

How to Read an SDS



This document contains detailed information about content that is provided in each section of a safety data sheet (SDS). The sections are grouped by similar types of information rather than going through the 16 sections of the SDS chronologically.

Sections 1 and 3 - Identification Information

The SDS sections that provide identification information are Sections 1 and 3.

SDS Section 1 - Identification

SDS Section 1 contains the product and supplier identification information.

Confirm that you are reading the SDS that matches your product by comparing the product name, the supplier, and other identifiers to the ones on the label.

SDS Section 1 also lists the emergency phone numbers and the supplier or manufacturer's recommended use for the product.

Restrictions about the product's use may also be listed. If you are using the product differently, the advice on the SDS may not be appropriate. Check with the product supplier if this is the situation.

SDS Section 3 - Composition/Information on ingredients

SDS Section 3 - Composition/Information on ingredients - confirms the chemical identity of each hazardous ingredient and indicates if there are any trade secrets.

Trade Secrets/Confidential Business Information (CBI)

Employers and suppliers can apply to Health Canada for an exemption from disclosing certain information on the SDS. If Health Canada approves the request, certain confidential business information (CBI) may not be required to be disclosed on the label or SDS. There are strict rules regarding this process, what may be considered confidential, and what information must still be included on a label or SDS.

If the trade secret/CBI exemption has been approved, the following information must be disclosed:

- Generic chemical name
- Hazardous Materials Information Review Act (HMIRA) registry number, statement of exemption, and date of the decision
- All other required information, including physical data of the product, all hazards, preventive measures, and first-aid information

The following outlines ingredient disclosure rules (i.e., what information is required to be in Section 3 of the SDS).

For a hazardous product that is a:

Material or substance: Chemical name, Chemical Abstracts Service (CAS)* registry number, and other identifying information.

Mixture: Chemical name, CAS registry number, and concentration (or concentration range) of all ingredients classified for a health hazard and present above the designated concentration limit for the category or subcategory regardless of whether the material or substance contributes to the classification of the mixture as a hazardous product.

By checking this section, you will know the identity of the chemical(s) that you are working with. Other unique identifiers may also be listed.

*Chemical Abstracts Service (CAS)

A CAS registry number is a unique identifying number given to each chemical. Sometimes, chemicals will be named similarly or have several synonyms.

With the CAS number, you can research the chemical and know the information about that specific chemical.

You can also use SDS Section 9 to confirm that your product matches the SDS description (colour, odour, and physical state, e.g., liquid vs. solid).

Sections 2, 9, 10, 11 and 12 – Hazard Identification

Section 2 summarizes the hazards of the product, including the hazard classification.

Sections 9, 10, 11, and 12 provide more detailed information about the hazards listed in SDS section 2.

SDS Section 2 – Hazard identification

SDS section 2 summarizes the product's hazards, including the hazard classification. Make sure that you read and understand all the hazards that may be present.

Section 2 also lists the elements that are required on the product's label.

You can use this section to find the information if you need to re-label a product or put it into a new container. It includes the pictogram (or the pictogram name), the signal word, hazard statements, and precautionary statements.

It may also list other hazards which did not result in classification but of which you should be aware. For example, if the product, when heated, produces a vapour that may scald or burn, the SDS may say: "When heated, releases vapours that may scald or burn the skin."

SDS Section 9 - Physical and chemical properties

Section 9 describes the physical and chemical properties of the product. This information helps safety professionals determine what safe operating or storage procedures to follow.

The following types of properties can be found in section 9 of the safety data sheet:

- Physical properties such as physical state, colour, odour, melting/freezing point, and boiling point
- Fire properties such as flammability, flash point, explosive limits, and auto-ignition temperature
- Properties that can influence how much product is in the air, such as, relative vapour density, and vapour pressure

Let's look at these properties in more detail.

Physical State

Gas, liquid, or solid?

Confirm that the description on the SDS is the same as the actual product.

Odour

Does the chemical have an odour?

