



INDIANA UNIVERSITY

Laboratory Safety Guideline

Laboratory Safety Data Sheets (SDS) Management, Understanding, Preparation

Introduction

Chemical manufacturers are required by the Occupational Health and Safety Administration's (OSHA) Hazard Communication Standard (HCS) to prepare chemical Safety Data Sheets (SDSs) and provide them to those that use or may come into contact with their products. Formerly known as Material Safety Data Sheets (MSDSs), the new Safety Data Sheets are prepared in a standard format in accordance with *The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)*. Safety Data Sheets communicate the hazards and other safety information associated with those products to those that use the products.

Users of chemical products are required to maintain SDSs for all chemicals (solids, liquids, and gases) and have them accessible to all employees at all times to comply with the regulations.

Researchers preparing synthesized chemicals at Indiana University that are intended for outside use (e.g. another institution, business, or product user) must comply with the requirements of the Hazard Communication Standard and prepare an SDS for these new chemicals or products. A blank template provided by OSHA is found in Appendix B and can be used to prepare a safety data sheet for synthesized chemicals. Department of Transportation shipping requirements also apply to chemicals shipped to other locations by commercial carrier.

Access to SDS

Access to SDSs can be provided as paper copies, electronically, or via the Internet. OSHA regulations do not require a paper copy. Title 29, Code of Federal Regulations, Part 1910.1200(g)(8) states:

"Electronic access, microfiche, and other alternatives to maintaining paper copies of the material safety data sheets are permitted as long as no barriers to immediate employee access in each workplace are created by such options."

Laboratories are strongly urged to print the SDSs for chemicals they use. Paper copies are recommended because electronic equipment needed to access information is dependent on uninterrupted power and network capabilities which could make electronic versions unavailable in the event of an emergency.

The SDS must come from the manufacturer that produced the chemical and correspond to the exact chemical and concentration in use or storage. The SDSs should be kept in a clearly marked three-ring binder in the laboratory on a bookshelf where they will be accessible to all employees. Manufacturers' websites for SDSs and other chemical reference information are found in the Appendix A.

SDS services and bookmarked manufacturers' websites are acceptable as long as all employees in the workplace are trained and know how to read and access SDSs. If a laboratory chooses to use electronic services then the SDS instructions and a link to the service should be posted on the computer and in the laboratory in a conspicuous location.

To ensure that everyone has access to SDSs, Indiana University provides on-line access to SDSs through "MSDSonline." To access MSDS and SDS information using "MSDSonline" go to the EHS website at www.ehs.iu.edu. Click on "MSDSonline" in the right hand column then click on "MSDSonline Search" in the upper right hand tab. Type in the chemical name or CAS# and select the MSDS/SDS that corresponds to the product you use.



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Accidents involving chemicals will require an SDS to be provided to emergency response personnel and to the attending physician so proper treatment can be administered. A person working in a laboratory should be able to produce an SDS for any hazardous chemical found in the lab within five minutes.

SDS collections should be maintained continually. If, for example, someone reports to the emergency room with a chemical in their eyes, they need not waste time looking for the exact SDS sheet and can take the entire binder.

SDSs can be provided to the emergency rooms on request; however, this wastes precious time and is problematic. For example, if the victim only knows the trade name of the product or the primary chemical name but not the concentration or mixture, etc., the correct SDS may be difficult to locate.

All of this information is provided on the SDS from the manufacturer. Therefore, it is prudent practice to maintain an SDS for the exact chemical from the manufacturer in a binder in the laboratory.

Content

The HCS (29 CFR 1910.1200 (g)) specifies that certain information must be presented on SDSs using a required 16-section format in accordance with GHS and the format established by the American National Standards Institute (ANSI) standard for preparation of MSDSs (Z400.1). While some of this information (such as ecological information) is not mandatory, the 16-section SDS is the international norm. The 16 sections are the following:

- Section 1, Identification/chemical identity
- Section 2, Hazard(s) identification
- Section 3, Composition/information on ingredients
- Section 4, First-aid measures
- Section 5, Fire-fighting measures
- Section 6, Accidental release measures
- Section 7, Handling and storage
- Section 8, Exposure controls/personal protection
- Section 9, Physical and chemical properties
- Section 10, Stability and reactivity
- Section 11, Toxicological information
- Section 12, Ecological information (non-mandatory)
- Section 13, Disposal considerations (non-mandatory)
- Section 14, Transport information (non-mandatory)
- Section 15, Regulatory information (non-mandatory)
- Section 16, Other information, including date of preparation or last revision.

