



# Columbus Stainless

Document no.:  
OCH-SDS-GEN018

Title: **SAFETY DATA SHEET CARBON STEELS**

Revision: 0

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## 1. COMPANY DETAILS

COLUMBUS STAINLESS (PTY) LTD  
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MPUMALANGA 1050  
REPUBLIC OF SOUTH AFRICA  
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## 2. PRODUCT IDENTIFICATION

**Product name:** Carbon and Structural steels – Alloys (non-stainless Alloys)

**Synonyms:** Mild Steel Alloys for example Commercial Quality and SAE 1008, HSLA and line pipe steel for example X42 API PSL1, Structural Steel for example S355M

**Use/Description:** Hot-rolled Plate & Coil.

## 3. PRODUCT COMPOSITION

Hazardous Ingredients	CAS No.	%	OEL (RSA) (mg/m <sup>3</sup> )	TLV (ACGIH) (mg/m <sup>3</sup> )
Iron	7439-89-6(Fe)	>90	TWA = 10 <sup>(R)</sup> (Fume)	TWA = 5 <sup>(R)</sup> (Dust & Fume)
Chromium	7440-47-3(Cr)	<1	TWA = 0.006 <sup>(I)</sup> (Chromium III Water-soluble Compounds) TWA = 1 <sup>(I)</sup> ChromiumMetal	TWA = 0.003 <sup>(I)</sup> Water-soluble Compounds & Metal
Nickel	7440-02-0(Ni)	<0.5	TWA = 0.1 <sup>(I)</sup> (Insoluble Inorganic Compounds) TWA = 0.02 <sup>(R)</sup> (Insoluble Inorganic Compounds)	TWA = 1.5 <sup>(I)</sup> Elemental Ni TWA = 0.2 <sup>(I)</sup> Insoluble Inorganic Compounds
Molybdenum	7439-98-7(Mo)	<0.5	TWA = 10 (Total Particulate) TWA = 5 <sup>(R)</sup> (Metal & Insoluble Compounds)	TWA = 10 <sup>(I)</sup> (Metal & Insoluble Compounds) TWA = 3 <sup>(R)</sup> (Metal & Insoluble Compounds)
Manganese	7439-96-5(Mn)	<2	TWA = 0.2 (Inorganic Compounds) TWA = 0.04 <sup>(R)</sup> (Elemental)	TWA = 0.02 <sup>(R)</sup> (Elemental & Inorganic Compounds) TWA = 0.1 <sup>(I)</sup> (Elemental & Inorganic Compounds)
Silicon	7440-21-3(Si)	0.6	TWA = 10 (Total Inhalable Dust) TWA = 5 <sup>(R)</sup> (Respirable Dust)	TWA = 10 (Total Inhalable Dust) TWA = 5 <sup>(R)</sup> (Respirable Dust)
Copper	7440-50-8(Cu)	<0.5	TWA = 0.4 (Fume) TWA = 2 (Dust & Mists)	TWA = 0.2 (Fume) TWA = 1 (Dust & Mists)
Titanium	13463-67-7(TiO <sub>2</sub> )	<0.3	TWA = 10 (Total Inhalable dust)	TWA = 10 (Total Inhalable dust)
Aluminium	7429-90-5(Al)	<0.3	TWA = 2 <sup>(R)</sup> (Metal & Insoluble Compounds)	TWA = 1 <sup>(R)</sup> (Metal & Insoluble Compounds)

- Steel contains various elements in addition to those specified above. The percentage composition reflects the range that is possible within this group of products. These are not technical specifications for a particular product.
- Percentages are given as a rough guide only and actual concentrations may vary to those provided in the table.
- OEL refers the relevant South African Occupational Exposure Limits as regulated in the Occupational Health & Safety Act, Act 85 of 1993.
- ACGIH refers to American Conference of Governmental Industrial Hygienists.
- TLV = Threshold Limit Value.
- TWA = 8-hour Time Weighted Average.
- Metallic and non-metallic coatings may be applied to the product at the customer's request. These are usually classified as protective coating or lubricants. The possible presence of coatings should be recognized and considered when evaluating potential employee hazards and exposures during dust/fume generating activities and potential safety and fire hazards during handling. Any non-metallic coatings which may be applied to this product represent only a small percentage of the total weight of the product.
- I = Inhalable Fraction.
- R = Respirable Fraction.



