

## APPENDIX A

# Material Safety Data Sheet

The Material Safety Data Sheet (MSDS) of a chemical provides the necessary and pertinent information for its safe handling. Federal regulations mandate that an MSDS for each chemical used in a workplace be available and accessible to workers. An MSDS produced by the manufacturer or the vendor is usually shipped with a chemical. In general, MSDSs can be found at manufacturers' websites. If an MSDS for a particular chemical is not already available, individuals or companies using the chemical should contact the supplier.

The MSDS provides information on physical and chemical characteristics; potential health symptoms and effects in case of exposure; how the chemical should be stored; safety precautions on handling and working with the chemical; and steps to follow in case of an accident. It describes the possible physical, health and environmental hazards involved when working with the chemical. An MSDS is not only useful for personnel who work with the chemical, but also for first responders in an incident involving the chemical. The data sheet contains instructions on what to do when exposure occurs, and how to recognize symptoms of overexposure that help first responders to handle the incident properly. By following instructions in an MSDS, the potential for an accident to occur and the hazards it may cause can be minimized.

The MSDS for a given chemical or compound contains many sections, and formats differ by manufacturer. However, all MSDSs for a particular chemical will include similar information. A typical MSDS includes the following:

- Product and company identification
- Composition/information on ingredients
- Hazards identification
- First-aid measures (or health hazards)
- Fire-fighting measures (or physical hazards)
- Accidental release measures
- Handling and storage

- Exposure controls/personal protection
- Physical and chemical properties
- Stability and reactivity
- Toxicological information
- Ecological information
- Disposal considerations
- Transport information
- Regulatory information
- Other information

In a typical MSDS, all of the above would appear as section headings. Appearing below is a hypothetical example of an MSDS: the right column presents example data, and the left column explains what should and could be found in each section, as well as term definitions. Note: The following is *not* a real-world MSDS for the example compound.

<b>Material Safety Data Sheet</b>	
<b>Content</b>	<b>Example</b>
<b>Section 1: Chemical Product and Company</b>	
<p>This section identifies the chemical by name, vendor's catalog number, synonyms, formula, and molecular weight, and so on. It may also contain descriptive terms to further help identify the material, such as its chemical family.</p> <p>The manufacturer's name, address, telephone number, and emergency telephone number are found in this section.</p>	<p>MSDS Name: Diphosgene, 99%.            Catalog Numbers: XXXXXX, XXXXXXXX.            Synonyms: Trichloromethyl chloroformate; carbonochloridic acid, trichloromethyl ester.            Molecular formula: C<sub>2</sub>C<sub>14</sub>O<sub>2</sub>.            Molecular weight: 197.83 g.            Company Identification:            Company Name: XXXX Company.            Company Address 1:            Company Address 2:            For information in North America, call: 1-XXX-XXX-XXXX.            For emergencies in the U.S., call: 1-XXX-XXX-XXXX.</p>
<b>Section 2: Composition/Information on Ingredients</b>	
<p>Chemical names, Chemical Abstract Service (CAS) numbers and percentages of chemicals that comprise the product (if the material is a compound) are found in this section. For a carcinogen identified by the National Toxicology Program (NTP), International Agency for Research on Cancer (IARC), or the U.S. Occupational Safety and Health Administration (OSHA), its presence is noted here, when ≥0.1%. If the makeup of the chemical is a trade secret, its composition may not be listed, but hazards and safety precautions are found here.</p>	<p><b>Chemical Name:</b> Diphosgene.  <b>CAS#:</b> 503-38-8.  <b>Percent:</b> 99%.</p>

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**Material Safety Data Sheet (Continued)**

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**Section 3: Hazards Identification**

The material's appearance, odor, and health, physical, and environmental hazards that may be of concern for emergency response personnel are found here. Understanding the consequences of exposure to this substance is important.

**Appearance:** Clear, colorless liquid.  
**Danger!** Corrosive. Causes eye and skin burns. May cause severe respiratory tract irritation with possible burns. May cause severe digestive tract irritation with possible burns. Lacrimator (substance that increases the flow of tears). May cause sensitization by inhalation and skin contact.

Reacts violently and/or explosively with water, steam, or moisture.

