

Safety Data Sheet (SDS)

Section 1 – Identification

1(a) Product Identifier used on Label: Ductile Iron (DI) / Compacted Graphite Iron (CGI) Castings

1(b) Other means of identification: ASTM A395, ASTM A535, ASTM A476, ASTM A897, ASTM Compacted Graphite Iron (CGI) A842

1(c) Recommended use of the chemical and restrictions on use: Solid casting, no restrictions

1(d) Name, address, and telephone number:



ELLWOOD Engineered Castings Phone number: 330-534-8668
 7158 Hubbard Masury Road Fax Number: 330-534-1660
 Hubbard, OH 44425

1(e) Emergency phone number: 1-800-424-9300 or CHEMTREC (Day or Night): 1-800-424-9300

Section 2 – Hazard(s) Identification

2(a) Classification of the chemical: Ductile Iron (DI) / Compacted Graphite Iron (CGI) Castings 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, **Ductile Iron (DI) / Compacted Graphite Iron (CGI) Castings** is not exempt as an article under OSHA's Hazard Communication Standard (29 CFR 1910.1200) due to its downstream use, thus this 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)
	Carcinogenicity - 2 Reproductive Toxicity - 2 Single Target Organ Toxicity (STOT) Repeat Exposure -1	DANGER	Suspected of causing cancer. Suspected of damaging fertility or the unborn child. Causes damage to lungs and central nervous system through prolonged or repeated inhalation exposure. Harmful if swallowed. May cause an allergic skin reaction. May cause respiratory irritation. Causes eye irritation
	Acute Toxicity -Oral - 4 Skin Sensitization - 1 STOT Single Exposure - 3		
NA	Eye Irritation - 2B		

Precautionary Statement(s):

Prevention	Response	Storage/Disposal
Do not breathe dusts / fume / gas / mist / vapor / spray. Wear protective gloves / protective clothing / eye protection / face protection. Contaminated work clothing must not be allowed out of the workplace. Use only outdoors or in well-ventilated areas. Wash thoroughly after handling. Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Do not eat, drink or smoke when using this product.	If inhaled: Remove person to fresh air and keep comfortable for breathing. If exposed, concerned or feel unwell: Get medical advice/attention. If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue Rinsing. If on skin: Wash with plenty of water. If irritation or rash occurs: Get medical advice/attention. Take off and wash contaminated clothing before reuse. If Swallowed: Call a poison center/doctor 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	% weight
Carbon	7440-44-0	231-153-3	3.0 – 4.3
Chromium	7440-47-3	231-096-4	0.02 – 0.13
Copper	7440-50-8	231-159-6	0.01 – 1.5
Iron	7439-89-6	231-096-4	87.7 – 95.1
Magnesium	7439-95-4	231-104-6	0.0001 – 0.10
Manganese	7439-96-5	231-105-1	<1.2

Section 3 – Composition/Information on Ingredients (continued)

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

Chemical Name	CAS Number	EC Number	% weight
Molybdenum	7439-98-7	231-107-2	0.01 – 0.50
Nickel	7440-02-0	231-111-4	0.1 – 2.0
Silicon	7440-21-3	231-130-8	1.8 – 4.0
Tin	7440-31-5	231-141-8	0.1 – 0.15

EC - European Community

CAS - Chemical Abstract Service

* Percentages are expressed as typical ranges or maximum concentrations of elements for the purpose of communicating the potential hazards of the finished product.

Section 4 – First-aid Measures

4(a) Description of necessary measures:

- **Inhalation:** Ductile Iron (DI) / Compacted Graphite Iron (CGI) Castings as sold/shipped is not a likely form of exposure.
- **Eye Contact:** Ductile Iron (DI) / Compacted Graphite Iron (CGI) Castings as sold/shipped is not a likely form of exposure.
- **Skin Contact:** Ductile Iron (DI) / Compacted Graphite Iron (CGI) Castings as sold/shipped is not a likely form of exposure.
- **Ingestion:** Ductile Iron (DI) / Compacted Graphite Iron (CGI) Castings as sold/shipped is not a likely form of exposure.

