

# SAFETY DATA SHEET

## 1. PRODUCT AND COMPANY IDENTIFICATION

**Product Name:** Lincolnweld® 860®

**Other means of identification**

**SDS number:** 200000000892

**Recommended use and restriction on use**

**Recommended use:** SAW (Submerged Arc Welding)

**Restrictions on use:** Not known. Read this SDS before using this product.

**Manufacturer/Importer/Supplier/Distributor Information**

**Company Name:** The Lincoln Electric Company  
**Address:** 22801 Saint Clair Avenue  
Cleveland, Ohio 44117  
USA  
**Telephone:** +1 (216) 481-8100  
**Contact Person:** **Safety Data Sheet Questions:** [www.lincolnelectric.com/sds](http://www.lincolnelectric.com/sds)

**Company Name:** Lincoln Electric do Brasil Industria e Comercio Lt  
**Address:** Av. Papa João Paulo I Nº 1818  
Guarulhos - SP CEP: 07170-350  
Brazil  
**Telephone:** +55 11 2431-4700  
**Contact Person:** **Safety Data Sheet Questions:** [www.lincolnelectric.com/sds](http://www.lincolnelectric.com/sds)  
**Arc Welding Safety Information:** [www.lincolnelectric.com/safety](http://www.lincolnelectric.com/safety)  
[SDS@lincolnelectric.com](mailto:SDS@lincolnelectric.com)

**Company Name:** The Lincoln Electric Company of Canada LP  
**Address:** 179 Wicksteed Avenue  
Toronto, Ontario M4G 2B9  
Canada  
**Telephone:** +1 (416) 421-2600  
**Contact Person:** **Safety Data Sheet Questions:** [www.lincolnelectric.com/sds](http://www.lincolnelectric.com/sds)

**Emergency telephone number:**

USA/Canada/Mexico +1 (888) 609-1762  
Americas/Europe +1 (216) 383-8962  
Asia Pacific +1 (216) 383-8966  
Middle East/Africa +1 (216) 383-8969

**3E Company Access Code:** 333988

## 2. HAZARDS IDENTIFICATION

Classified according to the criteria of the Globally Harmonized System of Classification and Labeling of Chemicals (GHS), The United States Occupational Safety and Health Administration's Hazard Communication Standard (29 CFR 1910.1200), Canada's Hazardous Product Regulations and Mexico's Harmonized System for the Identification and Communication of Hazards and Risks from Hazardous Chemicals in the Workplace.

**Hazard Classification**

**Health Hazards**

Acute toxicity (Oral)	Category 4
Carcinogenicity	Category 2

**Label Elements**

**Hazard Symbol:**



**Signal Word:** Warning

**Hazard Statement:** Harmful if swallowed.  
Suspected of causing cancer.

**Precautionary Statements:**

**Prevention:** Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Wash face, hands and any exposed skin thoroughly after handling. Do not eat, drink or smoke when using this product. Use personal protective equipment as required.

**Response:** IF SWALLOWED: Call a POISON CENTER/doctor if you feel unwell. Rinse mouth. IF exposed or concerned: Get medical advice/attention.

**Storage:** Store locked up.

**Disposal:** Dispose of contents/ container to an approved facility in accordance with local, regional, national and international regulations.

**Other hazards which do not result in GHS classification:** Electrical Shock can kill. If welding must be performed in damp locations or with wet clothing, on metal structures or when in cramped positions such as sitting, kneeling or lying, or if there is a high risk of unavoidable or accidental contact with work piece, use the following equipment: Semiautomatic DC Welder, DC Manual (Stick) Welder, or AC Welder with Reduced Voltage Control.

Arc rays can injure eyes and burn skin. Welding arc and sparks can ignite combustibles and flammable materials. Overexposure to welding fumes and gases can be hazardous. Read and understand the manufacturer's instructions, Safety Data Sheets and the precautionary labels before using this product. Refer to Section 8.

**Substance(s) formed under the conditions of use:** The welding fume produced from this welding electrode may contain the following constituent(s) and/or their complex metallic oxides as well as solid particles or other constituents from the consumables, base metal, or base metal coating not listed below.

Chemical Identity	CAS-No.
Carbon dioxide	124-38-9
Carbon monoxide	630-08-0
Nitrogen dioxide	10102-44-0
Ozone	10028-15-6

### 3. COMPOSITION / INFORMATION ON INGREDIENTS

#### Reportable Hazardous Ingredients Mixtures

Chemical Identity	CAS number	Content in percent (%)*
Magnesium oxide	1309-48-4	10 - <20%
Calcium fluoride	7789-75-5	10 - <20%
Manganese oxide (MnO <sub>2</sub> )	1313-13-9	10 - <25%
Sodium silicate	1344-09-8	5 - <10%
Quartz	14808-60-7	5 - <10%
Wollastonite	13983-17-0	1 - <5%
Silicon dioxide (amorphous)	7631-86-9	1 - <5%
Iron oxide	1309-37-1	1 - <5%
Titanium dioxide (naturally occurring)	13463-67-7	1 - <5%
Aluminum oxide	1344-28-1	1 - <5%
Silicon	7440-21-3	1 - <5%
Calcium oxide	1305-78-8	1 - <5%
Potassium oxide	12136-45-7	0.1 - <1%
Manganese	7439-96-5	0.1 - <1%
Barium and soluble compounds (as Ba)	7440-39-3	0.1 - <1%

\* All concentrations are percent by weight unless ingredient is a gas. Gas concentrations are in percent by volume.

#### Composition Comments:

The term "Hazardous Ingredients" should be interpreted as a term defined in Hazard Communication standards and does not necessarily imply the existence of a welding or allied process hazard. The product may contain additional non-hazardous ingredients or may form additional compounds under the condition of use. Refer to Sections 2 and 8 for more information.

### 4. FIRST AID MEASURES

#### Ingestion:

Avoid hand, clothing, food, and drink contact with fluxes, metal fume or powder which can cause ingestion of particulate during hand to mouth activities such as drinking, eating, smoking, etc. If ingested, do not induce vomiting. Contact a poison control center. Unless the poison control center advises otherwise, wash out mouth thoroughly with water. If symptoms develop, seek medical attention at once. Call a POISON CENTER/doctor if you feel unwell. Rinse mouth.

#### Inhalation:

Move to fresh air if breathing is difficult. If breathing has stopped, perform artificial respiration and obtain medical assistance at once.

#### Skin Contact:

Remove contaminated clothing and wash the skin thoroughly with soap and water. For reddened or blistered skin, or thermal burns, obtain medical assistance at once.

#### Eye contact:

Dust or fume from this product should be flushed from the eyes with copious amounts of clean, tepid water until transported to an emergency medical facility. Do not allow victim to rub or keep eyes tightly closed. Obtain medical assistance at once.

Arc rays can injure eyes. If exposed to arc rays, move victim to dark room, remove contact lenses as necessary for treatment, cover eyes with a

padded dressing and rest. Obtain medical assistance if symptoms persist.

**Most important symptoms/effects, acute and delayed**

**Symptoms:** Short-term (acute) overexposure to fumes and gases from welding and allied processes may result in discomfort such as metal fume fever, dizziness, nausea, or dryness or irritation of nose, throat, or eyes. May aggravate pre-existing respiratory problems (e.g. asthma, emphysema). Long-term (chronic) overexposure to fumes and gases from welding and allied processes can lead to siderosis (iron deposits in lung), central nervous system effects, bronchitis and other pulmonary effects. Refer to Section 11 for more information.

**Hazards:** The hazards associated with welding and its allied processes such as soldering and brazing are complex and may include physical and health hazards such as but not limited to electric shock, physical strains, radiation burns (eye flash), thermal burns due to hot metal or spatter and potential health effects of overexposure to fumes, gases or dusts potentially generated during the use of this product. Refer to Section 11 for more information.

**Indication of immediate medical attention and special treatment needed**

**Treatment:** Treat symptomatically.

**5. FIRE-FIGHTING MEASURES**

**General Fire Hazards:** As shipped, this product is nonflammable. However, welding arcs, sparks, open flames, and hot surfaces associated with welding, brazing, and soldering can ignite combustible and flammable materials. Implement fire protection measures according to the place of use risk assessment, local regulations, and all relevant safety standards. Read and understand the American National Standard Z49.1, "Safety in Welding, Cutting, and Allied Processes," and the National Fire Protection Association NFPA 51B, "Standard for Fire Prevention during Welding, Cutting, and Other Hot Work," before using this product.

**Suitable (and unsuitable) extinguishing media**

**Suitable extinguishing media:** As shipped, the product will not burn. In case of fire in the surroundings: use appropriate extinguishing agent.

**Unsuitable extinguishing media:** Do not use water jet as an extinguisher, as this will spread the fire.

**Specific hazards arising from the chemical:** Welding arc and sparks can ignite combustibles and flammable products.

**Special protective equipment and precautions for fire-fighters**

**Special fire-fighting procedures:** Use standard firefighting procedures and consider the hazards of other involved materials.

**Special protective equipment for fire-fighters:** Selection of respiratory protection for fire fighting: follow the general fire precautions indicated in the workplace. Self-contained breathing apparatus and full protective clothing must be worn in case of fire.

**6. ACCIDENTAL RELEASE MEASURES**

**Personal precautions, protective equipment and emergency procedures:** If airborne dust and/or fume is present, use adequate engineering controls and, if needed, personal protection to prevent overexposure. Refer to recommendations in Section 8.

<b>Methods and material for containment and cleaning up:</b>	Absorb spill with vermiculite or other inert material, then place in a container for chemical waste. Dike far ahead of larger spill for later recovery and disposal.
<b>Notification Procedures:</b>	Dike for later disposal. Prevent entry into waterways, sewer, basements or confined areas. Stop the flow of material, if this is without risk.
<b>Environmental Precautions:</b>	Do not contaminate water sources or sewer. Prevent further leakage or spillage if safe to do so.

## 7. HANDLING AND STORAGE

**Precautions for safe handling:** Prevent formation of dust. Provide appropriate exhaust ventilation at places where dust is formed.  
 Read and understand the manufacturer's instruction and the precautionary label on the product. Refer to Lincoln Safety Publications at [www.lincolnelectric.com/safety](http://www.lincolnelectric.com/safety), ISO/TR 18786:2014, ISO/TR 13392:2014, American National Standard Z49.1, "Safety In Welding, Cutting and Allied Processes" published by the American Welding Society, <http://pubs.aws.org> and OSHA Publication 2206 (29CFR1910), U.S. Government Printing Office, [www.gpo.gov](http://www.gpo.gov). Do not taste or swallow. Wash hands thoroughly after handling. Do not handle until all safety precautions have been read and understood. Obtain special instructions before use. Use personal protective equipment as required.