**4. HAZARDS IDENTIFICATION**

**EMERGENCY OVERVIEW:**

- Carbon Steel products in their solid state present no inhalation, ingestion or contact health hazard. When the product is subjected to welding, burning, melting, sawing, brazing, grinding or other similar processes, potentially hazardous airborne particulate and fumes may be generated. These operations should be performed in well-ventilated areas. Avoid inhalation of metal dusts and fumes.
- Molten material may cause thermal burns.

**FLAMMABILITY:**

Not Applicable.

**PRIMARY ROUTE OF EXPOSURE:**

Inhalation of fumes from welding or burning, dust from grinding or cutting.

**ROUTES OF EXPOSURE:**

Eye and skin contact, inhalation.

**NOTE:**

Steel products in sheet, slab or coil do not pose a significant health hazard. However, when subjected to welding, burning, sawing, brazing, grinding etc. potentially hazardous fumes or dust may be generated. Inhalation of the dust or fumes from these operations may cause ill health effects if adequate exhaust ventilation systems are not in place, or if the workmen are not issued with appropriate protective equipment including respirators designed to protect against the inhalation of dust. The above operations should be performed in well-ventilated areas. The primary route of exposure is from inhalation of fumes and dusts.

**EFFECTS OF SHORT-TERM (ACUTE) EXPOSURE:**

**Inhalation:**

Excessive inhalation of metallic fumes and dusts may be irritating to respiratory passages. Excessive inhalation of fumes 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), a metallic taste in the mouth, dryness and irritation to the throat. The symptoms appear 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. Iron oxide, manganese, zinc and copper have been associated with causing metal fume fever.

**Eye Contact:**

Dust or particles may cause mechanical irritation to eyes resulting in tearing, redness and pain. Scratching of the cornea may occur if eye is rubbed. Contact with heated material may cause thermal burns.

**Skin Contact:**

Dusts or particles may cause mechanical irritation due to abrasion. Coated steel may cause skin irritation in sensitive individuals. Some components in this product are capable of causing an allergic reaction (also see chronic health effects). Contact with heated material may cause thermal burns.

**Ingestion:**

Ingestion is not anticipated under normal circumstances of use. However, this material is not expected to be acutely toxic via ingestion.



**EFFECTS OF LONG-TERM (CHRONIC) EXPOSURE:**

Chronic inhalation of high concentrations of metallic fumes and dusts are associated with the following conditions:

**Iron Oxide:**

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 IARC).

**Manganese:**

Chronic exposure to high concentrations of manganese fumes and dusts may increase the incidence of bronchitis pneumonia and lung damage and may adversely affect the central nervous system with symptoms resembling Parkinson's Disease.

**Nickel:**

Exposure to nickel dusts and fumes can cause sensitization dermatitis, respiratory, irritation, asthma, pulmonary fibrosis, oedema, and may cause nasal or lung cancer in humans. Causes damage to lungs through prolonged or repeated inhalation exposure. IARC classified nickel compounds as carcinogenic to humans (Group 1) and metallic nickel as possibly carcinogenic to humans (Group 2B).

Skin contact may cause an allergic skin rash. Nickel itch is the dermatitis resulting from sensitization to nickel; the first symptom is usually itching, which occurs up to 7 days before skin eruption occurs. The primary skin eruptions are erythematous, or follicular, which may be followed by skin ulceration. However, it should be noted that high-quality carbon steel is not regarded by dermatologists to be a health hazard in view of the negligible leaching capability of nickel from carbon steel in its massive/solid form.

