that an employee's eyes may be exposed to this substance, the employer should provide an eye wash fountain within the immediate work area for emergency use. Contact lenses should not be worn when handling these materials.

Steps to be taken if material is released or spilled:
Sweep up with minimum amount of dust generation and place in suitable clean, dry containers for later disposal or reclamation. Residue should be cleaned up using a high efficiency particulate filter vacuum or wet clean up.

-----Section 7 - Handling and Storage-----

Handling Precautions:
Operations such as welding, dust generation, or fume generation can result in hazardous exposure to the elements present in the alloy. If necessary, precautions aren't taken. Protect against dust and fume inhalation and skin or eye contact. Use only with local exhaust ventilation. If the steel is contaminated with oil or other compounds, take precautions to prevent additional exposure to the contaminants when handling, welding, cutting, and/or heating or melting.

Storage Requirements:
Store in a manner that prevents accidental environmental contamination from traces of industrial lubricants or wetting oils.

-----Section 8 - Exposure Controls/Personal Protection-----

Ventilation:
Provide local exhaust ventilation or general dilution to maintain exposure levels below the PEL and TLV.

Respiratory Protection:
0.5 mg (CO)/m³ - Single-use approved dust and mist respirator. 0.5 mg (CO)/m³ - Dust mask, except single-use respirator. 1 mg (CO)/m³ - Dust mask, except single-use and quantum-mask respirator. Pure or high efficiency particulate respirator. 5 mg (CO)/m³ - High efficiency particulate respirator with a full facepiece, supplied-air respirator with a full facepiece, helmet or hood, self-contained breathing apparatus with a full facepiece.

Air + Wide range of Oxiants: Ignites upon heating.

Alkali, alkali-earth metals with halocarbon: Results in heat- or impact-sensitive explosions.

Bromine Trifluoride: Reacts violently.

Dilbromine:
Bromine Pentfluoride: Incandescent at ambient or slightly elevated temperatures.

Bromine Trihalide, Chlorine Trihalide, Lead Dioxide, Methyl Fluoride, or Iodine Pentfluoride: Incandescent reaction when heated.

Fluorine: Incandescent reaction at 205°C.

Sodium Peroxide: Explosive reaction at 240°C.

Potassium Peroxide: Ignites at 330°C.

Chromium:
Ammonium Nitrate: May produce violent or explosive reaction.

Carbon Dioxide: Chromium dust may become ignitable and explosive.

Bromine Pentfluoride: May cause violent reaction.

Nitrogen Oxide or Sulphur Dioxide: May produce vigorous reaction with priming effect.

Vanadium:
Getane, Methyl Fluoride, Lithium, Chlorine, Bromine Trihalogens: Violent reaction.

Cobalt:
Ammonium Nitrate + Metals or Bromine Pentfluoride: Reacts violently and
-----SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES-----

APPEARANCE AND ODOR: SOLID, ODORLESS MATERIALS

BOILING POINT: 5000 [°F]

SOLUBILITY IN WATER: PRACTICALLY INSOLUBLE

MELTING POINT: 2500 [°F]

PETROLEUM BASED SOLVENT SOLUBILITY: PRACTICALLY INSOLUBLE

SPECIFIC GRAVITY: (H2O = 1); 7.8 TO 8.2

-----SECTION 10 - STABILITY AND REACTIVITY-----

STABILITY:

STABLE UNDER NORMAL TEMPERATURES AND PRESSURES.

DECOMPOSITION:

THERMAL OXIDATIVE DECOMPOSITION OF STEEL CAN PRODUCE METALLIC AND CARBON

OXIDES.

INCOMPATIBILITIES:

IRON;

FLUORINE OR PHOSPHORS; MAY BECOME INCANDESCENT WHEN HEATED;

CHLORINE TRIFLUORIDE; MAY CAUSE INCANDESCENT REACTION.

HYDROGEN PEROXIDE; VIOLENTLY DECOMPOSES ON CONTACT.

RAT INTRAVENOUS LDLo: 114 MG/KG

-----SECTION 11 - TOXICOLOGICAL INFORMATION-----

MOLDS:

MOLDS ARE AN EYE AND NOSE INTRINSIC IRRITANT. INDIVIDUALS WITH A

HISTORY OF ASTHMA, CHRONIC RESPIRATORY, OR LIVER DISEASE MAY BE AT INCREASED

RISK FROM EXPOSURE.

RAT INTRAPERITONEAL LDLo: 114 MG/KG.

RABBIT INTRAPERITONEAL LDLo: 70 MG/KG

CHROMIUM:

CARCINOGENIC STATUS: THERE IS EVIDENCE OF INCREASED INCIDENCE OF LUNG CANCER

AMONG CHROMIUM ALLOY WORKERS. HOWEVER, ACCORDING TO IARC, THE CHROMIUM

COMPOUNDS RESPONSIBLE CANNOT BE SPECIFIED.

COBALT:

CARCINOGENIC STATUS: THE INTERNATIONAL AGENCY FOR RESEARCH ON CANCER (IARC)

LISTS COBALT AND COBALT COMPOUNDS AS CATEGORY 2B CARCINOGENS (POSSIBLY

CARCINOGENIC TO HUMANS). COBALT FUMES OR DUST MAY CAUSE PULMONARY, SKIN, OR

EYE IRRITATION. COBALT MAY BE A SENSITIZING AGENT FOR SKIN AND RESPIRATORY

SYSTEM. CHROMIUM EXPOSURE MAY AFFECT THE HEART, PANCREAS, THYROID GLAND, OR

BONE Marrow.

RAT ORAL LDLo: 1500 MG/KG.

RABBIT ORAL LDLo: 20 MG/KG

RAT INTRAPERITONEAL LDLo: 250 MG/KG

RABBIT INTRAPERITONEAL LDLo: 100 MG/KG

SOME INGREDIENTS IN GREENFIELD PRODUCTS, INCLUDING COBALT, NICKEL, COPPER,

CHROMIUM AND CHROMIUM COMPOUNDS, ARE SUBJECT TO THE REQUIREMENTS OF SECTION

112 OF TITLE III OF SUPPLEMENT REGULATIONS AND REAUTHORIZATION ACT OF 1986 AND

40 CFR PART 372.

-----SECTION 12 - ECOLOGICAL INFORMATION-----

NO DATA ARE AVAILABLE.

-----SECTION 13 - DISPOSAL CONSIDERATIONS-----

WASTE DISPOSAL METHOD:

THIS IS A VALUABLE MATERIAL THAT SHOULD BE SENT TO AN APPROPRIATE

RECLAMATION FACILITY IF AVAILABLE. IF MATERIAL CANNOT BE SENT TO A

RECLAMATION FACILITY, DISPOSAL SHOULD BE MADE IN COMPLIANCE WITH FEDERAL,

PROVINCIAL/STATE, AND LOCAL ENVIRONMENTAL REGULATIONS.

-----SECTION 14 - TRANSPORT INFORMATION-----

MAY BE CLASSIFIED AS A HAZARDOUS SUBSTANCE WHEN IT IS IN A QUANTITY, IN ONE

PACKAGE, IN WHICH INDIVIDUAL, REGULATED COMPONENTS EQUAL OR EXCEED THE

REPORTABLE QUANTITIES ESTABLISHED BY THE DEPARTMENT OF TRANSPORTATION.

-----SECTION 15 - REGULATORY INFORMATION-----

SOMETIMES EXPLOSIVELY.

HYDRAZINUM NITRATES; DECOMPOSE EXPLOSIVELY UPON RAPID HEATING.

METHYL FLOUREN, ACETYLENE; REACTS INCANDESCENTLY.