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

- **Inhalation:** Ductile Iron (DI) / Compacted Graphite Iron (CGI) Castings as sold/shipped is not likely to present an acute or chronic health effect.
- **Eye:** Ductile Iron (DI) / Compacted Graphite Iron (CGI) Castings as sold/shipped is not likely to present an acute or chronic health effect.
- **Skin:** Ductile Iron (DI) / Compacted Graphite Iron (CGI) Castings as sold/shipped is not likely to present an acute or chronic health effect.
- **Ingestion:** Ductile Iron (DI) / Compacted Graphite Iron (CGI) Castings 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 Ductile Iron (DI) / Compacted Graphite Iron (CGI) Castings as sold/shipped. Use extinguishers appropriate for surrounding materials.

5(b) Specific Hazards arising from the chemical: Not Applicable for Ductile Iron (DI) / Compacted Graphite Iron (CGI) Castings 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 Ductile Iron (DI) / Compacted Graphite Iron (CGI) Castings as sold/shipped.

6(b) Methods and materials for containment and clean up: Not Applicable for Ductile Iron (DI) / Compacted Graphite Iron (CGI) Castings as sold/shipped. Collect material in appropriately 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 Ductile Iron (DI) / Compacted Graphite Iron (CGI) Castings 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. 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): Ductile Iron (DI) / Compacted Graphite Iron (CGI) Castings 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 ¹	ACGIH TLV ²	NIOSH REL ³	IDLH ⁴
Carbon	NE	NE	NE	NE
Chromium	0.5 mg/m ³ (as Cr II & III, inorganic compounds) 1.0 mg/m ³ (as Cr, metal) 0.005 mg/m ³ (as Cr VI, inorganic compounds, water soluble & insoluble) "AL" 0.0025 mg/m ³ (as Cr VI, inorganic compounds, water soluble & insoluble)	0.003 mg/m ³ (as Cr III, inorganic compounds, inhalable fraction ⁵) "DSEN & RSEN" "water-soluble" compounds only 0.5 mg/m ³ (as Cr, metal, inhalable fraction) 0.0002 mg/m ³ (as Cr VI, inorganic compounds, water insoluble & insoluble) "DSEN & RSEN" "STEL" 0.0005 mg/m ³ (as Cr VI, inorganic compounds, water insoluble & insoluble) "DSEN & RSEN"	0.5 mg/m ³ (as Cr II & III, inorganic compounds & metal) 0.0002 mg/m ³ (as Cr VI, inorganic compounds, water insoluble & insoluble)	250 mg/m ³ (as Cr II & metal) 25 mg/m ³ (as Cr III) 15 mg/m ³ (as Cr VI, Ca)
Copper	0.1 mg/m ³ (as fume, Cu) 1.0 mg/m ³ (as dusts & mists, Cu)	0.2 mg/m ³ (as fume) 1.0 mg/m ³ (as dusts & mists, Cu)	0.1 mg/m ³ (as fume, Cu) 1.0 mg/m ³ (as dusts & mists, Cu)	100 mg Cu/m ³
Iron	10 mg/m ³ (iron oxide fume)	5.0 mg/m ³ (iron oxide, respirable fraction ⁶)	5.0 mg/m ³ (iron oxide dust and fume, as Fe)	2,500 mg/m ³ (as Fe)
Magnesium	15 mg/m ³ (as magnesium oxide fume, total particulate)	10 mg/m ³ (as magnesium oxide, inhalable fraction)	NE	750 mg/m ³ (as magnesium oxide fume)
Manganese	"C" 5.0 mg/m ³ (as fume & inorganic compounds, as Mn)	0.02 mg/m ³ (as fume & inorganic compounds, as Mn, respirable fraction) 0.1 mg/m ³ (as fume & inorganic compounds, as Mn, inhalable fraction)	1.0 mg/m ³ (as fume & inorganic compounds, as Mn) "STEL" 3.0 mg/m ³ (as fume & inorganic compounds, as Mn)	500 mg/m ³ (as Mn)
Molybdenum	15 mg/m ³ (as insoluble compounds, Mo, total dust) 5.0 mg/m ³ (as soluble compounds, Mo, respirable fraction)	10 mg/m ³ (as insoluble compounds, Mo, inhalable fraction) 3.0 mg/m ³ (as insoluble compounds, Mo, respirable fraction) 0.5 mg/m ³ (as soluble compounds, Mo, respirable fraction)	NE	NE
Nickel	1.0 mg/m ³ (metal, insoluble & soluble compounds, as Ni)	1.5 mg/m ³ (metal, as Ni, as inhalable fraction) 0.2 mg/m ³ (insoluble compounds, as Ni, inhalable fraction, inorganic only) 0.1 mg/m ³ (soluble compounds, as Ni, inhalable fraction, inorganic only)	0.015 mg/m ³ (metal & insoluble and soluble compounds, as Ni)	10 mg/m ³ (as Ni)
Silicon	15 mg/m ³ (total dust) 5.0 mg/m ³ (as respirable fraction)	NE	10 mg/m ³ (as total dust) 5.0 mg/m ³ (as respirable dust)	NE
Tin	2.0 mg/m ³ (metal & inorganic compounds, as Sn, except oxides) 0.1 mg/m ³ (organic compounds, as Sn)	2.0 mg/m ³ (metal, oxides & inorganic compounds, as Sn) 0.1 mg/m ³ (organic compounds, as Sn) "STEL" 0.2 mg/m ³ (organic compounds, as Sn)	2.0 mg/m ³ (metal & inorganic compounds, as Sn, except oxides) 0.1 mg/m ³ (organic compounds, as Sn, except Cyhexatin) 2.0 mg/m ³ (tin oxides, as Sn)	100 mg/m ³ (inorganic compounds, as Sn) 25 mg/m ³ (organic compounds, as Sn)