This information provides a description on the quality and intensity of the odour.

- Odour cannot be used as a warning of unsafe conditions since workers may become used to the smell, or the chemical may numb the sense of smell. However, the odour may help warn of exposure or a problem with your respirator.

Melting/Freezing Point

Does the physical state of the product change at working temperature?

The melting point is the temperature at which a solid product becomes a liquid. The freezing point is the temperature at which a liquid product becomes a solid. Usually, one value or the other is given on the SDS. It is important to know the freezing or melting point for storage and handling purposes. For example, a frozen or melted product may cause a container to burst. A change in the physical state could also change the product's hazards.

Boiling Point

The boiling point is the temperature at which the product changes from a liquid to a gas.

Near the boiling point, vapor concentrations may be very high, and more precautions may be needed.

Below the boiling point, the liquid can evaporate to form a vapour.

As the product approaches the boiling point, the change from liquid to vapour is rapid, and vapour concentrations in the air can be extremely high.

- Airborne gases and vapours may pose a fire, explosion, and health hazards.

Flammability

Flammability indicates if the product is ignitable (capable of catching on fire or being set on fire).

- Flammability is an important parameter in determining storage and transport conditions.

Flash Point

The flash point is the lowest temperature at which a liquid or solid gives off enough vapour to form a flammable air-vapour mixture near its surface. The lower the flash point, the greater the fire hazard.

The flash point is an approximate value and should not be taken as a sharp dividing line between safe and hazardous conditions.

Several test methods can be used to determine the flash point. Hence, you may find different values depending on the test method used. Two main methods are Open Cup (OC) and Closed Cup (CC).

Explosive Limits

The lower explosive limit (LEL), or lower flammable limit (LFL), is the lowest concentration of gas or vapour in the air which will burn or explode if ignited.

The upper explosive limit (UEL), or upper flammable limit (UFL), is the highest concentration of gas or vapour in the air which will burn or explode if ignited.

Concentrations of gas between the LEL and the UEL are flammable or explosive. When concentrations are below the LEL, the gas is too lean to burn. When concentrations are above the UEL, the gas is too rich to burn. However, concentrations above the UEL are still very dangerous because if the concentration is lowered (for example, by introducing fresh air), it will enter the

explosive range.

Explosive limits for a product vary since they depend on many factors, such as air temperature. Therefore, the values given on an SDS are approximate.

Auto-ignition Temperature

The auto-ignition temperature is the lowest temperature at which a product begins to burn in the air in the absence of a spark or flame. Many chemicals will decompose (break down) when heated. The auto-ignition temperature is the temperature at which the chemicals formed by decomposition begin to burn.

Auto-ignition temperatures for a specific product can vary by 100°C or more, depending on the test method used. Therefore, values listed in documents such as an SDS may be rough estimates.

- To avoid the risk of fire or explosion, products must be stored and handled at temperatures well below the auto-ignition temperature.

These properties help to determine the product's fire hazard severity. Emergency responders use this information when designing fire prevention measures.

Relative Vapour Density

Vapour density is the weight per unit volume of pure gas or vapour.

The relative vapour density is the ratio of the density of the gas or vapour to the density of air.

The density of air is given a value of 1. Light gases (relative vapour density less than 1) such as helium rise in the air, and heavy vapours (density greater than air) tend to sink.

- If there is inadequate ventilation, heavy gases and vapours (relative vapour density greater than 1) can accumulate in low-lying areas such as pits and along floors. This may create an explosion hazard if the gas or vapor is flammable or an asphyxiation hazard due to oxygen replacement.

Vapour Pressure

Vapour pressure is the tendency of a product to form a vapour.

The higher the vapour pressure, the higher the concentration of the product in the air.

For example, chloroform has a high vapour pressure (21.28 kPa (159.6 mm Hg) at 20 deg C) while polychlorinated biphenyls (PCBs) have essentially zero vapour pressure. Liquid chloroform readily forms a vapour, while PCBs do not.

