

**MATERIAL SAFETY DATA SHEET
STAINLESS STEEL****1. COMPANY DETAILS**

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2. PRODUCT IDENTIFICATION

Product name: STAINLESS STEEL – Alloys

Synonyms: Stainless Steel Alloys, including Grades 2001, 2304, 2205, 202, 301LN, 304, 304H, 304DQ, 304DDQ, 304L, 304LS, 304LDDQ, 304LN, 309S, 309S Si, 310S, 316L, 316LN, 316Ti, 321, 3CR12, 3CR12L, 409, 410S, 430, 430DDQ, 436, 439, 439Nb, 441, 444

Use/Description: Stainless Steel Plate & Coil.

3. PRODUCT COMPOSITION

Hazardous Ingredients	CAS No.	%	OEL (RSA) (mg/m ³)	TLV (ACGIH) (mg/m ³)	Additional Comments
Iron	7439-89-6 (Fe)	>50	TWA = 10 ^(R) (Fume)	TWA = 5 ^(R) (Dust & Fume)	OEL applicable to fume only
Chromium (Metal)	7440-47-3 (Cr)	10-26	TWA = 0.006 ^(I) (Chromium III Water-soluble Compounds) TWA = 1 ^(I) Chromium Metal	TWA = 0.003 ^(I) Water-soluble Compounds & Metal	Austenitics range = 15-26% Ferritics range = 10-19.5% Duplex range = 19.5-24%
Nickel	7440-02-0 (Ni)	22 max	TWA = 0.1 ^(I) (Insoluble Inorganic Compounds) TWA = 0.02 ^(R) (Insoluble Inorganic Compounds)	TWA = 1.5 ^(I) Elemental Ni TWA = 0.2 ^(I) Insoluble Inorganic Compounds	Austenitics range = 3.5-22% Ferritics range = 0.3-1% Duplex range = 1-6.5%
Molybdenum (Insoluble compounds)	7439-98-7 (Mo)	0.1-3.5	TWA = 10 (Total Particulate) TWA = 5 ^(R) (Metal & Insoluble Compounds)	TWA = 10 ^(I) (Metal & Insoluble Compounds) TWA = 3 ^(R) (Metal & Insoluble Compounds)	Austenitics range = 2-3% Ferritics range = 0.8-2.5% Duplex range = 0.1-3.5%
Manganese	7439-96-5 (Mn)	1-8	TWA = 0.2 (Inorganic Compounds) TWA = 0.04 ^(R) (Elemental)	TWA = 0.02 ^(R) (Elemental & Inorganic Compounds) TWA = 0.1 ^(I) (Elemental & Inorganic Compounds)	Austenitics range = 2-8% Ferritics range = 1-1.5% Duplex range = 2-6%
Silicon	7440-21-3 (Si)	0.75-2.5	TWA = 10 (Total Inhalable Dust) TWA = 5 ^(R) (Respirable Dust)	TWA = 10 (Total Inhalable Dust) TWA = 5 ^(R) (Respirable Dust)	Austenitics range = 0.75-2.5% Ferritics range = 0.75-1% Duplex range = 1%
Copper	7440-50-8 (Cu)	0.1-2	TWA = 0.4 (Fume) TWA = 2 (Dust & Mists)	TWA = 0.2 (Fume) TWA = 1 (Dust & Mists)	Lean Duplexes only = 0.1-1% Austenitic 202 range only = 2% max
Titanium	13463-67-7 (TiO ₂)	0.1-0.8	TWA = 10 (Total Inhalable dust)	TWA = 10 (Total Inhalable dust)	

- Stainless 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 recognised 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:**

- Stainless steel products in their solid state present no inhalation, ingestion or contact health hazard. However, inhaling

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dusts or fumes which may be generated during certain manufacturing procedures such as burning, melting, welding, sawing, brazing, grinding and machining may be hazardous to your health. Dusts may also be irritating to the unprotected skin and eyes.

- Molten material may cause thermal burns.
- Stainless steel products are sold in a solid form and does not present an immediate health or fire hazard.

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.