**Conditions for safe storage, including any incompatibilities:** Store locked up.

## 8. EXPOSURE CONTROLS / PERSONAL PROTECTION

### Control Parameters

#### Occupational Exposure Limits: US

Chemical Identity	Type	Exposure Limit Values	Source
Magnesium oxide - Inhalable fraction.	TWA	10 mg/m <sup>3</sup>	US. ACGIH Threshold Limit Values (2008)
Magnesium oxide - Total particulate.	PEL	15 mg/m <sup>3</sup>	US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000) (02 2006)
Magnesium oxide - Respirable fraction.	TWA	15 millions of particles per cubic foot of air	US. OSHA Table Z-3 (29 CFR 1910.1000) (03 2016)
Magnesium oxide - Total dust.	TWA	15 mg/m <sup>3</sup>	US. OSHA Table Z-3 (29 CFR 1910.1000) (03 2016)
	TWA	50 millions of particles per cubic foot of air	US. OSHA Table Z-3 (29 CFR 1910.1000) (03 2016)
Magnesium oxide - Respirable fraction.	TWA	5 mg/m <sup>3</sup>	US. OSHA Table Z-3 (29 CFR 1910.1000) (03 2016)
Magnesium oxide	IDLH	750 mg/m <sup>3</sup>	US. NIOSH. Immediately Dangerous to Life or Health (IDLH) Values (10 2017)
Calcium fluoride - as F	TWA	2.5 mg/m <sup>3</sup>	US. ACGIH Threshold Limit Values (2008)
	PEL	2.5 mg/m <sup>3</sup>	US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000) (02 2006)
Calcium fluoride - Dust.	TWA	2.5 mg/m <sup>3</sup>	US. OSHA Table Z-2 (29 CFR 1910.1000) (02 2006)
Calcium fluoride	IDLH	250 mg/m <sup>3</sup>	US. NIOSH. Immediately Dangerous to Life or Health (IDLH) Values (10 2017)
	IDLH	250 mg/m <sup>3</sup>	US. NIOSH. Immediately Dangerous to Life or Health (IDLH) Values (10 2017)

Manganese oxide (MnO <sub>2</sub> ) - Inhalable fraction. - as Mn	TWA	0.1 mg/m <sup>3</sup>	US. ACGIH Threshold Limit Values (02 2013)
Manganese oxide (MnO <sub>2</sub> ) - Respirable fraction. - as Mn	TWA	0.02 mg/m <sup>3</sup>	US. ACGIH Threshold Limit Values (02 2013)
Manganese oxide (MnO <sub>2</sub> ) - Fume. - as Mn	STEL	3 mg/m <sup>3</sup>	US. NIOSH: Pocket Guide to Chemical Hazards, as amended (2005)
	REL	1 mg/m <sup>3</sup>	US. NIOSH: Pocket Guide to Chemical Hazards, as amended (2005)
Manganese oxide (MnO <sub>2</sub> )	IDLH	500 mg/m <sup>3</sup>	US. NIOSH. Immediately Dangerous to Life or Health (IDLH) Values (10 2017)
Manganese oxide (MnO <sub>2</sub> ) - as Mn	Ceiling	5 mg/m <sup>3</sup>	US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000) (02 2006)
Quartz - Respirable.	TWA	2.4 millions of particles per cubic foot of air	US. OSHA Table Z-3 (29 CFR 1910.1000) (2000)
	TWA	0.1 mg/m <sup>3</sup>	US. OSHA Table Z-3 (29 CFR 1910.1000) (2000)
Quartz - Respirable dust.	REL	0.05 mg/m <sup>3</sup>	US. NIOSH: Pocket Guide to Chemical Hazards, as amended (2005)
Quartz - Respirable dust.	TWA	0.05 mg/m <sup>3</sup>	US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050) (03 2016)
	OSHA_ACT	0.025 mg/m <sup>3</sup>	US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050) (03 2016)
Quartz - Respirable dust.	PEL	0.05 mg/m <sup>3</sup>	US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000) (03 2016)
Quartz	IDLH	50 mg/m <sup>3</sup>	US. NIOSH. Immediately Dangerous to Life or Health (IDLH) Values (10 2017)
Quartz - Respirable fraction.	TWA	0.025 mg/m <sup>3</sup>	US. ACGIH Threshold Limit Values (02 2020)
Wollastonite - Inhalable fraction.	TWA	1 mg/m <sup>3</sup>	US. ACGIH Threshold Limit Values (03 2019)
Silicon dioxide (amorphous)	REL	6 mg/m <sup>3</sup>	US. NIOSH: Pocket Guide to Chemical Hazards, as amended (2005)
	IDLH	3,000 mg/m <sup>3</sup>	US. NIOSH. Immediately Dangerous to Life or Health (IDLH) Values (10 2017)
Silicon dioxide (amorphous) - Inhalable particles.	TWA	10 mg/m <sup>3</sup>	US. ACGIH Threshold Limit Values (01 2021)
Silicon dioxide (amorphous) - Respirable particles.	TWA	3 mg/m <sup>3</sup>	US. ACGIH Threshold Limit Values (01 2021)
Silicon dioxide (amorphous) - Respirable fraction.	TWA	5 mg/m <sup>3</sup>	US. OSHA Table Z-3 (29 CFR 1910.1000) (09 2016)
Silicon dioxide (amorphous) - Total dust.	TWA	15 mg/m <sup>3</sup>	US. OSHA Table Z-3 (29 CFR 1910.1000) (09 2016)
	TWA	50 millions of particles per cubic foot of air	US. OSHA Table Z-3 (29 CFR 1910.1000) (09 2016)
Silicon dioxide (amorphous) - Respirable fraction.	TWA	15 millions of particles per cubic foot of air	US. OSHA Table Z-3 (29 CFR 1910.1000) (09 2016)
Silicon dioxide (amorphous)	TWA	0.8 mg/m <sup>3</sup>	US. OSHA Table Z-3 (29 CFR 1910.1000) (09 2016)
	TWA	20 millions of particles per cubic foot of air	US. OSHA Table Z-3 (29 CFR 1910.1000) (09 2016)
Iron oxide - Dust and fume. - as Fe	REL	5 mg/m <sup>3</sup>	US. NIOSH: Pocket Guide to Chemical Hazards, as amended (2005)
Iron oxide - Fume.	PEL	10 mg/m <sup>3</sup>	US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000) (02 2006)
Iron oxide - Respirable fraction.	TWA	5 mg/m <sup>3</sup>	US. ACGIH Threshold Limit Values (01 2010)
Iron oxide - Total dust.	TWA	50 millions of particles per cubic foot of air	US. OSHA Table Z-3 (29 CFR 1910.1000) (03 2016)
Iron oxide - Respirable fraction.	TWA	5 mg/m <sup>3</sup>	US. OSHA Table Z-3 (29 CFR 1910.1000) (03 2016)

	TWA	15 millions of particles per cubic foot of air	US. OSHA Table Z-3 (29 CFR 1910.1000) (03 2016)
Iron oxide - Total dust.	TWA	15 mg/m <sup>3</sup>	US. OSHA Table Z-3 (29 CFR 1910.1000) (03 2016)
Iron oxide	IDLH	2,500 mg/m <sup>3</sup>	US. NIOSH. Immediately Dangerous to Life or Health (IDLH) Values (10 2017)
Titanium dioxide (naturally occurring)	IDLH	5,000 mg/m <sup>3</sup>	US. NIOSH. Immediately Dangerous to Life or Health (IDLH) Values (10 2017)
Titanium dioxide (naturally occurring) - Total dust.	PEL	15 mg/m <sup>3</sup>	US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000) (02 2006)
Titanium dioxide (naturally occurring) - Respirable fraction.	TWA	5 mg/m <sup>3</sup>	US. OSHA Table Z-3 (29 CFR 1910.1000) (03 2016)
Titanium dioxide (naturally occurring) - Total dust.	TWA	50 millions of particles per cubic foot of air	US. OSHA Table Z-3 (29 CFR 1910.1000) (03 2016)
Titanium dioxide (naturally occurring) - Respirable fraction.	TWA	15 millions of particles per cubic foot of air	US. OSHA Table Z-3 (29 CFR 1910.1000) (03 2016)
Titanium dioxide (naturally occurring) - Total dust.	TWA	15 mg/m <sup>3</sup>	US. OSHA Table Z-3 (29 CFR 1910.1000) (03 2016)
Titanium dioxide (naturally occurring) - Respirable finescale particles	TWA	2.5 mg/m <sup>3</sup>	US. ACGIH Threshold Limit Values (01 2022)
Titanium dioxide (naturally occurring) - Respirable nanoscale particles	TWA	0.2 mg/m <sup>3</sup>	US. ACGIH Threshold Limit Values (01 2022)
Aluminum oxide - Respirable fraction.	TWA	1 mg/m <sup>3</sup>	US. ACGIH Threshold Limit Values (12 2010)
	PEL	5 mg/m <sup>3</sup>	US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000) (02 2006)
Aluminum oxide - Total dust.	PEL	15 mg/m <sup>3</sup>	US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000) (02 2006)
Aluminum oxide - Respirable fraction.	TWA	15 millions of particles per cubic foot of air	US. OSHA Table Z-3 (29 CFR 1910.1000) (03 2016)
	TWA	5 mg/m <sup>3</sup>	US. OSHA Table Z-3 (29 CFR 1910.1000) (03 2016)
Aluminum oxide - Total dust.	TWA	15 mg/m <sup>3</sup>	US. OSHA Table Z-3 (29 CFR 1910.1000) (03 2016)
	TWA	50 millions of particles per cubic foot of air	US. OSHA Table Z-3 (29 CFR 1910.1000) (03 2016)
Aluminum oxide - Inhalable particles.	TWA	10 mg/m <sup>3</sup>	US. ACGIH Threshold Limit Values (01 2021)
Aluminum oxide - Respirable particles.	TWA	3 mg/m <sup>3</sup>	US. ACGIH Threshold Limit Values (01 2021)
Silicon - Respirable.	REL	5 mg/m <sup>3</sup>	US. NIOSH: Pocket Guide to Chemical Hazards, as amended (2005)
Silicon - Total	REL	10 mg/m <sup>3</sup>	US. NIOSH: Pocket Guide to Chemical Hazards, as amended (2005)
Silicon - Total dust.	PEL	15 mg/m <sup>3</sup>	US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000) (02 2006)
Silicon - Respirable fraction.	PEL	5 mg/m <sup>3</sup>	US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000) (02 2006)
Silicon - Respirable particles.	TWA	3 mg/m <sup>3</sup>	US. ACGIH Threshold Limit Values (01 2021)
Silicon - Inhalable particles.	TWA	10 mg/m <sup>3</sup>	US. ACGIH Threshold Limit Values (01 2021)
Silicon - Respirable fraction.	TWA	5 mg/m <sup>3</sup>	US. OSHA Table Z-3 (29 CFR 1910.1000) (09 2016)
Silicon - Total dust.	TWA	50 millions of particles per cubic foot of air	US. OSHA Table Z-3 (29 CFR 1910.1000) (09 2016)
	TWA	15 mg/m <sup>3</sup>	US. OSHA Table Z-3 (29 CFR 1910.1000)