- This information is important for controlling the exposure and responding to spills and leaks of products that are hazardous if inhaled or pose fire hazards.

Relative Density

Is the product lighter than water (relative density less than 1) or heavier than water (relative density greater than 1)?

- A light flammable liquid like gasoline (relative density 0.75) tends to float and spread on the surface of the water. It can burn, and the fire can spread on the water surface.

Solubility

Solubility is the ability of a product to dissolve in water or another liquid. Solubility in water is important for first aid, spill clean-up, and fire fighting.

pH

pH can tell if the product is acidic, neutral, or basic.

The pH scale runs from 0 to 14. pH=7 indicates a neutral product.

The lower the pH than 7, the higher the product's acidity.

Products with a pH higher than 7 are basic/alkaline. The alkalinity increases as the pH increases over 7.

Kinematic viscosity

Kinematic viscosity indicates the resistance of a liquid to flow under gravitational forces. It is measured in mm²/s.

It is a parameter used to determine the classification of liquid hydrocarbons in the aspiration class. It is measured in mm²/s. This value depends on the temperature. Hence, the temperature at which the value was determined must also be reported. For classification, the kinematic viscosity must be determined at 40 degrees Celsius.

n-Octanol/Water Partition Coefficient

The partition coefficient is used to help predict how the product will behave in the environment. It can be used to predict the distribution in water, in the soil, and the accumulation in living organisms of some chemicals.

Particle characteristics

This property will be provided only for solids, and it will indicate the particle size. The particle characteristics are factors that influence the capability of a product to disperse in the air, to be inhaled, or to create combustible dust.

SDS Section 10 - Stability and Reactivity

SDS Section 10 provides information about hazards caused by chemical changes or interactions.

Reactivity refers to dangerous conditions (fires and explosions) which may result from the nature of the product, such as being self-reactive, an organic peroxide, or an oxidizer.

Chemical Stability. Most products are stable and do not decompose when stored under normal conditions. Certain products are unstable, such as monomers or hardeners, and may cause fires or explosions if not handled properly.

- Look for information on conditions such as heat, sunlight, or storage time which can affect stability.

Possibility of hazardous reactions. Under certain conditions, some products may react or polymerize and could release excess heat and pressure or create other hazardous conditions.

Incompatible materials. Some products may react when in contact with one another and create a hazardous situation (e.g., explosion, the release of toxic and flammable materials and heat).

- Incompatible products should NOT be stored together.

Did you know? One of the major causes of accidents is incompatible products coming in contact with each other.

Conditions to avoid. Some products are affected by common environmental conditions such as light, moisture, and oxygen in the air. Others may catch fire or explode if exposed to static discharge, shock, and vibrations.

Hazardous decomposition products are the products produced as a result of use, storage, and heating. Some decomposition products are toxic, flammable, or explosive. For example, isopropyl ether can form explosive peroxides during storage. Exposure to light and heat can increase the rate of peroxide formation.

TIP: Make sure to read the 'conditions to avoid' on the SDS to learn about possibly hazardous situations, including light, moisture, aging, depletion of inhibitor, temperature, pressure, shock, and contact with air.

ALWAYS store and use products according to directions.

Hazard statements you may find in Section 10

Can form explosive peroxides

Peroxides are chemicals that contains reactive oxygen (-O-O-). Some peroxides are very unstable and can readily explode or burn. Certain solvents can form peroxides by reacting with air, moisture, or impurities.

Peroxide-forming chemicals must be carefully inspected before use and not be stored for extended periods. The SDS will give additional information about the length of storage and any special conditions for storage or use.

Polymerizes violently in the presence of acidic conditions (low pH)

Polymerization is a chemical reaction in which molecules (monomers) combine to form larger molecules. This reaction generally involves the release of heat. If the reaction is not controlled, a fire or explosion may occur. The SDS will describe how to handle and store the product to avoid problems.

Do not return product to container

Disposing of unused material may seem wasteful, but it is good practice.