NE - None Established

- OSHA PELs (Permissible Exposure Limits) 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 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.
- Threshold Limit Values (TLV) established by the American Conference of Governmental Industrial Hygienists (ACGIH) are 8-hour TWA concentrations unless otherwise noted. ACGIH TLVs are for guideline purposes only and as such are not legal, regulatory limits for compliance purposes. DSEN – May cause dermal sensitization. This notation is used to indicate the potential for dermal sensitization resulting from the interaction of an absorbed agent and ultraviolet light (i.e. photosensitization). RSEN – May cause respiratory sensitization.
- 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.
- 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. Ca is designated as carcinogen.
- 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 2024 TLVs[®] and BEIs[®] (Biological Exposure Indices) 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 ACGIH 2024 TLVs[®] and BEIs[®] Appendix D, paragraph C.

Section 8 - Exposure Controls / Personal Protection (continued)

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.

- **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 exposure 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

9(a) Appearance (physical state, color, etc.): Solid, Silver Gray Metallic Shape

9(b) Odor: NA

9(c) Odor Threshold: NA

9(d) pH: NA

9(e) Melting Point/Freezing Point: 2,350°F (1,300°C)

9(f) Initial Boiling Point and Boiling Range: 5,000°F (2,750°C) for iron

9(g) Flash Point: NA (for solid castings)

9(h) Evaporation Rate: NA

9(i) Flammability (solid, gas): Non-flammable, non-combustible (for solid castings)

NA - Not Applicable

ND - Not Determined for product as a whole

9(j) Upper/lower Flammability or Explosive Limits: NA (for solid castings)

9(k) Vapor Pressure: NA

9(l) Vapor Density (Air = 1): NA

9(m) Relative Density: 7.85 g/cm³ (for iron)

9(n) Solubility(ies): Insoluble

9(o) Coefficient (water/oil distribution): NA

9(p) Auto-ignition Temperature: NA

9(q) Decomposition Temperature: NA

9(r) Viscosity: NA

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/Aluminum 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 Information on toxicological effects: Ductile Iron (DI) / Compacted Graphite Iron (CGI) Castings 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.

Section 11 - Toxicological Information (continued)