			(09 2016)
Silicon - Respirable fraction.	TWA	15 millions of particles per cubic foot of air	US. OSHA Table Z-3 (29 CFR 1910.1000) (09 2016)
Calcium oxide	TWA	2 mg/m <sup>3</sup>	US. ACGIH Threshold Limit Values (12 2010)
	PEL	5 mg/m <sup>3</sup>	US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000) (02 2006)
	REL	2 mg/m <sup>3</sup>	US. NIOSH: Pocket Guide to Chemical Hazards, as amended (2005)
	IDLH	25 mg/m <sup>3</sup>	US. NIOSH. Immediately Dangerous to Life or Health (IDLH) Values (10 2017)
Manganese - Fume. - as Mn	Ceiling	5 mg/m <sup>3</sup>	US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000) (02 2006)
	REL	1 mg/m <sup>3</sup>	US. NIOSH: Pocket Guide to Chemical Hazards, as amended (2005)
	STEL	3 mg/m <sup>3</sup>	US. NIOSH: Pocket Guide to Chemical Hazards, as amended (2005)
Manganese - Inhalable fraction. - as Mn	TWA	0.1 mg/m <sup>3</sup>	US. ACGIH Threshold Limit Values (03 2014)
Manganese - Respirable fraction. - as Mn	TWA	0.02 mg/m <sup>3</sup>	US. ACGIH Threshold Limit Values (03 2014)
Manganese	IDLH	500 mg/m <sup>3</sup>	US. NIOSH. Immediately Dangerous to Life or Health (IDLH) Values (10 2017)
Barium and soluble compounds (as Ba) - as Ba	TWA	0.5 mg/m <sup>3</sup>	US. ACGIH Threshold Limit Values (2008)
	PEL	0.5 mg/m <sup>3</sup>	US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000) (01 2017)

### Occupational Exposure Limits: Canada

Chemical Identity	Type	Exposure Limit Values	Source
Magnesium oxide - Respirable dust and/or fume. - as Mg	STEL	10 mg/m <sup>3</sup>	Canada. British Columbia OELs: Table of Exposure Limits for Chemical Biological Substances (Workers Compensation Board); as amended (07 2007)
Magnesium oxide - Inhalable fume.	TWA	10 mg/m <sup>3</sup>	Canada. British Columbia OELs: Table of Exposure Limits for Chemical Biological Substances (Workers Compensation Board); as amended (07 2007)
Magnesium oxide - Respirable dust and/or fume. - as Mg	TWA	3 mg/m <sup>3</sup>	Canada. British Columbia OELs: Table of Exposure Limits for Chemical Biological Substances (Workers Compensation Board); as amended (07 2007)
Magnesium oxide - Fume.	TWA	10 mg/m <sup>3</sup>	Canada. Alberta OELs (Occupational Health & Safety Code, Schedule 1, Table 2), as amended (07 2009)
Magnesium oxide - Inhalable fraction.	15 MIN ACL	20 mg/m <sup>3</sup>	Canada. Saskatchewan OELs (Occupational Health and Safety Regulations, 1996, Table 21), as amended (05 2009)
	TWA	10 mg/m <sup>3</sup>	Canada. Manitoba OELs (Reg. 217/2006, The Workplace Safety And Health Act), as amended (03 2011)
	TWA	10 mg/m <sup>3</sup>	Canada. Ontario OELs. (Control of Exposure to Biological or Chemical Agents), as amended (11 2010)
Magnesium oxide - Inhalable dust.	TWA	10 mg/m <sup>3</sup>	Canada. Quebec OELs. (Ministry of Labor - Regulation respecting occupational health and safety), as amended (03 2020)
Magnesium oxide - Inhalable fraction.	8 HR ACL	10 mg/m <sup>3</sup>	Canada. Saskatchewan OELs (Occupational Health and Safety Regulations, 1996, Table 21), as amended (04 2021)
Calcium fluoride - as F	TWA	2.5 mg/m <sup>3</sup>	Canada. Alberta OELs (Occupational Health & Safety Code, Schedule 1, Table 2), as amended (10 2006)

	TWA	2.5 mg/m <sup>3</sup>	Canada. Alberta OELs (Occupational Health & Safety Code, Schedule 1, Table 2), as amended (07 2009)
	15 MIN ACL	5 mg/m <sup>3</sup>	Canada. Saskatchewan OELs (Occupational Health and Safety Regulations, 1996, Table 21), as amended (05 2009)
	TWA	2.5 mg/m <sup>3</sup>	Canada. Manitoba OELs (Reg. 217/2006, The Workplace Safety And Health Act), as amended (03 2011)
	TWA	2.5 mg/m <sup>3</sup>	Canada. Ontario OELs. (Control of Exposure to Biological or Chemical Agents), as amended (11 2010)
	TWA	2.5 mg/m <sup>3</sup>	Canada. Quebec OELs. (Ministry of Labor - Regulation respecting occupational health and safety), as amended (09 2017)
	TWA	2.5 mg/m <sup>3</sup>	Canada. British Columbia OELs: Table of Exposure Limits for Chemical Biological Substances (Workers Compensation Board); as amended (06 2022)
	8 HR ACL	2.5 mg/m <sup>3</sup>	Canada. Saskatchewan OELs (Occupational Health and Safety Regulations, 1996, Table 21), as amended (04 2021)
Manganese oxide (MnO <sub>2</sub> ) - Inhalable fraction. - as Mn	TWA	0.1 mg/m <sup>3</sup>	Canada. Manitoba OELs (Reg. 217/2006, The Workplace Safety And Health Act), as amended (03 2013)
Manganese oxide (MnO <sub>2</sub> ) - Respirable fraction. - as Mn	TWA	0.02 mg/m <sup>3</sup>	Canada. Manitoba OELs (Reg. 217/2006, The Workplace Safety And Health Act), as amended (03 2013)
Manganese oxide (MnO <sub>2</sub> ) - Inhalable fraction. - as Mn	TWA	0.1 mg/m <sup>3</sup>	Canada. Ontario OELs. (Control of Exposure to Biological or Chemical Agents), as amended (01 2020)
Manganese oxide (MnO <sub>2</sub> ) - as Mn	8 HR ACL	0.2 mg/m <sup>3</sup>	Canada. Saskatchewan OELs (Occupational Health and Safety Regulations, 1996, Table 21), as amended (05 2009)
	15 MIN ACL	0.6 mg/m <sup>3</sup>	Canada. Saskatchewan OELs (Occupational Health and Safety Regulations, 1996, Table 21), as amended (05 2009)
Manganese oxide (MnO <sub>2</sub> ) - Fume, total dust. - as Mn	TWA	0.2 mg/m <sup>3</sup>	Canada. Quebec OELs. (Ministry of Labor - Regulation respecting occupational health and safety), as amended (09 2017)
Manganese oxide (MnO <sub>2</sub> ) - as Mn	TWA	0.2 mg/m <sup>3</sup>	Canada. Alberta OELs (Occupational Health & Safety Code, Schedule 1, Table 2), as amended (08 2020)
Manganese oxide (MnO <sub>2</sub> ) - Respirable. - as Mn	TWA	0.02 mg/m <sup>3</sup>	Canada. British Columbia OELs: Table of Exposure Limits for Chemical Biological Substances (Workers Compensation Board); as amended (06 2022)
Manganese oxide (MnO <sub>2</sub> ) - Total - as Mn	TWA	0.2 mg/m <sup>3</sup>	Canada. British Columbia OELs: Table of Exposure Limits for Chemical Biological Substances (Workers Compensation Board); as amended (06 2022)
Manganese oxide (MnO <sub>2</sub> ) - as Mn	8 HR ACL	0.2 mg/m <sup>3</sup>	Canada. Saskatchewan OELs (Occupational Health and Safety Regulations, 1996, Table 21), as amended (04 2021)
Quartz - Respirable particles.	TWA	0.025 mg/m <sup>3</sup>	Canada. Alberta OELs (Occupational Health & Safety Code, Schedule 1, Table 2), as amended (07 2009)
Quartz - Respirable fraction.	8 HR ACL	0.05 mg/m <sup>3</sup>	Canada. Saskatchewan OELs (Occupational Health and Safety Regulations, 1996, Table 21), as amended (05 2009)
	TWA	0.10 mg/m <sup>3</sup>	Canada. Ontario OELs. (Control of Exposure to Biological or Chemical Agents), as amended (06 2015)
Quartz - Respirable dust.	TWA	0.1 mg/m <sup>3</sup>	Canada. Quebec OELs. (Ministry of Labor - Regulation respecting occupational

			health and safety), as amended (09 2017)
Quartz - Respirable fraction.	TWA	0.025 mg/m3	Canada. British Columbia OELs: Table of Exposure Limits for Chemical Biological Substances (Workers Compensation Board); as amended (06 2020)
	TWA	0.025 mg/m3	Canada. Manitoba OELs (Reg. 217/2006, The Workplace Safety And Health Act), as amended (01 2021)
	8 HR ACL	0.05 mg/m3	Canada. Saskatchewan OELs (Occupational Health and Safety Regulations, 1996, Table 21), as amended (04 2021)
Wollastonite - Inhalable fraction.	TWA	1 mg/m3	Canada. Manitoba OELs (Reg. 217/2006, The Workplace Safety And Health Act), as amended (03 2019)
Wollastonite - fibers, total dust	TWA	10 mg/m3	Canada. Quebec OELs. (Ministry of Labor - Regulation respecting occupational health and safety), as amended (09 2017)
Wollastonite - Fiber.	TWA	5 mg/m3	Canada. Quebec OELs. (Ministry of Labor - Regulation respecting occupational health and safety), as amended (09 2017)
Silicon dioxide (amorphous) - Total dust.	TWA	10 mg/m3	Canada. Quebec OELs. (Ministry of Labor - Regulation respecting occupational health and safety), as amended (03 2020)
Silicon dioxide (amorphous) - Respirable particles.	TWA	3 mg/m3	Canada. Alberta OELs (Occupational Health & Safety Code, Schedule 1, Table 2), as amended (01 2019)
Silicon dioxide (amorphous) - Inhalable fraction.	TWA	10 mg/m3	Canada. Ontario OELs. (Control of Exposure to Biological or Chemical Agents), as amended (01 2020)
Silicon dioxide (amorphous) - Respirable particles.	TWA	3 mg/m3	Canada. Ontario OELs. (Control of Exposure to Biological or Chemical Agents), as amended (01 2020)
Silicon dioxide (amorphous) - Respirable fraction.	TWA	3 mg/m3	Canada. Ontario OELs. (Control of Exposure to Biological or Chemical Agents), as amended (01 2020)
Silicon dioxide (amorphous) - Inhalable particles.	TWA	10 mg/m3	Canada. Ontario OELs. (Control of Exposure to Biological or Chemical Agents), as amended (01 2020)
Silicon dioxide (amorphous) - Respirable fraction.	TWA	3 mg/m3	Canada. British Columbia OELs: Table of Exposure Limits for Chemical Biological Substances (Workers Compensation Board); as amended (06 2020)
Silicon dioxide (amorphous) - Total dust.	TWA	10 mg/m3	Canada. British Columbia OELs: Table of Exposure Limits for Chemical Biological Substances (Workers Compensation Board); as amended (06 2020)
Silicon dioxide (amorphous) - Inhalable particles.	TWA	10 mg/m3	Canada. Manitoba OELs (Reg. 217/2006, The Workplace Safety And Health Act), as amended (01 2021)
Silicon dioxide (amorphous) - Respirable particles.	TWA	3 mg/m3	Canada. Manitoba OELs (Reg. 217/2006, The Workplace Safety And Health Act), as amended (01 2021)
Silicon dioxide (amorphous) - Inhalable fraction.	15 MIN ACL	20 mg/m3	Canada. Saskatchewan OELs (Occupational Health and Safety Regulations, 1996, Table 21), as amended (04 2021)
Silicon dioxide (amorphous) - Respirable fraction.	15 MIN ACL	6 mg/m3	Canada. Saskatchewan OELs (Occupational Health and Safety Regulations, 1996, Table 21), as amended (04 2021)
Silicon dioxide (amorphous) - Total	TWA	10 mg/m3	Canada. Alberta OELs (Occupational Health & Safety Code, Schedule 1, Table 2), as amended (08 2020)
Silicon dioxide (amorphous) - Inhalable fraction.	8 HR ACL	10 mg/m3	Canada. Saskatchewan OELs (Occupational Health and Safety Regulations, 1996, Table 21), as amended (04 2021)
Silicon dioxide (amorphous) - Respirable fraction.	8 HR ACL	3 mg/m3	Canada. Saskatchewan OELs (Occupational Health and Safety Regulations, 1996, Table 21), as

