

# FORGED Carbon Products

## Safety Data Sheet (SDS)



### Section 1 – Identification

- 1(a) Product Identifier used on Label:** Forged/FEP Carbon Products
- 1(b) Other means of identification:** Refer to Section 16
- 1(c) Recommended use of the chemical and restrictions on use:** Forged Engineering Product
- 1(d) Name, address, and telephone number:**  
 Union Electric Steel Corporation      Phone number: (412) 429-7655 (M-F 9:00 AM – 5:00 PM EDT)  
 PO Box 465  
 Carnegie, Pennsylvania 15106-0465
- 1(e) Emergency phone number:** (412) 429-7655 (24 Hours)

### Section 2 – Hazard(s) Identification

**2(a) Classification of the chemical:** Forged/FEP Carbon Product is considered an article under Reach regulation (REACH REGULATION (EC) No 1907/2006) and is not subject to classification under CLP regulation (REGULATION (EC) No 1272/2008). However, Forged/FEP Carbon Product is not exempt as an article under OSHA's Hazard Communication Standard (29 CFR 1910.1200) due to its downstream use, thus Forged/FEP Carbon Product is considered a mixture and a hazardous material. Therefore, the categories of Health Hazards as defined in "GLOBALLY HARMONIZED SYSTEM OF CLASSIFICATION AND LABELLING OF CHEMICALS (GHS), Third revised edition ST/SG/AC.10/30/Rev. 3" United Nations, New York and Geneva, 2009 have been evaluated. Refer to Section 3, 8 and 11 for additional information.

**2(b) Signal word, hazard statement(s), symbols and precautionary statement(s):**

Hazard Symbol	Hazard Classification	Signal Word	Hazard Statement(s)
	Single Target Organ Toxicity (STOT) Repeat Exposure - 1	<b>DANGER</b>	Causes damage to lungs and central nervous system through prolonged or repeated inhalation exposure. Harmful if swallowed. May cause respiratory irritation. Causes eye irritation.
	Acute Toxicity-Oral - 4 STOT Single Exposure - 3		
NA	Eye Irritation - 2B		

**Precautionary Statement(s):**

Prevention	Response	Storage/Disposal
Do not breathe dusts / fume / gas / mist / vapor / spray. Use only outdoors or in well ventilated areas. Wash thoroughly after handling. Do not eat, drink or smoke when using this product.	Get medical advice/attention if you feel unwell. If inhaled: Remove person to fresh air and keep comfortable for breathing. Call a poison center or doctor/physician if you feel unwell. If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue Rinsing. If eye irritation persists: Get medical advice/attention. If swallowed: Call a poison center or doctor/physician if you feel unwell. Rinse mouth.	Dispose of contents in accordance with federal, state and local regulations.

- 2(c) Hazards not otherwise classified:** None Known
- 2(d) Unknown acute toxicity statement (mixture):** None Known

### Section 3 – Composition/Information on Ingredients

**3(a-c) Chemical name, common name (synonyms), CAS number and other identifiers, and concentration:**

Chemical Name	CAS Number	EC Number	% by volume/weight
Iron	7439-89-6	231-096-4	Balance
Chromium	7440-47-3	231-157-5	0-8
Molybdenum	7439-98-7	231-107-2	0-3
Manganese	7439-96-5	231-105-1	0-1.65
Vanadium	7440-62-2	231-171-1	0-1.5
Carbon	7440-44-0	231-153-3	0.5-1

EC - European Community  
 CAS - Chemical Abstract Service

## Section 4 – First-aid Measures

**4(a) Description of necessary measures:**

- **Inhalation: Forged/FEP Carbon Product** as sold/shipped is not a likely form of exposure. However, during further processing (welding, grinding, burning, etc.), if inhaled: Remove person to fresh air and keep comfortable for breathing. If exposed, concerned, or feel unwell: Get medical advice/attention if you feel unwell.
- **Eye Contact: Forged/FEP Carbon Product** as sold/shipped is not a likely form of exposure. However, during further processing (welding, grinding, burning, etc.), if in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue Rinsing. If eye irritation persists: Get medical advice attention. If exposed, concerned or feel unwell: Get medical advice/attention.
- **Skin Contact: Forged/FEP Carbon Product** as sold/shipped is not a likely form of exposure. However, during further processing (welding, grinding, burning, etc.), Wash with plenty of water.
- **Ingestion: Forged/FEP Carbon Product** as sold/shipped is not a likely form of exposure. However, during further processing (welding, grinding, burning, etc.), if swallowed: Call a poison center or doctor/physician if you feel unwell. Rinse mouth. If exposed, concerned or feel unwell: Get medical advice/attention.

**4(b) Most important symptoms/effects, acute and delayed (chronic):**

- **Inhalation: Forged/FEP Carbon Product** as sold/shipped is not likely to present an acute or chronic health effect.
- **Eye: Forged/FEP Carbon Product** as sold/shipped is not likely to present an acute or chronic health effect.
- **Skin: Forged/FEP Carbon Product** as sold/shipped is not likely to present an acute or chronic health effect.
- **Ingestion: Forged/FEP Carbon Product** as sold/shipped is not likely to present an acute or chronic health effect.

However, during further processing (welding, grinding, burning, etc.) individual components may illicit an acute or chronic health effect. Refer to Section 11-Toxicological Information.

**4(c) Immediate Medical Attention and Special Treatment:** None Known

## Section 5 – Fire-fighting Measures

**5(a) Suitable (and unsuitable) Extinguishing Media:** Not Applicable for **Forged/FEP Carbon Product** as sold/shipped. Use extinguishers appropriate for surrounding materials.

**5(b) Specific Hazards arising from the chemical:** Not Applicable for **Forged/FEP Carbon Product** as sold/shipped. When burned, toxic smoke, fume and vapor may be emitted.