**Target Organs:** None.

**Potential Health Effects:**

**Eye:** Causes eye burns. Lacrimator.

**Skin:** Causes skin burns. May cause skin sensitization, an allergic reaction that becomes evident upon reexposure to this material.

**Ingestion:** May cause severe and permanent damage to the digestive tract. Causes gastrointestinal tract burns. Direct aspiration into the lungs may cause chemical pneumonitis, pulmonary edema, and hemorrhaging.

**Inhalation:** Causes chemical burns to the respiratory tract. Inhalation may produce coughing, nausea, and pulmonary edema. In rare instances, exposure may cause sensitization, resulting in inflammation of the mucous membranes and in eczematous eruptions.

**Chronic:** Repeated or prolonged exposure may cause allergic reactions in sensitive individuals.

**Section 4: First-Aid Measures (or Health Hazards)**

Information regarding acute and chronic health effects and what should and should not be done when a person is exposed to the chemical is found in this section. Since chemicals can enter the human body through different routes, procedures dealing with each potential route of exposure are also included here.

**Eyes:** Get medical aid immediately. Do NOT allow victim to rub or keep eyes closed. Extensive irrigation with water is required (at least 30 minutes).

**Skin:** Get medical aid immediately. Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Destroy contaminated shoes.

**Ingestion:** Do NOT induce vomiting. If victim is conscious and alert, give 2 to 4 cupfuls of milk or water. Never give anything by mouth to an unconscious person. Get medical aid immediately.

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**Material Safety Data Sheet (Continued)**

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**Section 4: First-Aid Measures (or Health Hazards) (Continued)**

**Inhalation:** Get medical aid immediately. Remove from exposure and move to fresh air immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Do NOT use mouth-to-mouth resuscitation.

**Notes to Physician:** Treat symptomatically and supportively.

**Section 5: Fire-Fighting Measures (or Physical Hazards)**

This section describes potential flammability and explosion hazards. Recommended extinguishing media to be used, procedures in handling these hazards, and storage considerations are included here. It may also contain information on chemical incompatibility. This section contains important characteristics of the chemical, such as extinguishing media, flash point, flammable limits (explosive limits), ignition temperature, auto-ignition temperature, hazardous decomposition products, fire-fighting equipment, fire-fighting methods, Fire Protection Association (FPA) codes, chemical incompatibilities, chemical instabilities, and hazardous polymerization.

**General Information:** Containers can build up pressure if exposed to heat and/or fire. As in any fire, wear a self-contained breathing apparatus in pressure-demand, Mine Safety and Health Administration (MSHA)/NIOSH (approved or equivalent), and full protective gear. During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion. Use water spray to keep fire-exposed containers cool. Vapors may be heavier than air. They can spread along the ground and collect in low or confined areas. May ignite or explode on contact with steam or moist air. Substance may react with water, and may release corrosive and/or toxic gases.

**Extinguishing Media:** Use dry sand or earth to smother fire. Do NOT get water inside containers. For large fires, use water spray, fog, or regular foam. Contact professional fire fighters immediately. Cool containers with flooding quantities of water until well after fire is out. For small fires, use dry chemical or carbon dioxide.

**Flash Point:** Not available.

**Auto-ignition Temperature:** Not available.

**Explosion Limits:** Not available.

**Lower:** Not available.

**Upper:** Not available.

**National Fire Protection Association (NFPA) Rating (estimated):** Health: 3; Flammability: 1; Instability: 1; Special Hazard: W.

**Section 6: Accidental Release Measures**

Information for preventing or minimizing adverse effects in the event of a spill or leak and methods of cleanup and disposal are presented in this section.

**General Information:** Use proper personal protective equipment as indicated in Section 8.

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**Material Safety Data Sheet (Continued)**

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**Section 6: Accidental Release Measures (Continued)**

**Spills/Leaks:** Absorb spill with inert material (e.g., vermiculite, sand, or earth), and then place in suitable container. Avoid runoff into storm sewers and ditches that lead to waterways. Clean up spills immediately, observing precautions in Section 8. Isolate area and deny entry. Provide ventilation. Do not expose spill to water. Do not get water inside containers. A vapor-suppressing foam may be used.