Patch-testing studies, in conjunction with investigations on nickel release, show that prolonged skin contact with most carbon steel grades is unlikely to elicit a skin response in nickel-sensitized individuals. Furthermore, available data on unsensitized subjects provides no evidence that skin contact with carbon steel induces skin sensitization. There is an extremely large population exposed to carbon steels, with either prolonged or intermittent skin contact, or as a result of carbon steel surgical implants, and there are very few reports of suspected allergic reactions available in literature.

**Chromium:**

The alleged health hazards associated with exposure to chromium are dependent on its oxidation state. The metal form (chromium as it exists in this product) is of low toxicity. Note that the new promulgated South African Hazardous Chemical Agents Regulations, 2020 classified Trivalent Chromium compounds: water-soluble compounds carcinogenic to humans. The hexavalent form is very toxic. Small quantities of hexavalent chromium may be liberated from certain carbon steel welding processes as a result of the combination of temperature, oxygen and of alkali metals commonly present in welding rod coatings. Adverse effects of the hexavalent form on the skin may include ulceration and perforation of the mucous membranes of the nasal septum, irritation of the pharynx and larynx, asthmatic bronchitis, bronchospasms and oedema. Respiratory symptoms may include coughing and wheezing, shortness of breath and nasal itch. Eye irritation or inflammation may also result. The International Agency for Research on Cancer (IARC) classified both water-soluble and water-insoluble Chromium VI as carcinogenic to humans (Group 1) and the National Toxicology programme (NTP) lists hexavalent chromium compounds as a known human carcinogen.



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The American Conference of Governmental Industrial Hygienists (ACGIH) has reviewed the toxicity data and concluded that chromium metal is not carcinogenic to humans.

### EFFECTS OF LONG-TERM (CHRONIC) EXPOSURE:

#### Titanium Dioxide:

Titanium Dioxide dust is a mild pulmonary irritant, eye and skin irritant. The dusts of titanium dioxide can be placed in the nuisance category.

#### Silicon:

Elementary silicon is an inert material which appears to lack the property of causing fibrosis in lung tissue. However, slight pulmonary lesions have been reported in Laboratory animals from intra-tracheal injections of silicon dust. Silicon dust has little adverse effect on lungs and does not appear to produce significant organic disease or toxic effects when exposures are kept under the TLV. Silicon may cause chronic respiratory effects.

#### Molybdenum:

Molybdenum is not foreseen as a hazard in the present context. Though molybdenum has caused toxicity (anaemia) and poor growth in farm animals, there is no data documenting toxicity to humans due to industrial Exposure. However, molybdenum may cause lung disease and irritation to membranes of the eyes, throat and nose.

#### Copper:

Industrial exposure to copper fumes, dusts or mists results in metal fume fever with atrophic changes in nasal mucous membranes. Chronic poisoning results in Wilson's disease, characterized by a hepatic cirrhosis, brain damage, demyelination, renal disease and copper deposition in the cornea.

#### Aluminium:

Chronic inhalation of fine dusts may cause lung damage.

#### **General Comments on the Health Effects of Steel:**

Steel in its massive/solid form is not anticipated to present significant acute or chronic health effects;

Welding of steel may generate potentially harmful metal fumes. Overall, the available data suggest that welding in general may be associated with an increased risk of reporting respiratory symptoms, but provide no convincing evidence of any increased risk of developing lung function abnormalities or of any specific association with steel. Welding of any type of steel appears to be associated with a possible increase in the risk of lung cancer. Airborne dust from grinding of steel is made up of spinels and therefore has a different chemical composition and metallurgical structure than that of metallic steel. According to the limited available data, there appears to be no identifiable hazard associated with grinding dust from steel. Nevertheless, as some of the airborne dust is respirable and therefore presents potential for inhalation exposure, it appears appropriate to treat grinding dust as any other kind of dust and to control exposure to the appropriate exposure limit.

## 5. FIRST AID MEASURES

#### **INHALATION:**

Not a likely form of exposure in its solid form. However, during further processing (welding, grinding, burning, etc.), if inhaled: Remove victim from the adverse environment to fresh air and keep at rest in a position comfortable for breathing. Seek medical attention if breathing difficulty persists.