Safely disposing of the product will prevent problems if an uncontrolled chemical reaction starts due to contamination (including explosion or the formation of shock- or mechanically-sensitive compounds).

SDS Section 11 - Toxicological information

SDS Section 11 provides information about health hazards and must include evidence that supports the data presented in SDS Section 2 – Hazard Identification.

Section 11 must provide information about:

Routes of exposure

Some products can cause harm depending on how you are exposed to them. For example, routes of entry tell you how a product can enter the body by:

- ▶ Inhalation – breathing it in
- ▶ Eye contact – splashing into the eye or touching with hands
- ▶ Skin contact – touching it or by being covered by a mist
- ▶ Ingestion – accidentally swallowing
- ▶ Injection – breaking the skin (e.g., needle stick)

The routes of exposure will determine what type of control measure or personal protective equipment to implement or use. Check out the resource page for more information about how chemicals can enter the body.

The acute (short-term) and chronic (long-term) toxicity of the product

- Symptoms of Exposure - The symptoms of exposure are also provided in SDS Section 4.
- This section will identify If the product may cause the following:
 - ▶ Skin corrosion/irritation - effect may range from severe skin burns to mild skin irritation
 - ▶ Eye damage/eye irritation - effect may range from severe eye damage (corrosion) to eye irritation
 - ▶ Carcinogenicity - may cause cancer or is suspected of causing cancer
 - ▶ Mutagenicity - may cause genetic defects or is suspected of causing genetic defects; mutations can lead to birth defects or cancer

- ▶ Reproductive toxicity - may damage fertility or the unborn child or is suspected of damaging fertility or the unborn child. May cause harm to breast-fed children.
- ▶ Specific target organ toxicity – single exposure - may cause a specific (but not fatal) target organ toxicity from one exposure. May cause respiratory irritation, drowsiness, or dizziness
- ▶ Specific target organ toxicity – repeated exposure - may cause damage to organs after repeated or prolonged exposure
- ▶ Aspiration hazard – may be fatal or harmful if the product enters directly through the mouth or nose or indirectly from vomiting into the airways

The meaning of some terms used in Section 11

Acute and short-term exposure

Acute or short-term exposures are those that occur in minutes, hours, or days.

Acute health effects are usually seen at the time of exposure (e.g., skin irritation or dizziness), but, in some cases, they may appear hours or days later (e.g., metal fume fever).

The toxic potency of a chemical is usually indicated by LD50 and LC50.

Workers should be familiar with any symptoms of acute exposure. They should report IMMEDIATELY any symptoms to their supervisor, a member of the health and safety committee, or a first-aid attendant so that they receive medical attention (if needed) and the cause can be found and fixed. Workers should also know if the product they are working with can cause delayed symptoms so that they recognize the connection to exposure at work.

LD50 or LC50

LD50 or LC50 is the lethal dose, 50% or lethal concentration, 50%. It represents how much of the chemical, in one dose, was needed to kill half of the test animals in experiments. The smaller the number, the more toxic the chemical is.

For example, those ingredients with oral LD50 scores below 50 mg/kg are considered very toxic. It allows toxicologists to compare the poisoning potential of different chemicals and classify a product.

Chronic or long-term health effects

Chronic or long-term health effects generally result from exposure that lasts for months or years. A chronic toxic effect can sometimes develop over time following a single exposure.

Illnesses may develop very slowly or even appear years after exposure stops. Before workers use a product, they need to know about the harmful effects of exposure and the necessary precautions to work safely with it.

For example, workers may not have any immediate nerve damage symptoms while working with a degreaser containing n-hexane. Still, numbness and weakness in the hands, arms, legs, and feet from damage to the nervous system may develop much later.

These facts make it important always to follow all safe handling procedures for the job.

SDS Sections 7, 8 and 13 – Hazard Prevention

Once you know the product's hazards, the next step is to learn how to work safely with it. Sections 7, 8, and 13 provide information about hazard prevention.