			amended (04 2021)
Iron oxide - Dust. - as Fe	TWA	5 mg/m3	Canada. British Columbia OELs: Table of Exposure Limits for Chemical Biological Substances (Workers Compensation Board); as amended (07 2007)
Iron oxide - Fume. - as Fe	STEL	10 mg/m3	Canada. British Columbia OELs: Table of Exposure Limits for Chemical Biological Substances (Workers Compensation Board); as amended (07 2007)
	TWA	5 mg/m3	Canada. British Columbia OELs: Table of Exposure Limits for Chemical Biological Substances (Workers Compensation Board); as amended (07 2007)
Iron oxide	15 MIN ACL	20 mg/m3	Canada. Saskatchewan OELs (Occupational Health and Safety Regulations, 1996, Table 21), as amended (05 2009)
Iron oxide - Respirable fraction.	TWA	5 mg/m3	Canada. Manitoba OELs (Reg. 217/2006, The Workplace Safety And Health Act), as amended (03 2011)
Iron oxide - Dust and fume. - as Fe	TWA	5 mg/m3	Canada. Quebec OELs. (Ministry of Labor - Regulation respecting occupational health and safety), as amended (09 2017)
Iron oxide - Respirable fraction.	TWA	5 mg/m3	Canada. Ontario OELs. (Control of Exposure to Biological or Chemical Agents), as amended (01 2020)
Iron oxide - Dust and fume. - as Fe	15 MIN ACL	10 mg/m3	Canada. Saskatchewan OELs (Occupational Health and Safety Regulations, 1996, Table 21), as amended (04 2021)
Iron oxide - Respirable.	TWA	5 mg/m3	Canada. Alberta OELs (Occupational Health & Safety Code, Schedule 1, Table 2), as amended (08 2020)
Iron oxide - Dust and fume. - as Fe	8 HR ACL	5 mg/m3	Canada. Saskatchewan OELs (Occupational Health and Safety Regulations, 1996, Table 21), as amended (04 2021)
Iron oxide	8 HR ACL	10 mg/m3	Canada. Saskatchewan OELs (Occupational Health and Safety Regulations, 1996, Table 21), as amended (04 2021)
Titanium dioxide (naturally occurring)	TWA	10 mg/m3	Canada. Alberta OELs (Occupational Health & Safety Code, Schedule 1, Table 2), as amended (07 2009)
Titanium dioxide (naturally occurring) - Total dust.	TWA	10 mg/m3	Canada. British Columbia OELs: Table of Exposure Limits for Chemical Biological Substances (Workers Compensation Board); as amended (07 2007)
Titanium dioxide (naturally occurring) - Respirable fraction.	TWA	3 mg/m3	Canada. British Columbia OELs: Table of Exposure Limits for Chemical Biological Substances (Workers Compensation Board); as amended (07 2007)
Titanium dioxide (naturally occurring)	TWA	10 mg/m3	Canada. Ontario OELs. (Control of Exposure to Biological or Chemical Agents), as amended (11 2010)
	8 HR ACL	10 mg/m3	Canada. Saskatchewan OELs (Occupational Health and Safety Regulations, 1996, Table 21), as amended (05 2009)
	15 MIN ACL	20 mg/m3	Canada. Saskatchewan OELs (Occupational Health and Safety Regulations, 1996, Table 21), as amended (05 2009)
Titanium dioxide (naturally occurring) - Total dust.	TWA	10 mg/m3	Canada. Quebec OELs. (Ministry of Labor - Regulation respecting occupational health and safety), as amended (09 2017)
Titanium dioxide (naturally occurring) - Respirable finescale particles	TWA	2.5 mg/m3	Canada. Manitoba OELs (Reg. 217/2006, The Workplace Safety And Health Act), as amended (01 2022)
Titanium dioxide (naturally occurring) - Respirable	TWA	0.2 mg/m3	Canada. Manitoba OELs (Reg. 217/2006, The Workplace Safety And Health Act), as

nanoscale particles			amended (01 2022)
Titanium dioxide (naturally occurring)	8 HR ACL	10 mg/m3	Canada. Saskatchewan OELs (Occupational Health and Safety Regulations, 1996, Table 21), as amended (04 2021)
Aluminum oxide	TWA	10 mg/m3	Canada. Alberta OELs (Occupational Health & Safety Code, Schedule 1, Table 2), as amended (07 2009)
Aluminum oxide - Respirable fraction.	TWA	1 mg/m3	Canada. Manitoba OELs (Reg. 217/2006, The Workplace Safety And Health Act), as amended (03 2011)
	TWA	3 mg/m3	Canada. Ontario OELs. (Control of Exposure to Biological or Chemical Agents), as amended (06 2015)
	TWA	1 mg/m3	Canada. Ontario OELs. (Control of Exposure to Biological or Chemical Agents), as amended (11 2010)
Aluminum oxide - Inhalable fraction.	TWA	10 mg/m3	Canada. Ontario OELs. (Control of Exposure to Biological or Chemical Agents), as amended (06 2015)
Aluminum oxide	8 HR ACL	10 mg/m3	Canada. Saskatchewan OELs (Occupational Health and Safety Regulations, 1996, Table 21), as amended (05 2009)
	15 MIN ACL	20 mg/m3	Canada. Saskatchewan OELs (Occupational Health and Safety Regulations, 1996, Table 21), as amended (05 2009)
Aluminum oxide - Total dust.	TWA	10 mg/m3	Canada. British Columbia OELs: Table of Exposure Limits for Chemical Biological Substances (Workers Compensation Board); as amended (06 2020)
Aluminum oxide - Respirable fraction.	TWA	3 mg/m3	Canada. British Columbia OELs: Table of Exposure Limits for Chemical Biological Substances (Workers Compensation Board); as amended (06 2020)
Aluminum oxide - Inhalable particles.	TWA	10 mg/m3	Canada. Manitoba OELs (Reg. 217/2006, The Workplace Safety And Health Act), as amended (01 2021)
Aluminum oxide - Respirable particles.	TWA	3 mg/m3	Canada. Manitoba OELs (Reg. 217/2006, The Workplace Safety And Health Act), as amended (01 2021)
	TWA	3 mg/m3	Canada. Ontario OELs. (Control of Exposure to Biological or Chemical Agents), as amended (01 2020)
Aluminum oxide - Inhalable particles.	TWA	10 mg/m3	Canada. Ontario OELs. (Control of Exposure to Biological or Chemical Agents), as amended (01 2020)
Aluminum oxide - Respirable.	TWA	1.0 mg/m3	Canada. British Columbia OELs: Table of Exposure Limits for Chemical Biological Substances (Workers Compensation Board); as amended (06 2022)
Aluminum oxide - Total dust.	TWA	10 mg/m3	Canada. Quebec OELs. (Ministry of Labor - Regulation respecting occupational health and safety), as amended (04 2022)
Aluminum oxide - Respirable dust.	TWA	5 mg/m3	Canada. Quebec OELs. (Ministry of Labor - Regulation respecting occupational health and safety), as amended (04 2022)
Aluminum oxide	8 HR ACL	10 mg/m3	Canada. Saskatchewan OELs (Occupational Health and Safety Regulations, 1996, Table 21), as amended (04 2021)
Silicon	15 MIN ACL	20 mg/m3	Canada. Saskatchewan OELs (Occupational Health and Safety Regulations, 1996, Table 21), as amended (05 2009)
Silicon - Total dust.	TWA	10 mg/m3	Canada. Quebec OELs. (Ministry of Labor - Regulation respecting occupational health and safety), as amended (09 2017)
Silicon - Respirable particles.	TWA	3 mg/m3	Canada. Alberta OELs (Occupational Health & Safety Code, Schedule 1, Table

			2), as amended (01 2019)
Silicon - Respirable fraction.	TWA	3 mg/m3	Canada. Ontario OELs. (Control of Exposure to Biological or Chemical Agents), as amended (01 2020)
Silicon - Inhalable fraction.	TWA	10 mg/m3	Canada. Ontario OELs. (Control of Exposure to Biological or Chemical Agents), as amended (01 2020)
Silicon - Inhalable particles.	TWA	10 mg/m3	Canada. Ontario OELs. (Control of Exposure to Biological or Chemical Agents), as amended (01 2020)
Silicon - Respirable particles.	TWA	3 mg/m3	Canada. Ontario OELs. (Control of Exposure to Biological or Chemical Agents), as amended (01 2020)
Silicon - Total dust.	TWA	10 mg/m3	Canada. British Columbia OELs: Table of Exposure Limits for Chemical Biological Substances (Workers Compensation Board); as amended (06 2020)
Silicon - Respirable fraction.	TWA	3 mg/m3	Canada. British Columbia OELs: Table of Exposure Limits for Chemical Biological Substances (Workers Compensation Board); as amended (06 2020)
Silicon - Inhalable particles.	TWA	10 mg/m3	Canada. Manitoba OELs (Reg. 217/2006, The Workplace Safety And Health Act), as amended (01 2021)
Silicon - Respirable particles.	TWA	3 mg/m3	Canada. Manitoba OELs (Reg. 217/2006, The Workplace Safety And Health Act), as amended (01 2021)
Silicon - Total	TWA	10 mg/m3	Canada. Alberta OELs (Occupational Health & Safety Code, Schedule 1, Table 2), as amended (08 2020)
Silicon	8 HR ACL	10 mg/m3	Canada. Saskatchewan OELs (Occupational Health and Safety Regulations, 1996, Table 21), as amended (04 2021)
Calcium oxide	TWA	2 mg/m3	Canada. Alberta OELs (Occupational Health & Safety Code, Schedule 1, Table 2), as amended (07 2009)
	TWA	2 mg/m3	Canada. British Columbia OELs: Table of Exposure Limits for Chemical Biological Substances (Workers Compensation Board); as amended (07 2007)
	TWA	2 mg/m3	Canada. Manitoba OELs (Reg. 217/2006, The Workplace Safety And Health Act), as amended (03 2011)
	TWA	2 mg/m3	Canada. Ontario OELs. (Control of Exposure to Biological or Chemical Agents), as amended (07 2010)
	15 MIN ACL	4 mg/m3	Canada. Saskatchewan OELs (Occupational Health and Safety Regulations, 1996, Table 21), as amended (05 2009)
	8 HR ACL	2 mg/m3	Canada. Saskatchewan OELs (Occupational Health and Safety Regulations, 1996, Table 21), as amended (05 2009)
	TWA	2 mg/m3	Canada. Quebec OELs. (Ministry of Labor - Regulation respecting occupational health and safety), as amended (09 2017)
	8 HR ACL	2 mg/m3	Canada. Saskatchewan OELs (Occupational Health and Safety Regulations, 1996, Table 21), as amended (04 2021)
Manganese - as Mn	8 HR ACL	0.2 mg/m3	Canada. Saskatchewan OELs (Occupational Health and Safety Regulations, 1996, Table 21), as amended (05 2009)
	15 MIN ACL	0.6 mg/m3	Canada. Saskatchewan OELs (Occupational Health and Safety Regulations, 1996, Table 21), as amended (05 2009)
Manganese - Respirable	TWA	0.02 mg/m3	Canada. Manitoba OELs (Reg. 217/2006,