#### **SKIN CONTACT:**

Skin contact with steel in its solid form is unlikely to result in adverse health effects. Obtain Medical advice if skin irritation does occur. If thermal burn occurs, flush area with cold water and obtain immediate medical attention.



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### EYE CONTACT:

Not a likely form of exposure in its solid form. However, during further processing (welding, grinding, burning, etc.), if in eyes: Rinse cautiously with large amounts of water for several minutes, while holding the eyelids wide open. Remove contact lenses, if present and easy to do. Continue rinsing. If irritation develops or persists obtain medical attention. Thermal burns should be treated as medical emergencies.

### INGESTION:

Not a likely form of exposure in its solid form. However, during further processing (welding, grinding, burning, etc.), if swallowed: Rinse mouth. If vomiting occurs naturally, have victim lean forward to reduce the risk of aspiration. Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Seek prompt medical attention.

## 6. FIRE FIGHTING MEASURES

### FLASH POINT:

Not Applicable

### EXTINGUISHING MEDIA:

Suitable to surrounding fire. Note, for molten metal, use dry powder or sand.

### UNUSUAL FIRE OR EXPLOSION HAZARDS:

Steel products do not present fire or explosion hazards under normal conditions; however certain coatings such as oils, etc. may be flammable.

## 7. ACCIDENTAL RELEASE MEASURES

### SPILL PRECAUTIONS:

Not applicable for solid product. Contain spilled dust and prevent from entering water courses or sewers. Fine turnings and small chips should be swept or vacuumed and placed into appropriate disposal containers. Steel can be recycled. Wear adequate personal protective equipment during clean-up duties. Avoid inhalation of dust.

### WASTE DISPOSAL METHOD:

Dispose of in accordance with applicable government and local regulations.

## 8. HANDLING AND STORAGE

### HANDLING:

- Beware of risk of physical injury from sharp edges (steel plate & coil).
- Avoid breathing dust or fumes.

### STORAGE:

Store away from strong oxidizers. Keep in a dry and ventilated place.

## 9. EXPOSURE CONTROLS & PERSONAL PROTECTION

### ENGINEERING CONTROLS:

#### Ventilation:

Local exhaust ventilation should be used to keep worker exposure below accepted exposure limits during welding and grinding operations.

### PERSONAL PROTECTIVE EQUIPMENT:

#### Respiratory protection:

When engineering or administrative controls are not feasible to control overexposure during welding and grinding operations or while they are being instituted, appropriate Government approved respirators must be



used and selected according to advice from Occupational Hygienist or Safety Officer.

**Eye protection:**

Appropriate protective eye and face equipment shall be worn where there is a reasonable probability of injury that can be prevented by such equipment (such as welding, grinding).

**Protective gloves:**

As required when handling metal.

**PERSONAL HYGIENE:**

Comply with personal hygiene standards associated with exposure to welding and grinding pollutants.

**10. PHYSICAL AND CHEMICAL PROPERTIES:**

APPEARANCE:	Grey Solid
ODOUR:	Odourless/Metallic
pH:	Not Applicable
BOILING POINT:	Not Applicable
MELTING POINT:	1400-1550°C depending on composition
FLASH POINT:	Not Applicable
FLAMMABILITY:	Not Applicable EXPLOSIVE
PROPERTIES:	Not Applicable OXIDISING
PROPERTIES:	Not Applicable VAPOUR
PRESSURE:	Not Applicable
SPECIFIC GRAVITY:	7.7-8.0 (Water = 1)
SOLUBILITY IN WATER:	Insoluble

**11. STABILITY & REACTIVITY**

**STABILITY:**

Stable: Yes.

Conditions to avoid: N/A

**INCOMPATIBILITY:**

(Materials to avoid): Reacts with strong acids to form hydrogen gas. Iron oxide dusts in contact with calcium hypochlorite evolve oxygen and may cause an explosion.

**HAZARDOUS DECOMPOSITION OR BY-PRODUCTS:**

Metal fumes: iron oxide, manganese, chromium, molybdenum (insoluble form) and titanium dioxide when welding or gouging.