Use the information provided in these sections to determine what controls you need.

Look for recommendations about various ways to stay safe, including keeping away from heat/sparks/etc., grounding and bonding, ventilation, washing after handling, wearing appropriate PPE, and other instructions.

Recall that control measures should address both health and physical hazards.

SDS Section 7 – Handling and Storage

Section 7 outlines handling and storage precautions when working with the product.

Safe handling procedures should be specific to the product's hazards and use. Additional information and training are usually required.

This section also includes recommended storage conditions and materials and conditions to avoid.

For example, the SDS for a flammable liquid might say: "Keep away from heat, hot surfaces, sparks, open flames, or other ignition sources. No smoking. Ground and bond container and receiving equipment."

Note: Other sections of the SDS also include relevant information for handling and storage:

SDS Section 10 – Stability and Reactivity lists incompatible materials. "Keep incompatible materials (e.g., acids and bases) in separate storage areas."

SDS Section 5 – Fire-Fighting Measures lists other conditions to avoid, such as unsuitable extinguishing media.

Section 8 – Exposure Controls/ Personal Protection

SDS Section 8 lists control parameters, appropriate engineering controls, and personal protection measures.

Exposure guidelines (control parameters) include:

- Occupational Exposure Limits (OEL) such as a Threshold Limit Value (TLV®). In general, this limit represents the admissible airborne exposure to a substance, for a length of time (usually 8 hours), that is not likely to affect the health of a worker.
- The American Conference of Governmental Hygienists publishes TLVs®. These values are used by occupational hygienists when air sampling is done. Jurisdictions may adopt ACGIH TLVs® or may adopt their own OELs.
- In your jurisdictions, the OELs may differ from those listed on the SDS as the TLVs® may or may not have been adopted by local legislation. Please check with your local government office or consult our Exposure Limits to Chemical and Biological Agents document included in the "Resources" web page of the course for more information.
- Exposure guidelines for the product, as recommended by the manufacturer. These are based on the manufacturer's testing and experience.

Engineering Controls

Appropriate Engineering Controls

Engineering controls are equipment installed in the workplace at the source and along the path. These controls reduce the hazard by removing or isolating it. Control methods recommended on an SDS may include:

Ventilation

- Local exhaust ventilation (at the source)
- General ventilation (air removed from the general work area)
- Permanent Barriers and Enclosures

For example, a fully enclosed handling system may be recommended for very toxic or reactive products.

Note: Once controls are in place, you must know how to tell if they are operating correctly.

Ventilation phrases commonly found on an SDS:

- Use only outdoors or in a well-ventilated area.
- Store in a well-ventilated place.

What is adequate ventilation for one product in one set of conditions may be different for another. You must consider the toxicity, form (dust, vapour, etc.), and quantity of the product used. A very toxic product that readily evaporates into the air will require a different level of control (e.g., more ventilation control) than a lower toxicity product.

Adequate ventilation could refer to general (or dilution) ventilation, natural ventilation (open windows, doors), or local exhaust ventilation (such as a fume hood). It is essential to control the product's release and thus protect workers from exposure as much as possible.

Personal Protection

If the product can become airborne, the SDS will indicate that respiratory protection is required. The employer must perform a risk assessment and determine the type of respirator appropriate for the level of exposure in the workplace.

Chemical protective clothing (e.g., gloves and aprons) is used to prevent exposure to products that can affect the skin on contact or be absorbed through the skin.

Where possible, the SDS should clearly state the type of PPE (e.g., PVC gloves or nitrile rubber gloves) and list the breakthrough time of the glove material.

REMEMBER! No one type of protective clothing material is an effective barrier to ALL chemicals.

Section 13 – Disposal Considerations

While the content for this section is not mandatory in Canada, if present, this information helps you to safely dispose of chemical waste.

Disposal advice may include:

- Treatment to make the waste less toxic or hazardous
- Waste handling precautions
- Waste storage conditions

In many cases, you will be referred to applicable environmental regulations. Be sure that you know what federal, provincial/territorial, or municipal laws apply to your workplace.