11 Information on toxicological effects (continued)

Hazard Classification	Hazard Category		Hazard Symbols	Signal Word	Hazard Statement
	EU	OSHA			
Acute Toxicity Hazard (covers Categories 1-4)	NA*	4 ^a		Warning	Harmful if swallowed- Rating due to iron particulate generated from further processing (welding, grinding, burning, etc.).
Eye Damage/ Irritation (covers Categories 1, 2A and 2B)	NA*	2B ^c	No Pictogram	Warning	Causes eye irritation - Rating due to iron particulate generated from further processing (welding, grinding, burning, etc.).
Skin/Dermal Sensitization (covers Category 1)	NA*	1 ^d		Warning	May cause an allergic skin reaction - Nickel is a skin sensitizer.
Carcinogenicity (covers Categories 1A, 1B and 2)	NA*	2 ^e		Warning	Suspected of causing cancer. - Rating due to nickel particulate or fume that can enter the body generated when further processed (welding, grinding, burning, etc.).
Toxic Reproduction (covers Categories 1A, 1B and 2)	NA*	2 ^h		Warning	Suspected of damaging fertility or the unborn child. - Rating due to nickel particulate or fume that can enter the body generated when further processed (welding, grinding, burning, etc.).
Specific Target Organ Toxicity (STOT) Following Single Exposure (covers Categories 1-3)	NA*	3 ⁱ		Warning	May cause respiratory irritation. Rating due to iron particulate or fume that can enter the body generated when further processed (welding, grinding, burning, etc.).
STOT following Repeated Exposure (covers Categories 1 and 2)	NA*	1 ^j		Danger	Causes damage to lungs and central nervous system through prolonged or repeated inhalation exposure. Rating due to nickel or manganese particulate or fume that can enter the body generated when further processed (welding, grinding, burning, etc.).

* Not Applicable - Semi-formed steel/aluminum 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.

a. No LC₅₀ or LD₅₀ has been established for **Ductile Iron (DI) / Compacted Graphite Iron (CGI) Castings**. The following data has been determined for the components:

- **Iron:** Rat LD₅₀ =98.6 g/kg (REACH)
Rat LD₅₀ =1060 mg/kg (IUCLID)
Rat LD₅₀ =984 mg/kg (IUCLID)
Rabbit LD₅₀ =890 mg/kg (IUCLID)
Guinea Pig LD₅₀ =20 g/kg (TOXNET)
- **Manganese:** Rat LD₅₀ > 2000 mg/kg (REACH)
Rat LD₅₀ > 9000 mg/kg (NLM Toxnet)
- **Nickel:** LD₅₀ >9000 mg/kg (Oral/Rat)
- **Silicon:** LD₅₀ = 3160 mg/kg (Oral/Rat)
- **Copper:** Rat LD₅₀ = 481 mg/kg (REACH)
Rat LD₅₀ > 2500 mg/kg (REACH)
- **Carbon:** LD₅₀ = >10,000 mg/kg (Oral/ Rat)
- **Nickel:** LD₅₀ >9000 mg/kg (Oral/Rat)

b. No Skin (Dermal) Irritation data available for **Ductile Iron (DI) / Compacted Graphite Iron (CGI) Castings** as a mixture. The following skin irritation information was found for the components:

- **Iron Oxide:** Moderately irritating.
- **Magnesium Dioxide:** Severe skin irritant in human (HSDB).

c. No Eye Irritation data available for **Ductile Iron (DI) / Compacted Graphite Iron (CGI) Castings** as a mixture. The following eye irritation information was found for the components:

- **Iron:** Causes eye irritation.
- **Silicon:** Slight eye irritation in rabbit protocol.
- **Nickel:** Slight eye irritation from particulate abrasion only.

d. No Skin (Dermal) Sensitization data available for **Ductile Iron (DI) / Compacted Graphite Iron (CGI) Castings** as a mixture. The following eye irritation information was found for the components:

- **Nickel:** May cause allergic skin sensitization.

e. No Respiratory Sensitization data available for **Ductile Iron (DI) / Compacted Graphite Iron (CGI) Castings** as a mixture or its components.

f. No Germ Cell Mutagenicity data available for **Ductile Iron (DI) / Compacted Graphite Iron (CGI) Castings** as a mixture. The following eye irritation information was found for the components:

- **Iron:** IUCLID has found some positive and negative findings in vitro.
- **Nickel:** EU RAR has found positive results in vitro and in vivo but insufficient data for classification.

g. Carcinogenicity: IARC, NTP, and OSHA do not list EA 2014 Alloy as carcinogens. The following Carcinogenicity information was found for the components:

- **Welding Fumes (not otherwise specified):** IARC-1, carcinogen to humans; NIOSH-Ca, potential occupational carcinogen
- **Copper (dust, mist, fume, inorganic compounds, as Cu):** EPA-D, not classifiable as to human carcinogenicity (CBD, cannot be determined)