**4. HAZARDS IDENTIFICATION (Continued)****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 stainless steel is not regarded by dermatologists to be a health hazard in view of the negligible leaching capability of nickel from stainless steel in its massive/solid form.

Patch-testing studies, in conjunction with investigations on nickel release, show that prolonged skin contact with most stainless steel grades is unlikely to elicit a skin response in nickel-sensitised individuals. Furthermore, available data on unsensitised subjects provides no evidence that skin contact with stainless steel induces skin sensitisation. There is an extremely large population exposed to stainless steels, with either prolonged or intermittent skin contact, or as a result of stainless 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 stainless 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.

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

**4. HAZARDS IDENTIFICATION (Continued)****EFFECTS OF LONG-TERM (CHRONIC) EXPOSURE:****Titanium Dioxide: (Continued from Page 3)**

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 affect 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.

Niobium (Nb):

No cases of occupational disease resulting from niobium exposures are known. Inhaled niobium is retained mainly in the lungs, and secondarily in the bones. In laboratory animals, inhalation of niobium nitride and/or pentoxide leads to scarring of the lungs at massive exposure levels unlikely to be encountered during processing of stainless steel under foreseeable conditions.

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.

General Comments on the Health Effects of Stainless Steel:

- Stainless steel in its massive/solid form is not anticipated to present significant acute or chronic health effects;
- Welding of stainless 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 stainless steel. Welding of any type of steel appears to be associated with a possible increase in the risk of lung cancer, but there is no further increased risk associated specifically with stainless steel welding; Airborne dust from grinding of stainless steel is made up of spinels and therefore has a different chemical composition and metallurgical structure than that of metallic stainless steel. According to the limited available data, there appears to be no identifiable hazard associated with grinding dust from stainless 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 Stainless 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.

5. FIRST AID MEASURES (Continued)**EYE CONTACT:**

Not a likely form of exposure in its solid form. However, during further processing (welding, grinding, burning, etc.), if in

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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 for solid product. Use extinguishers appropriate for surrounding materials.

EXTINGUISHING MEDIA:

For molten metal use dry powder or sand. Do not use water on molten metal. Use extinguishing media appropriate for surrounding materials.

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. Stainless steel can be recycled. Wear adequate personal protective equipment during clean-up duties.

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).
- Practice good housekeeping. Avoid breathing metal fumes and/or dust when processing.

STORAGE:

Store away from strong oxidizers, acids and incompatible materials.

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.

9. EXPOSURE CONTROLS & PERSONAL PROTECTION (Continued)**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.

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PAGE: 6 OF 7**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:	1400-1500°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: Contact with incompatible materials.

INCOMPATIBILITY:

(Materials to avoid): Reacts with strong acids to form hydrogen gas.

HAZARDOUS DECOMPOSITION OR BY-PRODUCTS:

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

HAZARDOUS POLYMERIZATION:

Will not occur.

12. TOXICOLOGICAL INFORMATION**ACUTE TOXICITY:**

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

SKIN AND EYE CONTACT:

Nickel and Chromium compounds can cause skin sensitization through prolonged contact.

CHRONIC TOXICITY:

Refer to Section 4.

CARCINOGENICITY:

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.

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Not applicable for solid alloy in its inert form. No information has been found on specific alloy as a whole in order to determine its effect if released into the environment in finely divided form. It is believed that finely divided alloy, based on its components, will be hazardous to fish, animals, plants and the environment if released, the degree of which would depend on the particle size and quantity released. In addition, if particles are small enough, alloy may be ingested by wildlife, with possible toxic effects occurring.

The solid alloy is not expected to migrate easily into soil or groundwater based upon its insoluble form. However, finely-divided alloy can become mobile in water and contaminate soil and groundwater, if particles are small enough. Finely-divided alloy may persist in the environment for long periods, based upon the corrosion resistant, insoluble, and non-biodegradable properties of the alloy. In addition, heavy metals may contaminate the food chain and ultimately be consumed by humans.

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 stainless 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 stainless steel processing. Therefore, we strongly urge that all operations with potentially hazardous exposures be evaluated by a competent industrial 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 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, 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.

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