**5(c) Special protective equipment and precautions for fire-fighters:** Self-contained NIOSH approved respiratory protection and full protective clothing should be worn when fumes and/or smoke from fire are present. Heat and flames cause emittance of acrid smoke and fumes. Do not release runoff from fire control methods to sewers or waterways. Firefighters should wear full face-piece self-contained breathing apparatus and chemical protective clothing with thermal protection. Direct water stream will scatter and spread flames and, therefore, should not be used.

## Section 6 - Accidental Release Measures

**6(a) Personal Precautions, Protective Equipment and Emergency Procedures:** Not Applicable for **Forged/FEP Carbon Product** as sold/shipped. For spills involving finely divided particles, clean-up personnel should be protected against contact with eyes and skin. If material is in a dry state, avoid inhalation of dust.

**6(b) Methods and materials for containment and clean up:** Not Applicable for **Forged/FEP Carbon Product** as sold/shipped. Collect material in appropriate, labeled containers for recovery or disposal in accordance with federal, state, and local regulations. Follow applicable OSHA regulations (29 CFR 1910.120) and all other pertinent state and federal requirements.

## Section 7 - Handling and Storage

**7(a) Precautions for safe handling:** Not Applicable for **Forged/FEP Carbon Product** as sold/shipped, however further processing (welding, burning, grinding, etc.) with the potential for generating high concentrations of airborne particulates should be evaluated and controlled as necessary. Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Use only outdoors or in well ventilated areas. Practice good housekeeping. Avoid breathing metal fumes and/or dust. Do not eat, drink or smoke when using this product. Cut resistant gloves and sleeves should be worn when working with steel products.

**7(b) Conditions for safe storage, including any incompatibilities:** Store away from acids and incompatible materials.

## Section 8 - Exposure Controls / Personal Protection

**8(a) Occupational Exposure Limits (OELs):** **Forged/FEP Carbon Product** as sold/shipped in its physical form does not present an inhalation, ingestion or contact hazard, nor would any of the following exposure data apply. However, operations such as burning, welding (high temperature), sawing, brazing, machining, grinding, etc. may produce fumes and/or particulates. The following exposure limits are offered as reference for an experienced industrial hygienist to review.

Ingredients	OSHA PEL <sup>1</sup>	ACGIH TLV <sup>2</sup>	NIOSH REL <sup>3</sup>	IDLH <sup>4</sup>
Iron	10 mg/m <sup>3</sup> (as iron oxide fume)	5.0 mg/m <sup>3</sup> (as iron oxide dust and fume)	5.0 mg/m <sup>3</sup> (as iron oxide dust and fume)	2,500 mg Fe/m <sup>3</sup>
Carbon	15 mg/m <sup>3</sup> (total dust, PNOR <sup>5</sup> ) 5.0 mg/m <sup>3</sup> (as respirable fraction, PNOR)	10 mg/m <sup>3</sup> (as inhalable fraction, PNO <sup>5</sup> ) 3.0 mg/m <sup>3</sup> (as respirable fraction, PNO <sup>5</sup> )	NE	NE

**Section 8 - Exposure Controls / Personal Protection (continued)**

**8(a) Occupational Exposure Limits (OELs): (continued)**

Ingredients	OSHA PEL <sup>1</sup>	ACGIH TLV <sup>2</sup>	NIOSH REL <sup>3</sup>	IDLH <sup>4</sup>
Chromium	0.5 mg/m <sup>3</sup> (as Cr II & III, inorganic compounds) 1.0 mg/m <sup>3</sup> (as Cr, metal) 0.005 mg/m <sup>3</sup> (as Cr VI, inorganic compounds & certain water insoluble) "AL" 0.0025 mg/m <sup>3</sup> (as Cr VI, inorganic compounds & certain water insoluble)	0.5 mg/m <sup>3</sup> (as Cr III, inorganic compounds) 0.5 mg/m <sup>3</sup> (as Cr, metal) 0.05 mg/m <sup>3</sup> (as Cr VI, inorganic compounds) 0.01 mg/m <sup>3</sup> (as Cr VI, inorganic compounds & certain water insoluble)	0.5 mg/m <sup>3</sup> (as Cr II & III, inorganic compounds) 0.5 mg/m <sup>3</sup> (as Cr, metal) 0.001 mg/m <sup>3</sup> (as Cr VI, inorganic compounds & certain water insoluble)	250 mg/m <sup>3</sup> (as Cr II & metal) 25 mg/m <sup>3</sup> (as Cr III) 15 mg/m <sup>3</sup> (as Cr VI)
Molybdenum	15 mg/m <sup>3</sup> (as total dust, PNOR <sup>5</sup> ) 5.0 mg/m <sup>3</sup> (as respirable fraction, PNOR)	10 mg/m <sup>3</sup> (as Mo insoluble compounds, inhalable <sup>6</sup> fraction) 3.0 mg/m <sup>3</sup> (as Mo insoluble compounds, respirable fraction <sup>7</sup> ) 0.5 mg/m <sup>3</sup> (as Mo soluble compounds, respirable fraction)	NE	NE
Manganese	(C) 5.0 mg/m <sup>3</sup> (as Fume & Mn compounds)	0.2 mg/m <sup>3</sup>	(C) 5.0 mg/m <sup>3</sup> 1.0 mg/m <sup>3</sup> (as fume) (STEL) 3.0 mg/m <sup>3</sup>	500 mg Mn/m <sup>3</sup>
Vanadium	(C) 0.5 mg/m <sup>3</sup> (as V <sub>2</sub> O <sub>5</sub> , respirable dust) (C) 0.1 mg/m <sup>3</sup> (as V <sub>2</sub> O <sub>5</sub> , fume)	0.05 mg/m <sup>3</sup> (as V <sub>2</sub> O <sub>5</sub> , inhalable fraction)	(C) 0.05 mg/m <sup>3</sup> (as V <sub>2</sub> O <sub>5</sub> , total dust or fume)	35 mg/m <sup>3</sup> (as V, dust or fume)