Section 11 - Toxicological Information (continued)

11 Information on toxicological effects (continued):

g. Carcinogenicity (continued):

- **Chromium (as metal):** IARC-3, unclassifiable as to carcinogenicity in humans; EPA-A, human carcinogen (inhalation), EPA-K, known human carcinogen (inhalation), EPA-D, not classifiable as a human carcinogen (oral), EPA-CBD, cannot be determined (oral)
- **Chromium (as trivalent chromium III, inorganic compounds):** IARC-3 (organic & inorganic compounds), unclassifiable as to carcinogenicity in humans; ACGIH TLV-A4, not classifiable as a human carcinogen; EPA-D, not classifiable as to human carcinogenicity (CBD, cannot be determined)
- **Chromium (hexavalent, VI, inorganic water-soluble & soluble compounds):** IARC-1, carcinogen to humans; ACGIH TLV-A1, confirmed human carcinogen; NIOSH-Ca, potential occupational carcinogen; NTP-K, known to be a carcinogen; EPA-A, human carcinogen (inhalation), EPA-K, known human carcinogen (inhalation), EPA-D, not classifiable as a human carcinogen (oral), EPA-CBD, cannot be determined (oral)
- **Iron Oxide (Fe₂O₃):** IARC-3, unclassifiable as to carcinogenicity in humans; ACGIH TLV-A4, not classifiable as a human carcinogen
- **Magnesium (oxide):** ACGIH TLV-A4, not classifiable as a human carcinogen
- **Manganese (inorganic compounds, as Mn):** ACGIH TLV-A4, not classifiable as a human carcinogen; EPA-D, not classifiable as to human carcinogenicity
- **Manganese (fume, as Mn):** ACGIH TLV-A4, not classifiable as a human carcinogen; EPA-D, not classifiable as to human carcinogenicity
- **Nickel, alloys:** IARC-2B, possibly carcinogenic to humans
- **Nickel compounds:** IARC-1, carcinogen to humans; NIOSH-Ca, potential occupational carcinogen; NTP-K, known to be a carcinogen
- **Nickel, elemental:** IARC-2B, possibly carcinogenic to humans; NIOSH-Ca, potential occupational carcinogen; NTP-K, known to be a carcinogen; ACGIH TLV-A5, not suspected as a human carcinogen
- **Nickel, insoluble compounds (as Ni):** NIOSH-Ca, potential occupational carcinogen; NTP-K, known to be a carcinogen; ACGIH TLV-A1, confirmed human carcinogen
- **Nickel, soluble compounds (as Ni):** NIOSH-Ca, potential occupational carcinogen; NTP-K, known to be a carcinogen; ACGIH TLV-A4, not classifiable as a human carcinogen
- **Tin:** ACGIH TLV-A4, not classifiable as a human carcinogen

h. No Toxic Reproduction data available for **Ductile Iron (DI) / Compacted Graphite Iron (CGI) Castings** as a mixture. The following eye irritation information was found for the components:

- **Nickel:** Effects on fertility

i. No Specific Target Organ Toxicity (STOT) following Single Exposure data available for **Ductile Iron (DI) / Compacted Graphite Iron (CGI) Castings** as a mixture. The following STOT following single exposure information was found for the components:

- **Iron:** Irritating to respiratory tract.

j. No Specific Target Organ Toxicity (STOT) following Repeated Exposure data was available for **Ductile Iron (DI) / Compacted Graphite Iron (CGI) Castings** as a mixture. The following STOT following Repeated Exposure data was found for the components:

- **Nickel:** Rat 4 wk inhalation LOEL 4 mg/m³ Lung and Lymph node histopathology. Rat 2 yr inhalation LOEL 0.1 mg/m³ Pigment in kidney, effects on hematopoiesis spleen and bone marrow and adrenal tumor. Rat 13 Week Inhalation LOAEC 1.0 mg/m³ Lung weights, and Alveolar histopathology.
- **Manganese:** Inhalation of metal fumes - Degenerative changes in human Brain; Behavioral: Changes in motor activity and muscle weakness (Whitlock *et al.*, 1966).
- **Copper:** Target organs affected - Skin, eyes liver, kidneys and respiratory tract.