SDS Sections 4, 5, 6 – Emergency Preparedness/Response

Knowing what to do in situations such as first aid, a fire, or an accidental release is important.

- SDS Section 4 provides first-aid and treatment information in the event of exposure.
- SDS Section 5 outlines steps to take in the event of a fire.
- SDS Section 6 gives precautions during accidental release or spills

Section 4 – First-aid Measures

First-aid measures are actions to be taken immediately to treat someone accidentally exposed to the product. The first-aid information on the SDS expands on the first-aid advice provided on the supplier label. It also should provide instructions to ensure the safety of the first aiders.

For example, when dealing with a skin contact hazard, first aiders should be warned to wear suitable chemical protective gloves.

IMPORTANT! ALWAYS check that the first-aid advice is consistent with the health hazards described on the SDS.

Section 5 – Fire-fighting Measures

This section provides information to fight fires. Emergency responders and planners use it to know what equipment should have on hand and how to respond to an emergency.

The information will cover:

- What types of fire extinguishing materials are and are not compatible with the product,
- Advice on specific hazards that may arise from the product such as hazardous combustion products,
- Brief advice for trained firefighters on how to fight fires involving this product.
- Look in particular at what types of extinguishers should be used and not used.

For example, carbon dioxide, a common extinguishing media, should not be used to extinguish fires caused by alkaline and alkaline earth metals such as calcium, lithium, magnesium, and powdered aluminum.

Important

Be prepared! Know what steps to take BEFORE an emergency happens!

Your workplace's emergency plan should be available and posted for everyone to review.

There is no time to find and read the SDS in a real emergency!

Section 6 – Accidental Release Measures

SDS Section 6 provides brief instructions for cleaning up a spill.

People responsible for emergency response planning use this information along with the Hazard Identification section when developing a spill response plan for their workplace. It can be used to determine if the clean-up crew needs specialized training and equipment.

For example:

You need to know what you must do immediately in case of a leak or spill at your worksite.

Ensure that you have adequate training BEFORE a spill happens (e.g., spills you can clean up, or who and when to call for assistance)

SDS Sections 14, 15 and 16

Section 14 and 15 may provide optional information about other laws that apply to the product or its ingredients. Section 16 is mandatory.

In Canada, the provision of content in these sections is not mandatory, but the SDS must include their headings.

- Section 14 may provide information about the product's hazards during transport.
- Section 15 may list other laws that apply.
- Providing content in Section 16 is mandatory. Section 16 will include information such as the date of the latest revision of the SDS and a key or legend to any abbreviations used on the SDS.

Section 14 – Transport Information

Transport information may include items such as:

- United Nations (UN) number
- UN proper shipping name
- Transport hazard class(es)

TIP! This information may be helpful if you need to further identify the product or the dangers that it may present.

Section 15 – Regulatory Information

This section may reference laws that apply to the product in a particular jurisdiction.

On many SDSs, much of the regulatory information is provided to meet safety, health, or product-specific environmental reporting requirements.

Section 16 - Other Information

Certain administrative information may appear here. The person or department responsible for writing the SDS may be identified.

The date that the SDS was written or revised will be listed here.

In some cases, suppliers may list key references or sources of the data used to prepare the SDS.

Hazard control using the SDS

You are responsible for providing a safe workplace as a manager or supervisor. Knowing how to control hazards is essential.

Managers/supervisors must identify hazards, perform risk assessments and tell workers about the hazards of the products they work with.

Use the SDS information and your knowledge of the specific ways the product is used in your workplace to determine what controls you need. Consult with workers, health and safety committees or representatives, and other subject matter experts (if needed).

Look at the precautionary statements and recommendations for engineering controls, safe use and handling, and personal protective equipment.

Workers need to know about:

- Control systems such as ventilation
- Safety policies and procedures
- Precautions necessary to work with the specific hazardous products in their work area