NE - None Established

1. OSHA Permissible Exposure Limits (PELs) are 8-hour TWA (time-weighted average) concentrations unless otherwise noted. A (C) designation denotes a ceiling limit, which should not be exceeded during any part of the working exposure unless otherwise noted. A Peak is defined as the acceptable maximum peak for a maximum duration above the ceiling concentration for an eight-hour shift. A skin notation refers to the potential significant contribution to the overall exposure by the cutaneous route, either by contact with vapors or, of probable greater significance, by direct skin contact with the substance. A Short Term Exposure Limit (STEL) is defined as a 15-minute exposure, which should not be exceeded at any time during a workday. An Action level (AL) is used by OSHA and NIOSH to express a health or physical hazard. They indicate the level of a harmful or toxic substance/activity, which requires medical surveillance, increased industrial hygiene monitoring, or biological monitoring. Action Levels are generally set at one half of the PEL but the actual level may vary from standard to standard. The intent is to identify a level at which the vast majority of randomly sampled exposures will be below the PEL.
2. Threshold Limit Values (TLV) established by the American Conference of Governmental Industrial Hygienists (ACGIH) are 8-hour TWA concentrations unless otherwise noted. A Short Term Exposure Limit (STEL) is defined as the maximum concentration to which workers can be exposed for a short period of time (15 minutes) for only four times throughout the day with at least one hour between exposures. A "skin" notation refers to the potential significant contribution to the overall exposure by the cutaneous route, either by contact with vapors or, of probable greater significance, by direct skin contact with the substance. ACGIH-TLVs are only recommended guidelines based upon consensus agreement of the membership of the ACGIH. As such, the ACGIH TLVs are for guideline use purposes and are not legal regulatory standards for compliance purposes. The TLVs are designed for use by individuals trained in the discipline of industrial hygiene relative to the evaluation of exposure to various chemical or biological substances and physical agents that may be found in the workplace.
3. The National Institute for Occupational Safety and Health Recommended Exposure Limits (NIOSH-REL) - Compendium of Policy and Statements, NIOSH, Cincinnati, OH (1992). NIOSH is the federal agency designated to conduct research relative to occupational safety and health. As is the case with ACGIH TLVs, NIOSH RELs are for guideline purposes only and as such are not legal, regulatory limits for compliance purposes.
4. The "immediately dangerous to life or health air concentration values (IDLHs)" are used by NIOSH as part of the respirator selection criteria and were first developed in the mid-1970's by NIOSH. The Documentation for Immediately Dangerous to Life or Health Concentrations (IDLHs) is a compilation of the rationale and sources of information used by NIOSH during the original determination of 387 IDLHs and their subsequent review and revision in 1994.
5. PNOR (Particulates Not Otherwise Regulated). All inert or nuisance dusts, whether mineral, inorganic, or organic, not listed specifically by substance name are covered by a limit which is the same as the inert or nuisance dust limit of 15 mg/m<sup>3</sup> for total dust and 5 mg/m<sup>3</sup> for the respirable fraction.
6. Inhalable fraction. The concentration of inhalable particulate for the application of this TLV is to be determined from the fraction passing a size-selector with the characteristics defined in the ACGIH 2015 TLVs<sup>®</sup> and BEIs<sup>®</sup> (Biological Exposure Indices) Appendix D, paragraph A.
7. Respirable fraction. The concentration of respirable dust for the application of this limit is to be determined from the fraction passing a size-selector with the characteristics defined in ACGIH 2015 TLVs<sup>®</sup> and BEIs<sup>®</sup> Appendix D, paragraph C.
8. PNOS (Particles Not Otherwise Specified). Inhalable fraction - The concentration of inhalable particulate for the application of this TLV is to be determined from the fraction passing a size-selector with the characteristics defined in the ACGIH TLVs and BEIs Appendix D, paragraph A. Respirable fraction - The concentration of respirable dust for the application of this limit is to be determined from the fraction passing a size-selector with the characteristics defined in the ACGIH TLVs and BEIs Appendix D, paragraph C.

**8(b) Appropriate Engineering Controls:** Use controls as appropriate to minimize exposure to metal fumes and dusts during handling operations. Provide general or local exhaust ventilation systems to minimize airborne concentrations. Local exhaust is necessary for use in enclosed or confined spaces. Provide sufficient general/local exhaust ventilation in pattern/volume to control inhalation exposures below current exposure limits.

**8(c) Individual Protection Measures:**

- **Respiratory Protection:** Seek professional advice prior to respirator selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, use only a NIOSH-approved respirator. Select respirator based on its suitability to provide adequate worker protection for given working conditions, level of airborne contamination, and presence of sufficient oxygen. Concentration in air of the various contaminants determines the extent of respiratory protection needed. Half-face, negative-pressure, air-purifying respirator equipped with P100 filter is acceptable for concentrations up to 10 times the exposure limit. Full-face, negative-pressure, air-purifying respirator equipped with P100 filter is acceptable for concentrations up to 50 times the exposure limit. Protection by air-purifying negative-pressure and powered air respirators is limited. Use a positive-pressure-demand, full-face, supplied air respirator or self-contained breathing apparatus (SCBA) for concentrations above 50 times the exposure limit. If exposure is above the IDLH (Immediately dangerous to life or health) for any of the constituents, or there is a possibility of an uncontrolled release or exposure levels are unknown, then use a positive-demand, full-face, supplied air respirator with escape bottle or SCBA.

**Warning!** Air-purifying respirators both negative-pressure, and powered-air do not protect workers in oxygen-deficient atmospheres.