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 2024, 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), European Union Classification, Labeling and Packaging. (EU CPL), Regulation on Registration, Evaluation, Authorization and Restriction of Chemicals (REACH), International Uniform Chemical Information Database (IUCLID), TOXicology Data NETwork (TOXNET), European Risk Assessment Reports (EU RAR).

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 exposure 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 this product as distributed is unlikely due to its solid insoluble form. Ingestion of metal dust may cause nausea or vomiting.

Acute Effects by component:

- **Carbon:** Not Reported/ Not Classified

Section 11 - Toxicological Information (continued)

Acute Effects by component (continued):

- **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.
- **Copper and copper oxides:** Copper may cause allergic skin reaction. Copper oxide is harmful if swallowed, causes skin and eye irritation, and may cause an allergic skin reaction.
- **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.
- **Magnesium and Magnesium oxide:** Headache, cough, sweating, nausea and fever may be caused by exposure to freshly formed fumes. The symptoms of metal fume fever do not become manifest until 4-12 hours after exposure.
- **Manganese and manganese oxides:** Manganese and Manganese oxide are harmful if swallowed.
- **Molybdenum and Oxides:** Molybdenum causes skin and eye irritation. Molybdenum oxide is toxic if swallowed, and causes eye irritation
- **Nickel and nickel oxides:** Nickel may cause allergic skin sensitization. Nickel oxide may cause an allergic skin.
- **Silicon and silicon oxides:** May be harmful if swallowed.
- **Tin:** Not Reported/ Not Classified

Delayed (chronic) Effects by component:

- **Carbon:** Not Reported/ Not Classified
- **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. 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.
- **Copper and copper oxides:** Inhalation of high concentrations of freshly formed oxide fumes and dusts of copper can cause metal fume fever. Chronic inhalation of copper dust has caused, in animals, hemolysis of the red blood cells, deposition of hemofuscin in the liver and pancreas, injury to lung cells and gastrointestinal symptoms.
- **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.
- **Magnesium Oxide:** Irritation of eyes, nose, and throat. Symptoms may include dryness of nose and mouth, cough, feeling of weakness, tightness of chest, muscular pain, chills, fever, headache, nausea, and vomiting.
- **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.
- **Molybdenum and 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.
- **Nickel and nickel oxides:** Exposure to nickel dusts and fumes can cause sensitization dermatitis, respiratory irritation, asthma, pulmonary fibrosis, edema, and may cause nasal or lung cancer in humans. Nickel causes damage to lungs through prolonged or repeated inhalation exposure. Nickel is suspected of damaging the unborn child.
- **Silicon and silicon oxides:** Silicon dusts are a low health risk by inhalation and should be treated as a nuisance dust. Eye contact with pure material can cause particulate irritation. Skin contact with silicon dusts may cause physical abrasion.
- **Tin:** No systemic effects have been reported from industrial exposure to tin. Occupational exposures to tin can cause a benign pneumoconiosis termed 'stannosis'. No cases of massive fibrosis from over-exposure to tin have been reported.

Section 12 - Ecological Information

12(a) Ecotoxicity (aquatic & terrestrial): No Data Available for **Ductile Iron (DI) / Compacted Graphite Iron (CGI) Castings** as sold/shipped. However, individual components of the product when processed have been found to be toxic to the environment.

- **Iron Oxide:** LC₅₀: >1000 mg/L; Fish 48 h-EC₅₀ > 100 mg/L (Currenta, 2008k); 96 h-LC₀ ≥ 50,000 mg/L Test substance: Bayferrox 130 red (95 – 97% Fe₂O₃; < 4% SiO₂ and Al₂O₃) (Bayer, 1989a).
- **Hexavalent Chrome:** EU RAR listed as category 1, found acute EC₅₀ and LD₅₀ to algae and invertebrates < 1 mg.
- **Nickel Oxide:** IUCLID found LC₅₀ in fish, invertebrates and algae > 100 mg/l.

12(b) Persistence & Degradability: No Data Available for **Ductile Iron (DI) / Compacted Graphite Iron (CGI) Castings** as sold/shipped or individual components.

12(c) Bioaccumulative Potential: No Data Available for **Ductile Iron (DI) / Compacted Graphite Iron (CGI) Castings** as sold/shipped or individual components.