**HAZARDOUS POLYMERIZATION:**

Will not occur.

Conditions to avoid: Storage with strong acids or calcium hypochlorite.

**12. TOXICOLOGICAL INFORMATION**

**ACUTE TOXICITY:**

Steel in its solid inert form is considered non-toxic.

**SKIN AND EYE CONTACT:**

Chromium compounds can cause skin sensitization through prolonged contact.

**CARCINOGENICITY:**



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IARC classified nickel compounds as carcinogenic to humans (Group 1) and metallic nickel as possibly carcinogenic to humans (Group 2B).

Hexavalent Chromium (water-soluble and water-insoluble): IARC Group 1 carcinogenic to humans. Chromium (as metal and trivalent chromium compounds) – IARC Group 3 carcinogens, not classifiable as to their human carcinogenicity.

RSA: Regulations for Hazardous Chemical Agents, 2020 classified Trivalent Chromium Compounds: Water-soluble compounds as carcinogenic to humans.

Welding fumes & UV Radiation from welding: IARC Group 1 carcinogenic to humans.

### CHRONIC TOXICITY:

Refer to Section 4.

### 13. ECOLOGICAL INFORMATION

No specific information is available. This material is not anticipated to pose a risk to the environment in its solid inert form.

**13(a) Ecotoxicity (aquatic & terrestrial):** 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:** LC50: >1000 mg/L; Fish 48 h-EC50 > 100 mg/L (Currenta, 2008k); 96 h-LC0  $\geq$  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 EC50 and LD50 to algae and invertebrates < 1 mg.

**13(b) Persistence & Degradability:** No Data Available for Hot Rolled Steel as sold/shipped or individual components.

**13(c) Bio-accumulative Potential:** No Data Available for Hot Rolled Steel as sold/shipped or individual components.

### 14. DISPOSAL CONSIDERATIONS:

Steel scrap should be recycled. Vacuum, shovel or sweep spilled material into containers. If practicable, moisten first to prevent dust.

Dispose of in accordance with applicable local and national environmental requirements.

### 15. TRANSPORT INFORMATION

The solid inert material may be transported as a non-hazardous material.

### 16. REGULATORY INFORMATION

- Exposure to hazardous dust and fumes evolved from activities such as welding and grinding of steel may be subject to control and compliance requirements as dictated by local health and safety legislation. This material contains ingredients in quantities that may be reportable under certain international/national regulations/standards.

### 17. OTHER INFORMATION

#### NOTE:

Specific grades may not include any of the hazardous ingredients listed in Section 1. When welding or cutting products containing chromium or nickel (for example), the potential for exposure to chromium or nickel obviously increases as their percentage composition increases. Furthermore, a range of pollutants other than those listed and discussed in Sections 3 & 4 may also be associated with steel processing. Therefore, we strongly urge that all operations with potentially hazardous exposures be evaluated by a competent industrial



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hygienist.

The steel itself presents no health hazard unless it is welded, gouged, ground, or cut. During these procedures, it is possible that hazardous amounts of fumes or dusts may be generated. It is advised that your particular operation be evaluated by a competent health professional to determine whether or not a hazard exists.

This information, recommendations and suggestions contained in the Material Safety Data Sheet were compiled from reference materials believed to be reliable. However, the fact sheet's accuracy or completeness is not guaranteed either by Columbus Stainless (Pty) Ltd, its holding or subsidiary companies, nor is any responsibility assumed or implied for any loss or damage resulting from inaccuracies or omissions. Since conditions of use are beyond our control, we expressly disclaim all warranties, including warranties of merchantability and fitness for a particular purpose. This fact sheet is not intended as a license to operate under, or recommendation to infringe upon any patents. Appropriate warnings and safe-handling procedures should be provided to handlers and users.

	<b>JOB TITLE</b>	<b>CO NO</b>
<b>PREPARED BY</b>	TCS Engineer	13047
<b>ACCEPTED BY</b>	Manager Safety	5674
<b>APPROVED BY</b>	Business Unit Manager Technical	8412