fraction. - as Mn			The Workplace Safety And Health Act), as amended (03 2014)
Manganese - Inhalable fraction. - as Mn	TWA	0.1 mg/m3	Canada. Manitoba OELs (Reg. 217/2006, The Workplace Safety And Health Act), as amended (03 2014)
Manganese - as Mn	TWA	0.2 mg/m3	Canada. Ontario OELs. (Control of Exposure to Biological or Chemical Agents), as amended (06 2015)
Manganese - Fume, total dust. - as Mn	TWA	0.2 mg/m3	Canada. Quebec OELs. (Ministry of Labor - Regulation respecting occupational health and safety), as amended (09 2017)
Manganese - as Mn	TWA	0.2 mg/m3	Canada. Alberta OELs (Occupational Health & Safety Code, Schedule 1, Table 2), as amended (08 2020)
Manganese - Respirable. - as Mn	TWA	0.02 mg/m3	Canada. British Columbia OELs: Table of Exposure Limits for Chemical Biological Substances (Workers Compensation Board); as amended (06 2022)
Manganese - Total - as Mn	TWA	0.2 mg/m3	Canada. British Columbia OELs: Table of Exposure Limits for Chemical Biological Substances (Workers Compensation Board); as amended (06 2022)
Manganese - as Mn	8 HR ACL	0.2 mg/m3	Canada. Saskatchewan OELs (Occupational Health and Safety Regulations, 1996, Table 21), as amended (04 2021)
Barium and soluble compounds (as Ba) - as Ba	TWA	0.5 mg/m3	Canada. Alberta OELs (Occupational Health & Safety Code, Schedule 1, Table 2), as amended (10 2006)
	15 MIN ACL	1.5 mg/m3	Canada. Saskatchewan OELs (Occupational Health and Safety Regulations, 1996, Table 21), as amended (05 2009)
	TWA	0.5 mg/m3	Canada. Manitoba OELs (Reg. 217/2006, The Workplace Safety And Health Act), as amended (03 2011)
	TWA	0.5 mg/m3	Canada. Ontario OELs. (Control of Exposure to Biological or Chemical Agents), as amended (11 2010)
	TWA	0.5 mg/m3	Canada. British Columbia OELs: Table of Exposure Limits for Chemical Biological Substances (Workers Compensation Board); as amended (06 2022)
	8 HR ACL	0.5 mg/m3	Canada. Saskatchewan OELs (Occupational Health and Safety Regulations, 1996, Table 21), as amended (04 2021)

### Occupational Exposure Limits: Mexico

Chemical Identity	Type	Exposure Limit Values	Source
Magnesium oxide - Inhalable fraction.	VLE-PPT	10 mg/m3	Mexico. OELs. (NOM-010-STPS-2014 Chemical Pollutants at the Workplace; Assessment and Control), as amended (04 2014)
Calcium fluoride - as F	VLE-PPT	2.5 mg/m3	Mexico. OELs. (NOM-010-STPS-2014 Chemical Pollutants at the Workplace; Assessment and Control), as amended (04 2014)
Manganese oxide (MnO <sub>2</sub> ) - as Mn	VLE-PPT	0.2 mg/m3	Mexico. OELs. (NOM-010-STPS-2014 Chemical Pollutants at the Workplace; Assessment and Control), as amended (04 2014)
Quartz - Respirable fraction.	VLE-PPT	0.025 mg/m3	Mexico. OELs. (NOM-010-STPS-2014 Chemical Pollutants at the Workplace; Assessment and Control), as amended (04 2014)
Silicon dioxide (amorphous) - Inhalable fraction.	VLE-PPT	10 mg/m3	Mexico. OELs. (NOM-010-STPS-2014 Chemical Pollutants at the Workplace; Assessment and Control), as amended

			(04 2014)
Silicon dioxide (amorphous) - Respirable fraction.	VLE-PPT	3 mg/m3	Mexico. OELs. (NOM-010-STPS-2014 Chemical Pollutants at the Workplace; Assessment and Control), as amended (04 2014)
Iron oxide - Respirable fraction.	VLE-PPT	5 mg/m3	Mexico. OELs. (NOM-010-STPS-2014 Chemical Pollutants at the Workplace; Assessment and Control), as amended (04 2014)
Titanium dioxide (naturally occurring)	VLE-PPT	10 mg/m3	Mexico. OELs. (NOM-010-STPS-2014 Chemical Pollutants at the Workplace; Assessment and Control), as amended (04 2014)
Aluminum oxide	VLE-PPT	10 mg/m3	Mexico. OELs. (NOM-010-STPS-2014 Chemical Pollutants at the Workplace; Assessment and Control), as amended (04 2014)
Silicon - Inhalable fraction.	VLE-PPT	10 mg/m3	Mexico. OELs. (NOM-010-STPS-2014 Chemical Pollutants at the Workplace; Assessment and Control), as amended (04 2014)
Silicon - Respirable fraction.	VLE-PPT	3 mg/m3	Mexico. OELs. (NOM-010-STPS-2014 Chemical Pollutants at the Workplace; Assessment and Control), as amended (04 2014)
Iron - as Fe	VLE-PPT	1 mg/m3	Mexico. OELs. (NOM-010-STPS-2014 Chemical Pollutants at the Workplace; Assessment and Control), as amended (04 2014)
Calcium oxide	VLE-PPT	2 mg/m3	Mexico. OELs. (NOM-010-STPS-2014 Chemical Pollutants at the Workplace; Assessment and Control), as amended (04 2014)
Manganese - as Mn	VLE-PPT	0.2 mg/m3	Mexico. OELs. (NOM-010-STPS-2014 Chemical Pollutants at the Workplace; Assessment and Control), as amended (04 2014)
Barium and soluble compounds (as Ba) - as Ba	VLE-PPT	0.5 mg/m3	Mexico. OELs. (NOM-010-STPS-2014 Chemical Pollutants at the Workplace; Assessment and Control), as amended (04 2014)

**Biological Limit Values: US**

Chemical Identity	Exposure Limit Values	Source
Calcium fluoride (Fluoride: Sampling time: Prior to shift.)	2 mg/l (Urine)	ACGIH BEI (03 2013)
Calcium fluoride (Fluoride: Sampling time: End of shift.)	3 mg/l (Urine)	ACGIH BEI (03 2013)

**Biological Limit Values: Mexico**

Chemical Identity	Exposure Limit Values	Source
Calcium fluoride (fluorides: Sampling time: Prior to shift.)	3 mg/g (Creatinine in urine)	MX IBE (06 2012)
Calcium fluoride (fluorides: Sampling time: End of shift.)	10 mg/g (Creatinine in urine)	MX IBE (06 2012)

**Additional exposure limits under the conditions of use: US**

Chemical Identity	Type	Exposure Limit Values	Source
Carbon dioxide	TWA	5,000 ppm	US. ACGIH Threshold Limit Values (12 2010)
	STEL	30,000 ppm	US. ACGIH Threshold Limit Values (12 2010)
	PEL	5,000 ppm      9,000 mg/m3	US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000) (02 2006)

	STEL	30,000 ppm	54,000 mg/m <sup>3</sup>	US. NIOSH: Pocket Guide to Chemical Hazards, as amended (2005)
	REL	5,000 ppm	9,000 mg/m <sup>3</sup>	US. NIOSH: Pocket Guide to Chemical Hazards, as amended (2005)
	IDLH	40,000 ppm		US. NIOSH. Immediately Dangerous to Life or Health (IDLH) Values (10 2017)
Carbon monoxide	TWA	25 ppm		US. ACGIH Threshold Limit Values (12 2010)
	PEL	50 ppm	55 mg/m <sup>3</sup>	US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000) (02 2006)
	REL	35 ppm	40 mg/m <sup>3</sup>	US. NIOSH: Pocket Guide to Chemical Hazards, as amended (2005)
	Ceil_Time	200 ppm	229 mg/m <sup>3</sup>	US. NIOSH: Pocket Guide to Chemical Hazards, as amended (2005)
	IDLH	1,200 ppm		US. NIOSH. Immediately Dangerous to Life or Health (IDLH) Values (10 2017)
Nitrogen dioxide	TWA	0.2 ppm		US. ACGIH Threshold Limit Values (02 2012)
	Ceiling	5 ppm	9 mg/m <sup>3</sup>	US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000) (02 2006)
	STEL	1 ppm	1.8 mg/m <sup>3</sup>	US. NIOSH: Pocket Guide to Chemical Hazards, as amended (2005)
	IDLH	20 ppm		US. NIOSH. Immediately Dangerous to Life or Health (IDLH) Values (10 2017)
	IDLH	13 ppm		US. NIOSH. Immediately Dangerous to Life or Health (IDLH) Values (10 2017)
Ozone	PEL	0.1 ppm	0.2 mg/m <sup>3</sup>	US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000) (02 2006)
	Ceil_Time	0.1 ppm	0.2 mg/m <sup>3</sup>	US. NIOSH: Pocket Guide to Chemical Hazards, as amended (2005)
	TWA	0.05 ppm		US. ACGIH Threshold Limit Values (03 2014)
	TWA	0.10 ppm		US. ACGIH Threshold Limit Values (03 2014)
	TWA	0.08 ppm		US. ACGIH Threshold Limit Values (03 2014)
	IDLH	5 ppm		US. NIOSH. Immediately Dangerous to Life or Health (IDLH) Values (10 2017)
	TWA	0.20 ppm		US. ACGIH Threshold Limit Values (02 2020)

**Additional exposure limits under the conditions of use: Canada**

Chemical Identity	Type	Exposure Limit Values		Source
Carbon dioxide	STEL	30,000 ppm	54,000 mg/m <sup>3</sup>	Canada. Alberta OELs (Occupational Health & Safety Code, Schedule 1, Table 2), as amended (07 2009)
	TWA	5,000 ppm	9,000 mg/m <sup>3</sup>	Canada. Alberta OELs (Occupational Health & Safety Code, Schedule 1, Table 2), as amended (07 2009)
	TWA	5,000 ppm		Canada. British Columbia OELs: Table of Exposure Limits for Chemical Biological Substances (Workers Compensation Board); as amended (07 2007)
	STEL	15,000 ppm		Canada. British Columbia OELs: Table of Exposure Limits for Chemical Biological Substances (Workers Compensation Board); as amended (07 2007)
	TWA	5,000 ppm		Canada. Manitoba OELs (Reg. 217/2006, The Workplace Safety And Health Act), as amended (03 2011)
	STEL	30,000 ppm		Canada. Manitoba OELs (Reg. 217/2006, The Workplace Safety And Health Act), as amended (03 2011)
	STEL	30,000 ppm		Canada. Ontario OELs. (Control of Exposure to Biological or Chemical Agents), as amended (11 2010)