Section 12 - Ecological Information (continued)

12(d) Mobility (in soil): No data available for **Ductile Iron (DI) / Compacted Graphite Iron (CGI) Castings** 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: Dispose of in accordance with Local, State, Federal and International regulations. Observe safe handling precautions.

Container Cleaning and Disposal: Follow Local, State, Federal and International regulations. Observe safe handling precautions

Please note this information is for Ductile Iron (DI) / Compacted Graphite Iron (CGI) Castings 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 **Ductile Iron (DI) / Compacted Graphite Iron (CGI) Castings** 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.

Section 15 - Regulatory Information

Regulatory Information: *The following listing of regulations relating to an Ellwood Engineered Castings product may not be complete and should not be solely relied upon for all regulatory compliance responsibilities.*

This 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, **Ductile Iron (DI) / Compacted Graphite Iron (CGI) Castings** 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, **Ductile Iron (DI) / Compacted Graphite Iron (CGI) Castings** is not listed as a whole. However, individual components of the product are listed:

Components	Regulations
Chromium	CERCLA, SARA 313, CWA, TSCA, SDWA
Copper	CERCLA, CWA, SARA 313, TSCA, SDWA
Iron	TSCA, SDWA
Magnesium	TSCA
Manganese	SARA 313, TSCA
Nickel	CERCLA, CWA, SARA 313, TSCA
Molybdenum	TSCA
Tin	TSCA

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

Section 313 Supplier Notification: The product, **Ductile Iron (DI) / Compacted Graphite Iron (CGI) Castings** 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	0.02 – 0.13
7440-50-8	Copper	0.01 – 1.5
7439-96-5	Manganese	<1.2
7440-02-0	Nickel	0.1 – 2.0

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 (continued)

State Regulations: The product, **Ductile Iron (DI) / Compacted Graphite Iron (CGI) Castings** 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: Magnesium, Manganese & Manganese Compounds, Molybdenum, Silicon, Tin
- Environmental Hazards: Chromium, Chromium Metal, Chromium Compounds (Hexavalent), Copper, Manganese & Manganese Compounds, Nickel,
- Special Hazardous Substance: Chromium, Chromium Metal, Chromium Compounds, Nickel,

California Prop. 65:  The product, **Ductile Iron (DI) / Compacted Graphite Iron (CGI) Castings** can expose you to chemicals including chromium (hexavalent chromium compounds), nickel (metallic), which is known to the State of California to cause cancer; and chromium (hexavalent chromium compounds) which is known to the State of California to cause reproductive toxicity. For more information go to www.P65Warnings.ca.gov.

New Jersey: Contains regulated material in the following categories:

- Hazardous Substance: Chromium, Chromium Metal, Chromium Compounds, Copper, Magnesium, Manganese & Manganese Compounds, Molybdenum, Nickel, Silicon, Tin
- Environmental Hazards: Chromium, Chromium Metal, Chromium Compounds, Copper, Manganese & Manganese Compounds, Nickel,
- Special Hazardous Substance: Chromium, Chromium Metal, Chromium Compounds, Manganese & Manganese Compounds, Silicon

Minnesota: Chromium, Chromium Compounds, Manganese & Manganese Compounds, Molybdenum, Nickel

Massachusetts: Chromium, Chromium Metal, Chromium Compounds, Copper (compounds), Magnesium, Manganese (compounds), Molybdenum, Nickel (compounds), Silicon, Tin

Other Regulations:

WHMIS Classification (Canadian): The product, **Ductile Iron (DI) / Compacted Graphite Iron (CGI) Castings** is not listed as a whole. However individual components are listed.