## Section 8 - Exposure Controls / Personal Protection (continued)

**8(c) Individual Protection Measures (continued):**

- **Eyes:** Wear appropriate eye protection to prevent eye contact. For operations which result in elevating the temperature of the product to or above its melting point or result in the generation of airborne particulates, use safety glasses to prevent eye contact. Contact lenses should not be worn where industrial exposures to this material are likely. Use safety glasses or goggles as required for welding, burning, sawing, brazing, grinding or machining operations.
- **Skin:** Wear appropriate personal protective clothing to prevent skin contact. Cut resistant gloves and sleeves should be worn when working with steel products. For operations which result in elevating the temperature of the product to or above its melting point or result in the generation of airborne particulates, use protective clothing, and gloves to prevent skin contact. Protective gloves should be worn as required for welding, burning or handling operations. Contaminated work clothing must not be allowed out of the workplace.
- **Other protective equipment:** An eyewash fountain and deluge shower should be readily available in the work area.

## Section 9 - Physical and Chemical Properties




- |  |  |
|--|--|
| <p><b>9(a) Appearance (physical state, color, etc.):</b> Metallic grey Solid</p> <p><b>9(b) Odor:</b> Odorless</p> <p><b>9(c) Odor Threshold:</b> NA</p> <p><b>9(d) pH:</b> NA</p> <p><b>9(e) Melting Point/Freezing Point:</b> 2,600 °C (approximate)</p> <p><b>9(f) Initial Boiling Point and Boiling Range:</b> 3,000°C (approximate)</p> <p><b>9(g) Flash Point:</b> NA</p> <p><b>9(h) Evaporation Rate:</b> NA</p> <p><b>9(i) Flammability (solid, gas):</b> Non-flammable, non-combustible</p> <p>NA - Not Applicable<br/>ND - Not Determined for product as a whole</p> | <p><b>9(j) Upper/lower Flammability or Explosive Limits:</b> NA</p> <p><b>9(k) Vapor Pressure:</b> NA</p> <p><b>9(l) Vapor Density (Air = 1):</b> NA</p> <p><b>9(m) Relative Density:</b> 7.8 SG</p> <p><b>9(n) Solubility(ies):</b> Water Insoluble</p> <p><b>9(o) Partition Coefficient n-octanol/water:</b> ND</p> <p><b>9(p) Auto-ignition Temperature:</b> NA</p> <p><b>9(q) Decomposition Temperature:</b> ND</p> <p><b>9(r) Viscosity:</b> NA</p> |
|--|--|

## Section 10 - Stability and Reactivity

- 10(a) Reactivity:** Not Determined (ND) for product in a solid form. Do not use water on molten metal.
- 10(b) Chemical Stability:** Steel products are stable under normal storage and handling conditions.
- 10(c) Possibility of hazardous reaction:** None Known
- 10(d) Conditions to Avoid:** Storage with strong acids or calcium hypochlorite.
- 10(e) Incompatible Materials:** Will react with strong acids to form hydrogen. Iron oxide dusts in contact with calcium hypochlorite evolve oxygen and may cause an explosion.
- 10(f) Hazardous Decomposition Products:** Thermal oxidative decomposition of steel products can produce fumes containing oxides of iron and manganese as well as other alloying elements.

## Section 11 - Toxicological Information

**11(a-e) Information on toxicological effects:** The following toxicity data has been determined for **Forged/FEP Carbon Product** when further processed using the information available for its components applied to the guidance on the preparation of an SDS under the GHS requirements of OSHA and the EU CPL:

Hazard Classification	Hazard Category		Hazard Symbols	Signal Word	Hazard Statement
	EU	OSHA			
<b>Acute Toxicity Hazard</b> (covers Categories 1-4)	NA*	a 4		<b>Warning</b>	Harmful if swallowed.
<b>Eye Damage/ Irritation</b> (covers Categories 1, 2A and 2B)	NA*	2B <sup>†</sup>	No Pictogram	<b>Warning</b>	Causes eye irritation.
<b>Specific Target Organ Toxicity (STOT) Following Single Exposure</b> (covers Categories 1-3)	NA*	3 <sup>i</sup>		<b>Warning</b>	May cause respiratory irritation.
<b>STOT following Repeated Exposure</b> (covers Categories 1 and 2)	NA*	i		<b>Danger</b>	Causes damage to lungs and central nervous system through prolonged or repeated inhalation exposure.

\* Not Applicable - Semi-formed steel products are considered articles under Reach regulation (REACH REGULATION (EC) No 1907/2006) and are not subject to classification under CLP regulation (REGULATION (EC) No 1272/2008).

Toxicological data listed below are presented regardless to classification criteria. Individual hazard classification categories where the toxicological information has met or exceeded a classification criteria threshold are listed above.