	TWA	5,000 ppm		Canada. Ontario OELs. (Control of Exposure to Biological or Chemical Agents), as amended (11 2010)
	8 HR ACL	5,000 ppm		Canada. Saskatchewan OELs (Occupational Health and Safety Regulations, 1996, Table 21), as amended (05 2009)
	15 MIN ACL	30,000 ppm		Canada. Saskatchewan OELs (Occupational Health and Safety Regulations, 1996, Table 21), as amended (05 2009)
	TWA	5,000 ppm	9,000 mg/m3	Canada. Quebec OELs. (Ministry of Labor - Regulation respecting occupational health and safety), as amended (09 2017)
	STEL	30,000 ppm	54,000 mg/m3	Canada. Quebec OELs. (Ministry of Labor - Regulation respecting occupational health and safety), as amended (09 2017)
Carbon monoxide	TWA	25 ppm	29 mg/m3	Canada. Alberta OELs (Occupational Health & Safety Code, Schedule 1, Table 2), as amended (07 2009)
	TWA	25 ppm		Canada. British Columbia OELs: Table of Exposure Limits for Chemical Biological Substances (Workers Compensation Board); as amended (07 2007)
	STEL	100 ppm		Canada. British Columbia OELs: Table of Exposure Limits for Chemical Biological Substances (Workers Compensation Board); as amended (07 2007)
	TWA	25 ppm		Canada. Manitoba OELs (Reg. 217/2006, The Workplace Safety And Health Act), as amended (03 2011)
	TWA	25 ppm		Canada. Ontario OELs. (Control of Exposure to Biological or Chemical Agents), as amended (07 2010)
	8 HR ACL	25 ppm		Canada. Saskatchewan OELs (Occupational Health and Safety Regulations, 1996, Table 21), as amended (05 2009)
	15 MIN ACL	190 ppm		Canada. Saskatchewan OELs (Occupational Health and Safety Regulations, 1996, Table 21), as amended (05 2009)
	TWA	35 ppm		Canada. Quebec OELs. (Ministry of Labor - Regulation respecting occupational health and safety), as amended (04 2022)
	STEL	175 ppm		Canada. Quebec OELs. (Ministry of Labor - Regulation respecting occupational health and safety), as amended (04 2022)
Nitrogen dioxide	STEL	5 ppm	9.4 mg/m3	Canada. Alberta OELs (Occupational Health & Safety Code, Schedule 1, Table 2), as amended (07 2009)
	TWA	3 ppm	5.6 mg/m3	Canada. Alberta OELs (Occupational Health & Safety Code, Schedule 1, Table 2), as amended (07 2009)
	CEILING	1 ppm		Canada. British Columbia OELs: Table of Exposure Limits for Chemical Biological Substances (Workers Compensation Board); as amended (07 2007)
	TWA	0.2 ppm		Canada. Manitoba OELs (Reg. 217/2006, The Workplace Safety And Health Act), as amended (03 2012)
	STEL	5 ppm		Canada. Ontario OELs. (Control of Exposure to Biological or Chemical Agents), as amended (11 2010)
	TWA	3 ppm		Canada. Ontario OELs. (Control of Exposure to Biological or Chemical Agents), as amended (11 2010)
	8 HR ACL	3 ppm		Canada. Saskatchewan OELs (Occupational Health and Safety Regulations, 1996, Table 21), as amended (05 2009)

	15 MIN ACL	5 ppm	Canada. Saskatchewan OELs (Occupational Health and Safety Regulations, 1996, Table 21), as amended (05 2009)
	TWA	3 ppm 5 mg/m3	Canada. Quebec OELs. (Ministry of Labor - Regulation respecting occupational health and safety), as amended (04 2022)
Ozone	STEL	0.3 ppm 0.6 mg/m3	Canada. Alberta OELs (Occupational Health & Safety Code, Schedule 1, Table 2), as amended (07 2009)
	TWA	0.1 ppm 0.2 mg/m3	Canada. Alberta OELs (Occupational Health & Safety Code, Schedule 1, Table 2), as amended (07 2009)
	TWA	0.05 ppm	Canada. British Columbia OELs: Table of Exposure Limits for Chemical Biological Substances (Workers Compensation Board); as amended (07 2007)
	TWA	0.1 ppm	Canada. British Columbia OELs: Table of Exposure Limits for Chemical Biological Substances (Workers Compensation Board); as amended (07 2007)
	TWA	0.08 ppm	Canada. British Columbia OELs: Table of Exposure Limits for Chemical Biological Substances (Workers Compensation Board); as amended (07 2007)
	TWA	0.2 ppm	Canada. British Columbia OELs: Table of Exposure Limits for Chemical Biological Substances (Workers Compensation Board); as amended (07 2007)
	TWA	0.1 ppm 0.2 mg/m3	Canada. Ontario OELs. (Control of Exposure to Biological or Chemical Agents), as amended (07 2010)
	STEL	0.3 ppm 0.6 mg/m3	Canada. Ontario OELs. (Control of Exposure to Biological or Chemical Agents), as amended (07 2010)
	15 MIN ACL	0.15 ppm	Canada. Saskatchewan OELs (Occupational Health and Safety Regulations, 1996, Table 21), as amended (05 2009)
	8 HR ACL	0.05 ppm	Canada. Saskatchewan OELs (Occupational Health and Safety Regulations, 1996, Table 21), as amended (05 2009)
	CEILING	0.1 ppm 0.2 mg/m3	Canada. Quebec OELs. (Ministry of Labor - Regulation respecting occupational health and safety), as amended (12 2008)
	TWA	0.05 ppm	Canada. Manitoba OELs (Reg. 217/2006, The Workplace Safety And Health Act), as amended (03 2014)
	TWA	0.08 ppm	Canada. Manitoba OELs (Reg. 217/2006, The Workplace Safety And Health Act), as amended (03 2014)
	TWA	0.10 ppm	Canada. Manitoba OELs (Reg. 217/2006, The Workplace Safety And Health Act), as amended (03 2014)
	TWA	0.20 ppm	Canada. Manitoba OELs (Reg. 217/2006, The Workplace Safety And Health Act), as amended (02 2020)

**Additional exposure limits under the conditions of use: Mexico**

Chemical Identity	Type	Exposure Limit Values	Source
Carbon dioxide	VLE-CT	30,000 ppm	Mexico. OELs. (NOM-010-STPS-2014 Chemical Pollutants at the Workplace; Assessment and Control), as amended (04 2014)
	VLE-PPT	5,000 ppm	Mexico. OELs. (NOM-010-STPS-2014 Chemical Pollutants at the Workplace; Assessment and Control), as amended (04 2014)

Carbon monoxide	VLE-PPT	25 ppm	Mexico. OELs. (NOM-010-STPS-2014 Chemical Pollutants at the Workplace; Assessment and Control), as amended (04 2014)
Nitrogen dioxide	VLE-PPT	0.2 ppm	Mexico. OELs. (NOM-010-STPS-2014 Chemical Pollutants at the Workplace; Assessment and Control), as amended (04 2014)
Ozone	VLE-P	0.1 ppm	Mexico. OELs. (NOM-010-STPS-2014 Chemical Pollutants at the Workplace; Assessment and Control), as amended (04 2014)

**Appropriate Engineering Controls**

**Ventilation:** Use enough ventilation and local exhaust at the arc, flame or heat source to keep the fumes and gases from the worker's breathing zone and the general area. Train the operator to keep their head out of the fumes. **Keep exposure as low as possible.**

**Individual protection measures, such as personal protective equipment (PPE)**

**General information:**

**Exposure Guidelines:** To reduce the potential for overexposure, use controls such as adequate ventilation and personal protective equipment (PPE). Overexposure refers to exceeding applicable local limits, the American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values (TLVs) or the Occupational Safety and Health Administration's (OSHA) Permissible Exposure Limits (PELs). Workplace exposure levels should be established by competent industrial hygiene assessments. Unless exposure levels are confirmed to be below the applicable local limit, TLV or PEL, whichever is lower, respirator use is required. Absent these controls, overexposure to one or more compound constituents, including those in the fume or airborne particles, may occur resulting in potential health hazards. According to the ACGIH, TLVs and Biological Exposure Indices (BEIs) "represent conditions under which ACGIH believes that nearly all workers may be repeatedly exposed without adverse health effects." The ACGIH further states that the TLV-TWA should be used as a guide in the control of health hazards and should not be used to indicate a fine line between safe and dangerous exposures. See Section 10 for information on constituents which have some potential to present health hazards. Welding consumables and materials being joined may contain chromium as an unintended trace element. Materials that contain chromium may produce some amount of hexavalent chromium (CrVI) and other chromium compounds as a byproduct in the fume. In 2018, the American Conference of Governmental Industrial Hygienists (ACGIH) lowered the Threshold Limit Value (TLV) for hexavalent chromium from 50 micrograms per cubic meter of air (50 µg/m<sup>3</sup>) to 0.2 µg/m<sup>3</sup>. At these new limits, CrVI exposures at or above the TLV may be possible in cases where adequate ventilation is not provided. CrVI compounds are on the IARC and NTP lists as posing a lung cancer and sinus cancer risk. Workplace conditions are unique and welding fume exposures levels vary. Workplace exposure assessments must be conducted by a qualified professional, such as an industrial hygienist, to determine if exposures are below applicable limits and to make recommendations when necessary for preventing overexposures.

**Maximum Dust Exposure Guideline™ (MDEG)™** for this product (based on content of Manganese oxide (MnO<sub>2</sub>)) is 0.2 mg/m<sup>3</sup>. This exposure guideline is calculated using the most conservative value of the ACGIH TLV or OSHA PEL for the stated substance. Handle to minimize generation of airborne dust. Use adequate ventilation and dust collection. Use respiratory protection, if required, to keep exposure below limits. If your local applicable exposure limits are lower than the ACGIH TLV or OSHA PEL for any of the substances listed in Section 3 of this SDS, you must take

that into consideration before utilizing or applying this guideline.

**Eye/face protection:**

Wear helmet or use face shield with filter lens shade number 12 or darker for open arc processes – or follow the recommendations as specified in ANSI Z49.1, Section 4; ISO/TR 18786:2014, based on your process and settings. No specific lens shade recommendation for submerged arc or electroslag processes. Shield others by providing appropriate screens and flash goggles.

**Skin Protection****Hand Protection:**

Wear protective gloves. Suitable gloves can be recommended by the glove supplier.