**Section 7: Handling and Storage**

This section provides guidelines for minimizing potential hazards from storage and handling the chemical. Conditions for storage and safe handling and conditions that should be avoided are listed.

**Handling:** Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Use only in a well-ventilated area. Do not allow water to get into the container because of violent reaction. Avoid contact with skin and eyes. Keep container tightly closed. Avoid ingestion and inhalation. Do not allow contact with water. Discard contaminated shoes. Keep from contact with moist air and steam.

**Storage:** Keep container closed when not in use. Store in a cool, dry, well-ventilated area away from incompatible substances. Keep away from water.

**Section 8: Exposure Controls, Personal Protection**

Engineering control needed when handling the material and personal protective equipment (e.g., respirators, gloves, and goggles) to be used are discussed. Exposure and work practices guidelines are included in this section. Specific steps and precautions to take to safeguard human health, such as proper ventilation requirements, are included here.

**Engineering Controls:** Use explosion-proof ventilation equipment. Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use adequate ventilation to keep airborne concentrations low.

**Exposure Limits:**

American Conference of Industrial Hygienists (**ACGIH**): None listed.

**NIOSH:** None listed.

**OSHA Final PELs:** None listed.

**OSHA Vacated PELs:** No OSHA vacated PELs are listed for this chemical.

**Personal Protective Equipment:**

**Eyes:** Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

**Skin:** Wear appropriate protective gloves to prevent skin exposure.

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**Material Safety Data Sheet (Continued)**

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**Section 8: Exposure Controls, Personal Protection (Continued)**

**Clothing:** Wear appropriate protective clothing to minimize contact with skin.

**Respirators:** Wear a NIOSH/MSHA or European Standard EN 149 approved full-face airline respirator in the positive pressure mode with emergency escape provisions.

**Section 9: Physical and Chemical Properties**

This section includes physical and chemical properties of the chemical. These properties may include many items such as physical state (liquid, solid, gas), appearance, odor, physical state, pH, vapor pressure and density, evaporation rate, viscosity, boiling point, melting and freezing point, decomposition temperature, solubility, and specific gravity, among others. Other useful properties may also be found here.

Physical State: Liquid.  
Appearance: Clear, colorless.  
Odor: Phosgene odor.  
pH: Not available.  
Vapor Pressure: 13.7 mbar at 20°C.  
Vapor Density: 6.8.  
Evaporation Rate: Not available.  
Viscosity: Not available.  
Boiling Point: 128°C at 760.00 mmHg.  
Freezing/Melting Point: -57°C.  
Decomposition Temperature: Not available.  
Solubility: May decompose.  
Specific Gravity/Density: 1.6400g/cm<sup>3</sup>.

**Section 10: Stability and Reactivity**

Conditions under which the chemical is stable or unstable or a potentially hazardous reaction may occur, such as storage and handling temperature, reactions with other chemicals, production of heat, or other hazardous conditions are given in this section.

Chemical Stability: Stable under normal temperatures and pressures. Combines vigorously or explosively with water.  
Conditions to Avoid: Incompatible materials, excess heat, exposure to moist air or water, oxidizers.  
Incompatibilities with Other Materials: Metals, strong oxidizing agents, ammonia, isopropyl alcohol.  
Hazardous Decomposition Products: Hydrogen chloride, phosgene, irritating and toxic fumes and gases, hydrogen gas.  
Hazardous Polymerization: Has not been reported.

**Section 11: Toxicological Information**

This section includes information on toxicity of the chemical, and its potential for causing cancer, and other chronic health problems. Acute, subchronic, and chronic exposure data can also be found here.

Registry of Toxic Effects of Chemical Substances (RTECS)#: LQ7350000  
CAS#: 503-38-8: LD<sub>50</sub>/LC<sub>50</sub>: Not available.  
Carcinogenicity:  
CAS# 503-38-8: Not listed by ACGIH, IARC, NIOSH, NTP, or OSHA.  
Epidemiology: No information available.  
Teratogenicity: No information available.  
Reproductive Effects: No information available.  
Neurotoxicity: No information available.  
Mutagenicity: No information available.  
Other Studies: No data available.

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**Material Safety Data Sheet (Continued)**


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**Section 12: Ecological Information**

Impacts to the environment that may occur if the material leaks to the environment are discussed here.