## Section 11 - Toxicological Information (continued)

### 11(a-e) Information on toxicological effects (continued):

- a. No LC<sub>50</sub> or LD<sub>50</sub> has been established for **Forged/FEP Carbon Product**. The following data has been determined for the components:
- **Iron:** Rat LD<sub>50</sub> =98.6 g/kg (REACH) Rat  
LD<sub>50</sub> =1060 mg/kg (IUCLID) Rat  
LD<sub>50</sub> =984 mg/kg (IUCLID) Rabbit  
LD<sub>50</sub> =890 mg/kg (IUCLID)
  - **Vanadium Pentoxide:** LD<sub>50</sub> = 145 mg/kg (Oral/Mouse)
  - **Carbon:** LD<sub>50</sub>= >10,000 mg/kg (Oral/ Rat)
  - **Manganese:** Rat LD<sub>50</sub> > 2000 mg/kg (REACH)  
Rat LD<sub>50</sub> > 9000 mg/kg (NLM Toxnet)
- b. No Skin (Dermal) Irritation data available for **Forged/FEP Carbon Product** as a mixture. The following data has been determined for the components:
- **Molybdenum:** May cause skin irritation.
- c. No Eye Irritation data available for **Forged/FEP Carbon Product** as a mixture. The following Eye Irritation information was found for the components:
- **Iron and Molybdenum:** Causes eye irritation.
  - **Vanadium Pentoxide:** Rabbit Draize – Corrosive.
- d. No Skin (Dermal) Sensitization data available for **Forged/FEP Carbon Product** as a mixture or its components.
- e. No Respiratory Sensitization data available for **Forged/FEP Carbon Product** as a mixture or its components.
- f. No Germ Cell Mutagenicity data available for **Forged/FEP Carbon Product** as a mixture. The following Mutagenicity and Genotoxicity information was found for the components:
- **Iron:** IUCLID has found some positive and negative findings in vitro.
- g. Carcinogenicity: IARC, NTP, and OSHA do not list **Forged/FEP Carbon Product** as carcinogens. The following Carcinogenicity information was found for the components:
- **Welding Fumes** - IARC Group 2B carcinogen, a mixture that is possibly carcinogenic to humans.
  - **Chromium (as metal and trivalent chromium compounds)** – IARC Group 3 carcinogens, not classifiable as to their human carcinogenicity.
  - **Vanadium Pentoxide:** IARC - 2B, ACGIH - Animal carcinogen A-4. 104 wk Rat inhalation carcinogenicity - some evidence of lung neoplasms in males. 104 wk Mouse inhalation carcinogenicity - clear evidence of carcinogenicity.
- h. No Toxic Reproduction data available for **Forged/FEP Carbon Product** as a mixture. The following Toxic Reproductive information was found for the components:
- **Vanadium Pentoxide:** Mouse 3 mo inhalation decreases in epididymal sperm motility. Rat 3 mo inhalation no effects in males increase in estrous in females (REACH and NTP).
- i. No Specific Target Organ Toxicity (STOT) following a Single Exposure data available for **Forged/FEP Carbon Product** as a mixture. The following STOT following a Single Exposure data was found for the components:
- **Iron and Molybdenum:** Irritating to Respiratory tract.
  - **Vanadium Pentoxide:** Kidney, lung, and thorax cardiac rate increased.
- j. No Specific Target Organ Toxicity (STOT) following Repeated Exposure data was available for **Forged/FEP Carbon Product** as a whole. The following STOT following Repeated Exposure data was found for the components:
- **Manganese:** Inhalation of metal fumes - Degenerative changes in human Brain; Behavioral: Changes in motor activity and muscle weakness (Whitlock *et al.*, 1966).
  - **Vanadium Pentoxide:** Rat 90 day feeding LOEL 3 mg/kg based on erythropenia, anemia in all groups. Rat 16 da inhalation LOEC = 2 mg/m<sup>3</sup> based on survival and inflammation in Lung (NTP Study). Rat 90 da inhalation NOAEC 1 mg/m<sup>3</sup> based on lung effects (NTP and REACH).

The above toxicity information was determined from available scientific sources to illustrate the prevailing posture of the scientific community. The scientific resources includes: The American Conference of Governmental Industrial Hygienist (ACGIH) Documentation of the Threshold Limit Values (TLVs) and Biological Exposure indices (BEIs) with Other Worldwide Occupational Exposure Values 2009, The International Agency for Research on Cancer (IARC), The National Toxicology Program (NTP) updated documentation, the World Health Organization (WHO) and other available resources, the International Uniform Chemical Information Database (IUCLID), European Union Risk Assessment Report (EU-RAR), Concise International Chemical Assessment Documents (CICAD), European Union Scientific Committee for Occupational Exposure Limits (EU-SCOEL), Agency for Toxic Substances and Disease Registry (ATSDR), Hazardous Substance Data Bank (HSDB), and International Programme on Chemical Safety (IPCS).

The following health hazard information is provided regardless to classification criteria and is based on the individual component(s) and potential resultant components from further processing:

#### Acute Effects:

- **Inhalation:** Excessive exposure to high concentrations of metal dust may cause irritation to the eyes, skin and mucous membranes of the upper respiratory tract. Excessive inhalation of fumes of freshly formed metal oxide particles sized below 1.5 micrometer and usually between 0.02-0.05 micrometers from many metals can produce an acute reaction known as “metal fume fever”. Symptoms consist of chills and fever (very similar to and easily confused with flu symptoms), metallic taste in the mouth, dryness and irritation of the throat followed by weakness and muscle pain. The symptoms come on in a few hours after excessive exposures and usually last from 12 to 48 hours. Long-term effects from metal fume fever have not been noted. Freshly formed oxide fumes of manganese and copper have been associated with causing metal fume fever.
- **Eye:** Excessive exposure to high concentrations of metal dust may cause irritation to the eyes.
- **Skin:** Skin contact with metal dusts may cause irritation or sensitization, possibly leading to dermatitis. Skin contact with metallic fumes and dusts may cause physical abrasion.
- **Ingestion:** Ingestion of harmful amounts of **Forged/FEP Carbon Product** as distributed is unlikely due to its solid insoluble form. Ingestion of metal dust may cause nausea or vomiting.

**Section 11 - Toxicological Information (continued)**

**Acute Effects by component:**

- **Iron and iron oxides:** Iron is harmful if swallowed, causes skin irritation, and causes eye irritation. Contact with iron oxide has been reported to cause skin irritation and serious eye damage. Particles of iron or iron compounds, which become imbedded in the eye, may cause rust stains unless removed fairly promptly.
- **Chromium, chromium oxides and hexavalent chrome:** Hexavalent chrome causes damage to gastrointestinal tract, lung, severe skin burns and eye damage, serious eye damage, skin contact may cause an allergic skin reaction. Inhalation may cause allergic or asthmatic symptoms or breathing difficulties.
- **Molybdenum and molybdenum oxides:** Molybdenum causes skin and eye irritation. Molybdenum oxide is toxic if swallowed, and causes eye irritation.
- **Manganese and manganese oxides:** Manganese and Manganese oxide is harmful if swallowed.
- **Vanadium and vanadium Pentoxide:** Vanadium oxide is fatal if swallowed or inhaled, and may be harmful in contact with skin.
- **Carbon:** Not Reported/Not classified