Ingredients	WHMIS Classification
Carbon	Combustible dusts*
Chromium	Combustible dusts*
Chromium III	Oxidizing solids - Undefined category1; Acute toxicity - oral - Category 2; Acute toxicity - dermal - Category 2; Acute toxicity - inhalation - Category 2; Skin corrosion/irritation - Category 1 (Strong acid: pH of a 1% solution = 1,1); Serious eye damage/eye irritation - Category 1; Respiratory sensitization - Category 1; Skin sensitization - Category 1A; Germ cell mutagenicity - Category 2; Carcinogenicity - Category 1A; Reproductive toxicity - Category 1B (Toxic to the development (Category 1B) Toxic to the reproductive function (Category 2); Health hazards not otherwise classified (corrosion) - Category 1
Copper	Acute oral toxicity – oral – Category 4; Combustible dusts*
Iron	Combustible dusts - Category 1 (may form combustible dust concentrations in air)
Magnesium	Flammable Solids – Category 2
Manganese	Reproductive toxicity - Category 2; Specific target organ toxicity - repeated exposure - Category 1; Combustible dusts*
Molybdenum	Combustible dusts*
Nickel	Skin sensitization – Category 1; Carcinogenicity – Category 2; Specific target organ toxicity – repeated exposure - Category 1
Silicon	Flammable solids - Category 2 (The classification "Flammable solids" refers to the amorphous form of silicon powder); Combustible dusts**

* This product could belong to the hazard class "Combustible dust", based on various factors related to the combustibility and explosiveness of its dust, including composition, shape and size of the particles.

** This product belongs to the hazard class "Combustible dust" if 5% or more by weight of its composition has a particle size < 500 µm.

This product 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: Ellwood Engineered Castings

Original Issue Date: 10/2013

Revised Date: 4/08/2024

Additional Information:

Hazardous Material Identification System (HMIS) Classification

Health Hazard	1
Fire Hazard	0
Physical Hazard	0

National Fire Protection Association (NFPA)



Section 16 - Other Information (continued)

Additional Information (continued):

Hazardous Material Identification System (HMIS) Classification

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.

National Fire Protection Association (NFPA)

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:

ACGIH	American Conference of Governmental Industrial Hygienists	NIF	No Information Found
BEIs	Biological Exposure Indices	NIOSH	National Institute for Occupational Safety and Health
CAS	Chemical Abstracts Service	NTP	National Toxicology Program
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act	ORC	Organization Resources Counselors
CLP	Classification, Labelling and Packaging	OSHA	Occupational Safety and Health Administration
CFR	Code of Federal Regulations	PEL	Permissible Exposure Limit
CNS	Central Nervous System	PNOR	Particulate Not Otherwise Regulated
GI, GIT	Gastro-Intestinal, Gastro-Intestinal Tract	PNOC	Particulate Not Otherwise Classified
HMIS	Hazardous Materials Identification System	PPE	Personal Protective Equipment
IARC	International Agency for Research on Cancer	ppm	parts per million
LC50	Median Lethal Concentration	RCRA	Resource Conservation and Recovery Act
LD50	Median Lethal Dose	REACH	Regulation on Registration, Evaluation, Authorization and Restriction of Chemicals
LD_{Lo}	Lowest Dose to have killed animals or humans	RTECS	Registry of Toxic Effects of Chemical Substances
LEL	Lower Explosive Limit	SARA	Superfund Amendment and Reauthorization Act
LOEL	Lowest Observed Effect Level	SCBA	Self-contained Breathing Apparatus
LOAEC	Lowest Observable Adverse Effect Concentration	SDS	Safety Data Sheet
µg/m³	microgram per cubic meter of air	STEL	Short-term Exposure Limit
mg/m³	milligram per cubic meter of air	TLV	Threshold Limit Value
mppcf	million particles per cubic foot	TWA	Time-weighted Average
MSHA	Mine Safety and Health Administration	UEL	Upper Explosive Limit
NFPA	National Fire Protection Association		

This information is based on our current knowledge and is intended to describe the product for the purposes of health, safety and environmental requirements only. It should not therefore be construed as guaranteeing any specific property of the product.

Ductile Iron (DI) / Compacted Graphite Iron (CGI) Castings

Signal Word: **Warning**

Symbols:



HAZARD STATEMENTS:

May cause damage to respiratory system through prolonged or repeated exposure.

PRECAUTIONARY STATEMENTS

Do not breathe dusts or fumes.
Get medical advice/attention if you feel unwell.
Dispose of contents in accordance with federal, state and local regulations.

SDS ID No.: SC-000-042

ELLWOOD Engineered Castings
7158 Hubbard Masury Road
Hubbard, OH 44425

General Information: Phone: 330-534-8668

CHEMTREC (Day or Night): 1-800-424-9300

Original Issue Date: 10/2013

Revised: 4/08/2024