Ecotoxicity: No data available. No information available.

Environmental: Based on its low melting and boiling points, this chemical is expected to rapidly volatilize into the atmosphere.

Physical: No information available.

Other: No information available.

**Section 13: Disposal Considerations**

This section includes guidance for environmental and other technical personnel responsible for waste management of this chemical.

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. U.S. EPA guidelines for classification determination are listed in 40 CFR Parts 261.3.

Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.

RCRA P-Series: None listed.

RCRA U-Series: None listed.

**Section 14: Transport Information**

This section gives information regarding U.S. Department of Transportation (DOT) and other classifications.

**U.S. DOT.**

**International Air Transport Association (IATA).**

**European Agreements Governing the Regulations Concerning the International Transport of Dangerous Goods by Rail (RID) or Road (ADR) (RID/ADR).**

**International Maritime Organization (IMO).**

**Canada, Transport Dangerous Goods (TDG).**

Shipping Name: TOXIC LIQUIDS, CORROSIVE, ORGANIC, Not otherwise specified N.O.S.:

No information available.

Hazard Class: 6.1.

United Nations (UN) Number: UN2927.

Packing Group: I

**Section 15: Regulatory Information**

Information regarding the regulatory status of the material: OSHA regulations, EPA regulations, regulations by other federal regulatory agencies, and state agencies should be found in this section.

**U.S. FEDERAL REGULATIONS**

Toxic Substances Control Act (TSCA).

CAS# 503-38-8 is listed on the TSCA inventory.

Health & Safety Reporting List: None of the chemicals in this product are on the Health & Safety Reporting List.

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**Material Safety Data Sheet (Continued)**

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**Section 15: Regulatory Information (Continued)**

Chemical Test Rules: None of the chemicals in this product are under a Chemical Test Rule.

Section 12b: None of the chemicals are listed under TSCA Section 12b.

TSCA Significant New Use Rule (SNUR): None of the chemicals in this material have a SNUR under TSCA.

Comprehensive Environmental Response Compensation & Liability Act (CERCLA) Hazardous Substances and corresponding Reportable Quantity (RQ): None of the chemicals in this material have an RQ.

Superfund Amendments and Reauthorization Act (SARA) Section 302 Extremely Hazardous Substances: None of the chemicals in this product have a threshold planning quantities (TPQ).

Section 313: None of the chemicals in this product are reportable under Section 313.

Clean Air Act (CWA): This material does not contain any hazardous air pollutants. This material does not contain any Class 1 ozone depleters. This material does not contain any Class 2 ozone depleters.

None of the chemicals in this product are listed as Hazardous Substances under the CWA. None of the chemicals in this product are listed as Priority Pollutants under the CWA. None of the chemicals in this product are listed as Toxic Pollutants under the CWA.

Occupational Safety and Health Administration (OSHA): None of the chemicals in this product are considered highly hazardous by OSHA.

**STATE REGULATIONS**

CAS# 503-38-8 is not present on state lists from CA, PA, MN, MA, FL, or NJ. None of the chemicals in this product are listed on CA state list.

European/International Regulations: European Labeling in Accordance with EC Directives.

Hazard Symbols: T+ C.

Risk Phrases: R 26/27/28, Very toxic by inhalation, in contact with skin and if swallowed. R 34, Causes burns.

Safety Phrases: S 36/39, Wear suitable protective clothing and eye/face protection. S 45, In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

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**Material Safety Data Sheet (Continued)**

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**Section 15: Regulatory Information (Continued)**

WGK (Water Danger/Protection)  
CAS# 503-38-8: No information available.  
Canada, Domestic Substance List and the  
Nondomestic Substance List (DSL/NDSL):  
CAS# 503-38-8 is listed on Canada's  
NDSL list.  
Canada, Workplace Hazardous Materials  
Information System (WHMIS): This  
product does not have a WHMIS  
classification.  
Canadian Ingredient Disclosure List.  
Exposure Limits.

**Section 16: Other**

This last section may include pertinent information that does not fit in above sections. Information such as label information, hazard ratings, revision dates, and references to other related information should be provided.

MSDS Creation Date: 10/20/1998.  
Revision #2 Date: 3/18/2003.  
The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall the company be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if the company has been advised of the possibility of such damages.