**Delayed (chronic) Effects by component:**

- **Iron and iron oxides:** Chronic inhalation of excessive concentrations of iron oxide fumes or dusts may result in the development of a benign pneumoconiosis, called siderosis, which is observable as an X-ray change. No physical impairment of lung function has been associated with siderosis. Inhalation of excessive concentrations of ferric oxide may enhance the risk of lung cancer development in workers exposed to pulmonary carcinogens. Iron oxide is listed as a Group 3 (not classifiable) carcinogen by the International Agency for Research on Cancer (IARC).
- **Chromium, chromium oxides and hexavalent chromium:** The health hazards associated with exposure to chromium are dependent upon its oxidation state. The metal form (chromium as it exists in this product) is of very low toxicity. The hexavalent form is very toxic. Repeated or prolonged exposure to hexavalent chromium compounds may cause respiratory irritation, nosebleed, ulceration and perforation of the nasal septum. Industrial exposure to certain forms of hexavalent chromium has been related to an increased incidence of cancer. NTP (The National Toxicology Program) Fourth Annual report on Carcinogens cites "certain Chromium compounds" as human carcinogens. ACGIH has reviewed the toxicity data and concluded that chromium metal is not classifiable as a human carcinogen. Hexavalent chromium may cause genetic defects and is suspected of damaging the unborn child. Developmental toxicity in the mouse, suspected of damaging fertility or the unborn child.
- **Molybdenum and molybdenum oxides:** Certain handling operations, such as burning and welding, may generate both insoluble molybdenum compounds (metal and molybdenum dioxide) and soluble molybdenum compounds (molybdenum trioxide). Molybdenum compounds generally exhibit a low order of toxicity with the trioxide the more toxic. However, some reports indicate that the dust of the molybdenum metal, molybdenum dioxide and molybdenum trioxide may cause eye, skin, nose and throat irritation in animals. Also has been reported to cause induction of tumors in experimental animals, suspected of causing cancer. Molybdenum oxide is suspected of causing cancer in humans.
- **Manganese and manganese oxides:** Chronic exposure to high concentrations of manganese fumes and dusts may adversely affect the central nervous system with symptoms including languor, sleepiness, weakness, emotional disturbances, spastic gait, mask-like facial expression and paralysis. Animal studies indicate that manganese exposure may increase susceptibility to bacterial and viral infections. Occupational overexposure (Manganese) is a progressive, disabling neurological syndrome that typically begins with relatively mild symptoms and evolves to include altered gait, fine tremor, and sometimes, psychiatric disturbances. May cause damage to lungs with repeated or prolonged exposure. Neurobehavioral alterations in worker populations exposed to manganese oxides include: speed and coordination of motor function are especially impaired.
- **Vanadium and Vanadium Pentoxide:** Vanadium is considered non-toxic. Excessive long term or repeated exposures to vanadium compounds, especially vanadium pentoxide, may result in chronic pulmonary changes such as emphysema or bronchitis. Vanadium pentoxide is suspected of damaging fertility or the unborn child. Vanadium pentoxide is fatal if swallowed or inhaled. It causes damage to lungs by single, repeated or prolonged exposure.
- **Carbon:** Chronic inhalation may lead to decreased pulmonary function.

**Section 12 - Ecological Information**

**12(a) Ecotoxicity (aquatic & terrestrial):** No Data Available for **Forged/FEP Carbon Product** as sold/shipped. However, individual components of the product when processed have been found to be toxic to the environment. Metal dusts may migrate into soil and groundwater and be ingested by wildlife as follows:

- **Iron Oxide:** LC<sub>50</sub>: >1000 mg/L; Fish 48 h-EC<sub>50</sub> > 100 mg/L (Currenta, 2008k); 96 h-LC<sub>0</sub> ≥ 50,000 mg/L. Test substance: Bayferrox 130 red (95 – 97% Fe<sub>2</sub>O<sub>3</sub>; < 4% SiO<sub>2</sub> and Al<sub>2</sub>O<sub>3</sub>) (Bayer, 1989a).
- **Hexavalent Chrome:** EU RAR listed as category 1, found acute EC<sub>50</sub> and LD<sub>50</sub> to algae and invertebrates < 1 mg.

**12(b) Persistence & Degradability:** No Data Available for **Forged/FEP Carbon Product** as sold/shipped or individual components.

**12(c) Bioaccumulative Potential:** No Data Available for **Forged/FEP Carbon Product** as sold/shipped or individual components.

**12(d) Mobility (in soil):** No data available for **Forged/FEP Carbon Product** as sold/shipped. However, individual components of the product have been found to be absorbed by plants from soil.

**12(e) Other adverse effects:** None Known

**Additional Information:**

**Hazard Category:** Not Reported

**Signal Word:** No Signal Word

**Hazard Symbol:** No Symbol

**Hazard Statement:** No Statement

**Section 13 - Disposal Considerations**

**Disposal:** Steel scrap should be recycled whenever possible. Product dusts and fumes from processing operations should also be recycled, or classified by a competent environmental professional and disposed of in accordance with applicable federal, state or local regulations.

## Section 13 - Disposal Considerations (continued)

**Container Cleaning and Disposal:** Follow applicable federal, state and local regulations. Observe safe handling precautions. European Waste Catalogue (EWC): 16-01-17 (ferrous metals), 12-01-99 (wastes not otherwise specified), 16-03-04 (off specification batches and unused products), or 15-01-04 (metallic packaging).

Please note this information is for Forged/FEP Carbon Product in its original form. Any alterations can void this information.

## Section 14 - Transport Information

**14 (a-g) Transportation Information:**

**US Department of Transportation (DOT)** under 49 CFR 172.101 **does not** regulate **Forged/FEP Carbon Product** as a hazardous material. All federal, state, and local laws and regulations that apply to the transport of this type of material must be adhered to.