**Other:**

**Protective Clothing:** Wear hand, head, and body protection which help to prevent injury from radiation, open flames, hot surfaces, sparks and electrical shock. See Z49.1, ISO/TR 18786:2014, ISO/TR 13392:2014. At a minimum, this includes welder's gloves and a protective face shield when welding, and may include arm protectors, aprons, hats, shoulder protection, as well as dark substantial clothing when welding, brazing and soldering. Wear dry gloves free of holes or split seams. Train the operator not to permit electrically live parts or electrodes from contacting the skin . . . or clothing or gloves if they are wet. Insulate yourself from the work piece and ground using dry plywood, rubber mats or other dry insulation.

**Respiratory Protection:**

Keep your head out of fumes. Use enough ventilation and local exhaust to keep fumes and gases from your breathing zone and the general area. An approved respirator should be used unless exposure assessments are below applicable exposure limits.

Workplace exposure levels should be established by competent industrial hygiene assessments. Unless exposure levels are confirmed to be below the applicable local limit, TLV or PEL, whichever is lower, respirator use is required.

**Hygiene measures:**

Do not eat, drink or smoke when using the product. Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants. Determine the composition and quantity of fumes and gases to which workers are exposed by taking an air sample from inside the welder's helmet if worn or in the worker's breathing zone. Improve ventilation if exposures are not below limits. See ISO 10882-1:2024; ANSI/AWS F1.1, F1.2, F1.3 and F1.5, available from the American Welding Society, [www.aws.org](http://www.aws.org). Wash hands after handling. Observe good industrial hygiene practices. Wash hands before breaks and immediately after handling the product.

**9. PHYSICAL AND CHEMICAL PROPERTIES**

<b>Appearance:</b>	Granular welding flux.
<b>Physical state:</b>	Solid
<b>Form:</b>	Granular
<b>Color:</b>	Grey
<b>Odor:</b>	No data available.
<b>Odor threshold:</b>	No data available.
<b>pH:</b>	Not applicable
<b>Melting point/freezing point:</b>	No data available.
<b>Initial boiling point and boiling</b>	No data available.

**range:**

<b>Flash Point:</b>	No data available.
<b>Evaporation rate:</b>	No data available.
<b>Flammability (solid, gas):</b>	No data available.
<b>Upper/lower limit on flammability or explosive limits</b>	
<b>Flammability limit - upper (%):</b>	No data available.
<b>Flammability limit - lower (%):</b>	No data available.
<b>Explosive limit - upper:</b>	No data available.
<b>Explosive limit - lower:</b>	No data available.
<b>Vapor pressure:</b>	No data available.
<b>Vapor density:</b>	No data available.
<b>Density:</b>	2.0 g/cm <sup>3</sup>
<b>Relative density:</b>	No data available.
<b>Solubility(ies)</b>	
<b>Solubility in water:</b>	No data available.
<b>Solubility (other):</b>	No data available.
<b>Partition coefficient (n-octanol/water):</b>	No data available.
<b>Auto-ignition temperature:</b>	No data available.
<b>Decomposition temperature:</b>	No data available.
<b>Viscosity:</b>	No data available.

**10. STABILITY AND REACTIVITY**

<b>Reactivity:</b>	The product is non-reactive under normal conditions of use, storage and transport.
<b>Chemical Stability:</b>	Material is stable under normal conditions.
<b>Possibility of hazardous reactions:</b>	None under normal conditions.
<b>Conditions to avoid:</b>	Avoid heat or contamination.
<b>Incompatible Materials:</b>	Strong acids. Strong oxidizing substances. Strong bases.
<b>Hazardous Decomposition Products:</b>	<p>Fumes and gases from welding and its allied processes such as brazing and soldering cannot be classified simply. The composition and quantity of both are dependent upon the metal to which the joining or hot work is applied, the process, procedure - and where applicable - the electrode or consumable used. Other conditions which also influence the composition and quantity of the fumes and gases to which workers may be exposed include: coatings on the metal being welded or worked (such as paint, plating, or galvanizing), the number of operators and the volume of the work area, the quality and amount of ventilation, the position of the operator's head with respect to the fume plume, as well as the presence of contaminants in the atmosphere (such as chlorinated hydrocarbon vapors from cleaning and degreasing activities.)</p> <p>In cases where an electrode or other applied material is consumed, the fume and gas decomposition products generated are different in percent and form from the ingredients listed in Section 3. Decomposition products of normal operation include those originating from the volatilization,</p>

reaction, or oxidation of the materials shown in Section 3, plus those from the base metal and coating, etc., as noted above. Reasonably expected fume constituents produced during arc welding and brazing include the oxides of iron, manganese and other metals present in the welding consumable or base metal. Hexavalent chromium compounds may be in the welding or brazing fume of consumables or base metals which contain chromium. Gaseous and particulate fluoride may be in the fume of consumables or flux materials which contain fluoride. Gaseous reaction products may include carbon monoxide and carbon dioxide. Ozone and nitrogen oxides may be formed by the radiation from the arc associated with welding.

## 11. TOXICOLOGICAL INFORMATION

### General information:

The International Agency for Research on Cancer (IARC) has determined welding fumes and ultraviolet radiation from welding are carcinogenic to humans (Group 1). According to IARC, welding fumes cause cancer of the lung and positive associations have been observed with cancer of the kidney. Also according to IARC, ultraviolet radiation from welding causes ocular melanoma. IARC identifies gouging, brazing, carbon arc or plasma arc cutting, and soldering as processes closely related to welding. Read and understand the manufacturer's instructions, Safety Data Sheets and the precautionary labels before using this product.

### Information on likely routes of exposure

#### Inhalation:

Potential chronic health hazards related to the use of welding consumables are most applicable to the inhalation route of exposure. Refer to Inhalation statements in Section 11.

#### Skin Contact:

Arc rays can burn skin. Skin cancer has been reported.

#### Eye contact:

Arc rays can injure eyes.

#### Ingestion:

Harmful if swallowed.

### Symptoms related to the physical, chemical and toxicological characteristics

#### Inhalation:

Overexposure to respirable crystalline silica, which may be present in dust created from the processing, handling or use of this product, can cause severe lung damage (silicosis). Respiratory overexposure to airborne crystalline silica is known to cause silicosis, a form of disabling pulmonary fibrosis which can be progressive and may lead to death. Crystalline silica is on the IARC (International Agency for Research on Cancer) and NTP (National Toxicology Program) lists as posing a cancer risk to humans. Note: All regional authorities do not use the same criteria for assigning carcinogenic classifications to chemicals. For example, the European Union (EU) CLP does not require classifying crystalline silica as a carcinogenic compound, or listing it in Section 3 of the SDS when concentrations are less than 1%. Short-term (acute) overexposure to fumes and gases from welding and allied processes may result in discomfort such as metal fume fever, dizziness, nausea, or dryness or irritation of nose, throat, or eyes. May aggravate pre-existing respiratory problems (e.g. asthma, emphysema). Long-term (chronic) overexposure to fumes and gases from welding and allied processes can lead to siderosis (iron deposits in lung), central nervous system effects, bronchitis and other pulmonary effects.

### Information on toxicological effects

#### Acute toxicity (list all possible routes of exposure)

**Oral**

<b>Product:</b>	ATEmix: 1,752.8 mg/kg
<b>Specified substance(s):</b>	
Calcium fluoride	LD 50 (Rat): 4,250 mg/kg
Manganese oxide (MnO <sub>2</sub> )	LD 50 (Rat): > 3,480 mg/kg
Sodium silicate	LD 50 (Rat): 1.1 g/kg
Barium and soluble compounds (as Ba)	LD 50 (Rat): 630 mg/kg

**Dermal****Product:****Inhalation****Product:****Repeated dose toxicity****Product:** No data available.**Skin Corrosion/Irritation****Product:** No data available.**Serious Eye Damage/Eye Irritation****Product:** No data available.**Respiratory or Skin Sensitization****Product:** No data available.**Specified substance(s):**

Silicon dioxide (amorphous)	Skin sensitization:, in vivo (Guinea pig): Not Classified
Iron oxide	Skin sensitization:, in vivo (Guinea pig): Not sensitising Skin sensitization:, in vivo: Not sensitising
Titanium dioxide (naturally occurring)	Skin sensitization:, in vivo (Guinea pig): Not sensitising Skin sensitization:, in vivo (Guinea pig): Not Classified
Aluminum oxide	Skin sensitization:, in vivo (Guinea pig): Not Classified Skin sensitization:, skin sensitisation, other: Not Classified
Potassium oxide	Skin sensitization:, Skin Sensitisation (Guinea pig): Not sensitising Skin sensitization:, in vivo (Guinea pig): Not sensitising

**Carcinogenicity****Product:** Suspected of causing cancer.**IARC Monographs on the Evaluation of Carcinogenic Risks to Humans:**

Quartz	Overall evaluation: 1. Carcinogenic to humans.
Titanium dioxide (naturally occurring)	Overall evaluation: 2B. Possibly carcinogenic to humans.

**US. National Toxicology Program (NTP) Report on Carcinogens:**

Quartz Known To Be Human Carcinogen.

**US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1053), as amended:**

Quartz Cancer

**Germ Cell Mutagenicity****In vitro****Product:** No data available.

**In vivo**  
**Product:** No data available.

**Reproductive toxicity**  
**Product:** No data available.

**Specific Target Organ Toxicity - Single Exposure**  
**Product:** No data available.

**Specific Target Organ Toxicity - Repeated Exposure**  
**Product:** Repeated overexposure to airborne manganese may affect the brain and central nervous system, resulting in poor coordination, difficulty speaking, and arm or leg tremor. This condition can be irreversible.

**Aspiration Hazard**  
**Product:** Not applicable  
**Other effects:** Organic polymers may be used in the manufacture of various welding consumables. Overexposure to their decomposition byproducts may result in a condition known as polymer fume fever. Polymer fume fever usually occurs within 4 to 8 hours of exposure with the presentation of flu like symptoms, including mild pulmonary irritation with or without an increase in body temperature. Signs of exposure can include an increase in white blood cell count. Resolution of symptoms typically occurs quickly, usually not lasting longer than 48 hours.