<b>Shipping Name:</b> Not Applicable (NA) <b>Shipping Symbols:</b> NA <b>Hazard Class:</b> NA <b>UN No.:</b> NA <b>Packing Group:</b> NA <b>DOT/ IMO Label:</b> NA <b>Special Provisions (172.102):</b> NA	<b>Packaging Authorizations</b> a) <b>Exceptions:</b> NA b) <b>Group:</b> NA c) <b>Authorization:</b> NA	<b>Quantity Limitations</b> a) <b>Passenger, Aircraft, or Railcar:</b> NA b) <b>Cargo Aircraft Only:</b> NA <b>Vessel Stowage Requirements</b> a) <b>Vessel Stowage:</b> NA b) <b>Other:</b> NA <b>DOT Reportable Quantities:</b> NA
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**International Maritime Dangerous Goods (IMDG) and the Regulations Concerning the International Carriage of Dangerous Goods by Rail (RID)** classification, packaging and shipping requirements follow the US DOT Hazardous Materials Regulation.

**Regulations Concerning the International Carriage of Dangerous Goods by Road (ADR)** does not regulate **Forged/FEP Carbon Product** as a hazardous material.

<b>Shipping Name:</b> Not Applicable (NA) <b>Classification Code:</b> NA <b>UN No.:</b> NA <b>Packing Group:</b> NA <b>ADR Label:</b> NA <b>Special Provisions:</b> NA <b>Limited Quantities:</b> NA	<b>Packaging</b> a) <b>Packing Instructions:</b> NA b) <b>Special Packing Provisions:</b> NA c) <b>Mixed Packing Provisions:</b> NA	<b>Portable Tanks &amp; Bulk Containers</b> a) <b>Instructions:</b> NA b) <b>Special Provisions:</b> NA
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**International Air Transport Association (IATA)** does not regulate **Forged/FEP Carbon Product** as a hazardous material.

<b>Shipping Name:</b> Not Applicable (NA) <b>Class/Division:</b> NA <b>Hazard Label (s):</b> NA <b>UN No.:</b> NA <b>Packing Group:</b> NA <b>Excepted Quantities (EQ):</b> NA	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th colspan="2" style="text-align: left;">Passenger &amp; Cargo Aircraft Limited Quantity (EQ)</th> </tr> <tr> <td style="width: 50%;">Pkg Inst: NA</td> <td style="width: 50%;">Pkg Inst: NA</td> </tr> <tr> <td>Max Net Qty/Pkg: NA</td> <td>Max Net Qty/Pkg: NA</td> </tr> </table>	Passenger & Cargo Aircraft Limited Quantity (EQ)		Pkg Inst: NA	Pkg Inst: NA	Max Net Qty/Pkg: NA	Max Net Qty/Pkg: NA	<b>Cargo Aircraft Only</b> <b>Pkg Inst:</b> NA  <b>Max Net Qty/Pkg:</b> NA	<b>Special Provisions:</b> NA  <b>ERG Code:</b> NA
Passenger & Cargo Aircraft Limited Quantity (EQ)									
Pkg Inst: NA	Pkg Inst: NA								
Max Net Qty/Pkg: NA	Max Net Qty/Pkg: NA								

Pkg Inst – Packing Instructions

Max Net Qty/Pkg – Maximum Net Quantity per Package

ERG – Emergency Response Drill Code

**Transport Dangerous Goods (TDG) Classification:** **Forged/FEP Carbon Product** does not have a TDG classification.

## Section 15 - Regulatory Information

**Regulatory Information:** *The following listing of regulations relating to a UNION ELECTRIC STEEL product may not be complete and should not be solely relied upon for all regulatory compliance responsibilities.* **Forged/FEP Carbon Product** and/or its constituents are subject to the following regulations:

**OSHA Regulations:** Air Contaminant (29 CFR 1910.1000, Table Z-1, Z-2, Z-3): The product, **Forged/FEP Carbon Product** as a whole is not listed. However, individual components of the product are listed: Refer to Section 8, Exposure Controls and Personal Protection

**EPA Regulations:** The product, **Forged/FEP Carbon Product** is not listed as a whole. However, individual components of the product are listed:

Components	Regulations	
Chromium	CERCLA, CWA, SARA 313, RCRA, SDWA	
Manganese	SARA 313, SDWA	

**SARA 311/312 Potential Hazard Categories:** Immediate Acute Health Hazard; Delayed Chronic Health Hazard

**Regulations Key:**

- CAA Clean Air Act (42 USC Sec. 7412; 40 CFR Part 61 [As of: 8/18/06])
- CERCLA Comprehensive Environmental Response, Compensation and Liability Act (42 USC Secs. 9601(14), 9603(a); 40 CFR Sec. 302.4, Table 302.4, Table 302.4 and App. A)
- CWA Clean Water Act (33 USC Secs. 1311; 1314(b), (c), (e), (g); 136(b), (c); 137(b), (c) [as of 8/2/06])
- RCRA Resource Conservation Recovery Act (42 USC Sec. 6921; 40 CFR Part 261 App VIII)
- SARA Superfund Amendments and Reauthorization Act of 1986 Title III Section 302 Extremely Hazardous Substances (42 USC Secs. 11023, 13106; 40 CFR sec. 372.65) and Section 313 Toxic Chemicals (42 USC Secs. 11023, 13106; 40 CFR Sec. 372.65 [as of 6/30/05])
- TSCA Toxic Substance Control Act (15 U.S.C. s/s 2601 et seq. [1976])
- SDWA Safe Drinking Water Act (42 U.S.C. s/s 300f et seq. [1974])

## Section 15 - Regulatory Information

**EPA Regulations (continued):**

**Section 313 Supplier Notification:** The product, **Forged/FEP Carbon Product** contains the following toxic chemicals subject to the reporting requirements of section 313 of the Emergency Planning and Community Right-to-Know Act and 40 CFR part 372:

CAS #	Chemical Name	Percent by Weight
7440-47-3	Chromium	8
7439-96-5	Manganese	1.65

**State Regulations:** The product, **Forged/FEP Carbon Product** as a whole is not listed in any state regulations. However, individual components of the product are listed in various state regulations:

Pennsylvania Right to Know: Contains regulated material in the following categories:

- Hazardous Substances: Chromium, Molybdenum, Nickel, Manganese and Vanadium
- Environmental Hazards: Chromium, Nickel, Manganese and Vanadium
- Special Hazardous Substance: Chromium and Nickel

California Prop. 65: Contains elements known to the State of California to cause cancer or reproductive toxicity. This includes Chromium compounds and Nickel.