**Symptoms related to the physical, chemical and toxicological characteristics under the condition of use**

**Additional toxicological Information under the conditions of use:**

**Acute toxicity**

**Inhalation**

**Specified substance(s):**

Carbon dioxide	LC Lo (Human, 5 min): 90000 ppm
Carbon monoxide	LC 50 (Rat, 4 h): 1300 ppm
Nitrogen dioxide	LC 50 (Rat, 4 h): 88 ppm
Ozone	LC Lo (Human, 30 min): 50 ppm

**Other effects:**

**Specified substance(s):**

Carbon dioxide	Asphyxia
Carbon monoxide	Carboxyhemoglobinemia
Nitrogen dioxide	Lower respiratory tract irritation

## 12. ECOLOGICAL INFORMATION

**Ecotoxicity**

**Acute hazards to the aquatic environment:**

**Fish**

**Product:** No data available.

**Specified substance(s):**

Calcium fluoride	LC 50 (96 h): 340 mg/l
Sodium silicate	LC 50 (Western mosquitofish ( <i>Gambusia affinis</i> ), 96 h): 1,800 mg/l

**Aquatic Invertebrates**

**Product:** No data available.

**Specified substance(s):**

Calcium fluoride	EC 50 ( <i>Daphnia magna</i> ; <i>Daphnia</i> sp., 48 h): 270 mg/l
Sodium silicate	EC 50 ( <i>Water flea</i> ( <i>Ceriodaphnia dubia</i> ), 48 h): 22.94 - 49.01 mg/l

Manganese EC 50 (Water flea (Daphnia magna), 48 h): 40 mg/l

**Chronic hazards to the aquatic environment:**

**Fish**

**Product:** No data available.

**Aquatic Invertebrates**

**Product:** No data available.

**Specified substance(s):**

Calcium fluoride	NOEC (Daphnia magna): 3.7 mg/l NOEC : 7.6 mg/l NOEC : 28.96 mg/l NOEC (Daphnia magna): 14.1 mg/l
Silicon dioxide (amorphous)	NOEC (Daphnia magna): 100 mg/l NOEC (Mysid shrimp): 346.737 mg/l NOEC (Daphnid): 34.223 mg/l NOEC (Daphnia magna): 250 mg/l NOEC (Daphnia magna): 149.2 mg/l
Iron oxide	NOEC (Daphnia magna): 2 mg/l NOEC (Daphnia pulex): 2.5 mg/l NOEC (Chironomus attenuatus): 200 mg/l NOEC (Daphnia magna): >= 20 mg/l NOEC : >= 20 mg/l
Titanium dioxide (naturally occurring)	NOEC (Daphnia magna): 30 mg/l NOEC (Lumbriculus variegatus): >= 100 mg/l NOEC (Daphnia magna): < 0.1 mg/l NOEC : > 1 mg/l NOEC (Daphnia magna): >= 3.12 mg/l
Aluminum oxide	NOEC (Brachionus calyciflorus): 405 µg/l NOEC (Lymnaea stagnalis): 1,059.9 µg/l NOEC (Chironomus riparius): 4,281.8 µg/l NOEC (Brachionus calyciflorus): 963 µg/l NOEC (Ceriodaphnia dubia): 3,161.3 µg/l
Calcium oxide	NOEC (Crangon septemspinosa): 32 mg/l
Potassium oxide	NOEC (Daphnid): 273.134 mg/l
Manganese	NOEC (Ceriodaphnia dubia): 1.7 mg/l NOEC (Daphnia magna): < 1.1 mg/l
Barium and soluble compounds (as Ba)	NOEC (Cancer anthonyi): 10,000 µg/l

**Toxicity to Aquatic Plants**

**Product:** No data available.

**Persistence and Degradability**

**Biodegradation**

**Product:** No data available.

**Bioaccumulative potential**

**Bioconcentration Factor (BCF)**

**Product:** No data available.

**Mobility in soil:**

No data available.

**13. Disposal considerations**

**General information:**

The generation of waste should be avoided or minimized whenever possible. When practical, recycle in an environmentally acceptable, regulatory compliant manner. Dispose of non-recyclable products in accordance with all applicable Federal, State, Provincial, and Local requirements. Minerals such as Florida Zircon Sand are used as one of the components in the manufacturing of welding fluxes contain trace levels of Naturally Occurring Radioactive Material (NORM). Based on the radiological status of these materials, the scrap flux and waste slag generated in welding processes should be acceptable for disposal in RCRA Title D landfills. Flux materials containing sufficiently low concentrations of NORM are not subject to federal radiation control regulations. The regulation for classifying the flux material (zircon sand) is Title 10, Code of Federal Regulations, Part 40 Section 40.13 (10CFR40.13). **Materials**

**which contain less than 0.05% (0,05%) by weight of uranium and/or thorium, are exempt from regulation.** The concentrations in the flux and slag are considerably lower than 0.05% (0,05%). Note: Many states are developing regulations pertaining to Naturally Occurring Radioactive Materials (NORM) above background levels. Consult with the applicable regulations and the authority with jurisdiction.

**Disposal instructions:**

Disposal of this product may be regulated as a Hazardous Waste. The welding consumable and/or by-product from the welding process (including, but not limited to slag, dust, etc.) may contain levels of leachable heavy metals such as Barium or Chromium. Prior to disposal, a representative sample must be analyzed in accordance with US EPA's Toxicity Characteristic Leaching Procedure (TCLP) to determine if any constituents exist above regulated threshold levels. Discard any product, residue, disposable container, or liner in an environmentally acceptable manner according to Federal, State and Local Regulations. Discharge, treatment, or disposal may be subject to national, state, or local laws.

**Contaminated Packaging:**

Dispose of contents/container to an appropriate treatment and disposal facility in accordance with applicable laws and regulations, and product characteristics at time of disposal.

**14. TRANSPORT INFORMATION****DOT**

UN number or ID number:  
UN Proper Shipping Name: NOT DG REGULATED  
Transport Hazard Class(es)  
Class: NR  
Label(s): –  
Packing Group: –  
Marine Pollutant: No

**IMDG**

UN number or ID number:  
UN Proper Shipping Name: NOT DG REGULATED  
Transport Hazard Class(es)  
Class: NR  
Label(s): –  
EmS No.:  
Packing Group: –  
Marine Pollutant: No

**IATA**

UN number or ID number:  
Proper Shipping Name: NOT DG REGULATED  
Transport Hazard Class(es):  
Class: NR  
Label(s): –  
Packing Group: –  
Marine Pollutant: No  
Cargo aircraft only: Allowed.

**TDG**

UN number or ID number:  
UN Proper Shipping Name: NOT DG REGULATED  
Transport Hazard Class(es)  
Class: NR

Label(s): –  
Packing Group: –  
Marine Pollutant: No

**15. REGULATORY INFORMATION****US Federal Regulations****TSCA Section 12(b) Export Notification (40 CFR 707, Subpt. D)**

None present or none present in regulated quantities.

**US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1053), as amended****Chemical Identity**

Quartz

**OSHA hazard(s)**

kidney effects  
lung effects  
immune system effects  
Cancer

**CERCLA Hazardous Substance List (40 CFR 302.4):****Chemical Identity**

Manganese

**Reportable quantity**

Included in the regulation but with no data values. See regulation for further details.

**Superfund Amendments and Reauthorization Act of 1986 (SARA)****Hazard categories**

Immediate (Acute) Health Hazards  
Delayed (Chronic) Health Hazard  
Acute toxicity (any route of exposure)  
Carcinogenicity

**SARA 302 Extremely Hazardous Substance**

None present or none present in regulated quantities.

**SARA 304 Emergency Release Notification**

None present or none present in regulated quantities.

**SARA 311/312 Hazardous Chemical****Chemical Identity****Threshold Planning Quantity****SARA 313 (TRI Reporting)****Chemical Identity**

Manganese oxide (MnO<sub>2</sub>)

**Reporting threshold  
for other users**

10000 lbs

**Reporting threshold for****manufacturing and processing**

25000 lbs.

**Clean Water Act Section 311 Hazardous Substances (40 CFR 117.3)**

None present or none present in regulated quantities.

**Clean Air Act (CAA) Section 112(r) Accidental Release Prevention (40 CFR 68.130):**

None present or none present in regulated quantities.

**US State Regulations****US. California Proposition 65**



**WARNING:** This product can expose you to chemicals including, Quartz, Titanium dioxide (naturally occurring), which is [are] known to the State of California to cause cancer.

For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).

**WARNING:** This product contains or produces a chemical known to the State of California to cause cancer and birth defects (or other reproductive harm). (California Health & Safety Code Section 25249.5 et seq.)

**WARNING:** Cancer and Reproductive Harm – [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov)

#### **US. New Jersey Worker and Community Right-to-Know Act**

##### **Chemical Identity**

Calcined bauxite  
Magnesium oxide  
Calcium fluoride  
Manganese oxide (MnO<sub>2</sub>)  
Wollastonite  
Silicon dioxide (amorphous)  
Iron oxide  
Titanium dioxide (naturally occurring)  
Aluminum oxide  
Silicon  
Manganese  
Barium and soluble compounds (as Ba)

#### **US. Massachusetts RTK - Substance List**

##### **Chemical Identity**

Magnesium oxide  
Quartz  
Silicon dioxide (amorphous)  
Iron oxide  
Titanium dioxide (naturally occurring)  
Aluminum oxide  
Silicon

#### **US. Pennsylvania RTK - Hazardous Substances**

##### **Chemical Identity**

Magnesium oxide  
Calcium fluoride  
Manganese oxide (MnO<sub>2</sub>)  
Quartz  
Silicon dioxide (amorphous)  
Iron oxide  
Titanium dioxide (naturally occurring)  
Aluminum oxide  
Silicon  
Calcium oxide

#### **US. Rhode Island RTK**

##### **Chemical Identity**

Magnesium oxide  
Calcium fluoride  
Silicon dioxide (amorphous)  
Iron oxide  
Titanium dioxide (naturally occurring)  
Aluminum oxide  
Silicon



Thailand Existing Chemical Inv. List:	One or more components are not listed or are exempt from listing.
EINECS, ELINCS or NLP:	On or in compliance with the inventory
Vietnam National Chemical Inventory:	On or in compliance with the inventory

**16. OTHER INFORMATION****Definitions:**

**The Maximum Dust Exposure Guideline™ (MDEG)™** is provided to assist with the management of workplace exposures where granular solid welding products or other materials are being utilized. It is derived from relevant compositional data and estimates the lowest level of total airborne dust exposure, for a given product, at which some specific constituent might potentially exceed its individual exposure limit. The specific exposure limits referenced are the American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Value (TLV®) and the U. S. OSHA Permissible Exposure Limit (PEL), which ever value is the lowest. If local applicable limits for any of the substances listed in Section 3 of this SDS are lower than the TLV or PEL this must be taken into consideration before utilizing or applying this guideline. The MDEG™ is never greater than 10 mg/m<sup>3</sup> as this is the airborne exposure guideline for total particulate (total dust). **The MDEG™ is intended to serve as a general guideline to assist in the management of workplace exposure and does not replace the regular measurement and analysis of worker exposure to individual airborne dust constituents in accordance with recommended industrial hygiene practice.**

**Combustible Dust Hazard Rating:** This material will not burn and has the Lincoln Electric Combustible Dust Hazard Rating: 0-CS. For additional information contact the Lincoln Electric EHS Department (216) 383-2669.

**Combustible Dust Hazard Rating Information:** **Lincoln Electric's Combustible Dust Rating System is as follows:**

- 3: Fine solid powders or dusts which can ignite with contact with air, or have a Kst value  $\geq 300$ , and/or would have an ignition flame front faster than the speed of sound.
- 2: Fine solid powders or dusts which can ignite with contact with air, have an MIE  $< 3$  mJ, or have a Kst value  $> 200$  &  $\leq 299$ , and/or would have an ignition flame front faster than the speed of sound.
- 1.3: Fine solid powders or dusts which have an MIE  $> 3$  mJ  $< 500$  mJ, and a Kst  $\geq 25 < 200$  mJ.
- 1.2: Fine solid powders or dusts which have an MIE  $> 3$  mJ  $< 500$  mJ, and a Kst  $< 25$ , or MIE  $> 500$  mJ and Kst  $\geq 25$  but  $< 200$  mJ.
- 1.1: Fine solid powders or dusts which have an MIE  $> 10$  J and a positive Kst value  $< 25$ .
- 0-CS: Materials that will not burn.

**Revision Date:** 10/23/2025

**Further Information:** Additional information is available by request.

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