New Jersey: Contains regulated material in the following categories:

- Hazardous Substance: Chromium, Molybdenum, Nickel, Manganese and Vanadium
- Special Hazard Substance: Chromium and Manganese
- Environmental Hazard Substance: Chromium, Molybdenum, Nickel, Manganese and Vanadium

Minnesota: Chromium, Molybdenum and Manganese

Massachusetts: Chromium, Molybdenum, Nickel compounds, Manganese and Vanadium

**Other Regulations:**

**WHMIS Classification (Canadian):** The product, **Forged/FEP Carbon Product** is not listed as a whole. However individual components are listed.

Ingredients	WHMIS Classification
Manganese	Reproductive toxicity - Category 2; Specific target organ toxicity - repeated exposure - Category 1; Combustible dusts

**Forged / FEP Carbon** has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the SDS contains all the information required by the Controlled Products Regulations.

## Section 16 - Other Information

**Prepared By:** AM Health and Safety, Inc

**Original Issue Date:** 03/14/2016

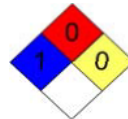
**Revised Date:** NA

**Additional Information:**

**Hazardous Material Identification System (HMIS) Classification**

<b>Health Hazard</b>	<b>1</b>
<b>Fire Hazard</b>	<b>0</b>
<b>Physical Hazard</b>	<b>0</b>

**National Fire Protection Association (NFPA)**



HEALTH= **1**, Denotes possible chronic hazard if airborne dusts or fumes are generated Irritation or minor reversible injury possible.

FIRE= **0**, Materials that will not burn.

PHYSICAL HAZARD= **0**, Materials that are normally stable, even under fire conditions, and will not react with water, polymerize, decompose, condense, or self-react. Non-explosives.

HEALTH = **1**, Exposure could cause irritation but only minor residual injury even if no treatment is given.

FLAMMABILITY = **0**, Materials that will not burn.

INSTABILITY = **0**, Normally stable, even under fire exposure conditions, and are not reactive with water.

**ABBREVIATIONS/ACRONYMS:**

<b>ACGIH</b>	American Conference of Governmental Industrial Hygienists	<b>NIF</b>	No Information Found
<b>BEIs</b>	Biological Exposure Indices	<b>NIOSH</b>	National Institute for Occupational Safety and Health
<b>CAS</b>	Chemical Abstracts Service	<b>NTP</b>	National Toxicology Program
<b>CERCLA</b>	Comprehensive Environmental Response, Compensation, and Liability Act	<b>ORC</b>	Organization Resources Counselors
<b>CFR</b>	Code of Federal Regulations	<b>OSHA</b>	Occupational Safety and Health Administration
<b>CNS</b>	Central Nervous System	<b>PEL</b>	Permissible Exposure Limit
<b>GI, GIT</b>	Gastro-Intestinal, Gastro-Intestinal Tract	<b>PNOR</b>	Particulate Not Otherwise Regulated
<b>HMS</b>	Hazardous Materials Identification System	<b>PNOC</b>	Particulate Not Otherwise Classified
<b>IARC</b>	International Agency for Research on Cancer	<b>PPE</b>	Personal Protective Equipment
<b>LC50</b>	Median Lethal Concentration	<b>ppm</b>	parts per million
<b>LD50</b>	Median Lethal Dose	<b>RCRA</b>	Resource Conservation and Recovery Act





# FORGED/FEP CARBON Products

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## Section 16 - Other Information (continued)

### ABBREVIATIONS/ACRONYMS (continued):

<b>LD<sub>Lo</sub></b>	Lowest Dose to have killed animals or humans	<b>RTECS</b>	Registry of Toxic Effects of Chemical Substances
<b>LEL</b>	Lower Explosive Limit	<b>SARA</b>	Superfund Amendment and Reauthorization Act
<b>LOEL</b>	Lowest Observed Effect Level	<b>SCBA</b>	Self-contained Breathing Apparatus
<b>LOAEC</b>	Lowest Observable Adverse Effect Concentration	<b>SDS</b>	Safety Data Sheet
<b>µg/m<sup>3</sup></b>	microgram per cubic meter of air	<b>STEL</b>	Short-term Exposure Limit
<b>mg/m<sup>3</sup></b>	milligram per cubic meter of air	<b>TLV</b>	Threshold Limit Value
<b>mppcf</b>	million particles per cubic foot	<b>TWA</b>	Time-weighted Average
<b>MSHA</b>	Mine Safety and Health Administration	<b>UEL</b>	Upper Explosive Limit
<b>NFPA</b>	National Fire Protection Association		

**Disclaimer:** This information is taken from sources or based upon data believed to be reliable. However, UNION ELECTRIC STEEL makes no warranty as to the absolute correctness or sufficiency of any of the foregoing or that additional or other measures may not be required under particular conditions.

**Forged/FEP Carbon Product covered by this SDS:**

FEP Carbon alloy (all Grades)	5CR80MO
Forged - 2CR(HCR)	5CRDH
3CR	5CRMO
3CR50C(UEHM),	DH3CR
3CRMO	SDS II
4CRMO	SHSS II
5CR	



# FORGED/FEP CARBON Products

Safety Data Sheet (SDS)

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