By following this required format, the information of greatest importance to workers is featured at the beginning of the data sheet. More technical information that addresses topics such as the physical and chemical properties of the material and toxicological data appears later in the document.



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Chemical Classifications

Understanding the GHS chemical classifications while reading an SDS is very important. They are different than some of the standard classifications used previously. Most SDSs present both the new classifications and previous chemical classifications.

The hazard classifications are presented in three groups: health hazards, physical hazards, and environmental hazards. Hazard categories are defined in *The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)* found at www.osha.gov/dsg/hazcom/ghs.html.

The following tables represent the hazard classifications, categories, and ratings for physical hazards and health hazards. The hazard categories are rated according to an alpha-numeric system under GHS beginning with a rating of 1, 1A, or A, for example, that represents the most hazardous substance in that hazard class.

Physical Hazards							
Hazard Class	Hazard Category						
Explosives	Unstable Explosives	Div 1.1	Div 1.2	Div 1.3	Div 1.4	Div 1.5	Div 1.6
Flammable Gases	1	2					
Flammable Aerosols	1	2					
Oxidizing Gases	1						
Gases under Pressure Compressed gases Liquefied gases Refrigerated liquefied gases Dissolved gases	1						
Flammable Liquids	1	2	3	4			
Flammable Solids	1	2					
Self-Reactive Chemicals	Type A	Type B	Type C	Type D	Type E	Type F	Type G
Pyrophoric Liquids	1						
Pyrophoric Solids	1						
Pyrophoric Gases	Single Category						
Self-Heating Chemicals	1	2					
Chemicals in which contact with water emit flammable gases	1	2	3				
Oxidizing Liquids	1	2	3				
Oxidizing Solids	1	2	3				
Organic Peroxides	Type A	Type B	Type C	Type D	Type E	Type F	Type G
Corrosive to Metals	1						
Combustible Dust	Single Category						



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Health Hazards				
Hazard Class	Hazard Category			
Acute toxicity	1	2	3	4
Skin Corrosion/Irritation	1A	1B	1C	2
Serious Eye Damage/Eye Irritation	1	2A	2B	
Respiratory or Skin Sensitization	1			
Germ Cell Mutagenicity	1A	1B	2	
Carcinogenicity	1A	1B	2	
Reproductive Toxicity	1A	1B	2	Lactation
Specific Target Organ Toxicity – Single Exposure	1	2	3	
Specific Target Organ Toxicity – Repeated Exposure	1	2		
Aspiration	1			
Simple Asphyxiants	Single Category			

References

The Globally Harmonized System of Classification and Labeling of Chemicals (GHS), United Nations, World Health Organization.

Toxic and Hazardous Substances, Title 29, Code of Feral Regulations, Part 1910, Subpart Z (29 CFR 1910, Subpart Z).

Threshold Limit Values for Chemical Substances and Physical Agents & Biological Exposure Indices, TLV's and BEI's, NIOSH, American Conference of Governmental Industrial Hygienists (ACGIH).

Pocket Guide to Chemical Hazards, US Department of Health and Human Services, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health (NIOSH).

Note: For assistance please contact the Indiana University Office of Environmental, Health, and Safety Management, (812) 855-6311.



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Appendix A

MSDS Resources

[IU EHS SDS webpage](http://www.ehs.iu.edu/topics/laboratory-chemical-safety/laboratory-msds.shtml) (www.ehs.iu.edu/topics/laboratory-chemical-safety/laboratory-msds.shtml)

[IU MSDS Online](https://msdsmanagement.msdsonline.com/ViewerSite/MSDSearch.aspx) (<https://msdsmanagement.msdsonline.com/ViewerSite/MSDSearch.aspx>)

Chemical Manufacturers

[3M](#)
[Alfa Aesar](#)
[Dow Chemical](#)
[DuPont](#)
[Kodak](#)
[Fisher Scientific](#)
[Flinn Scientific](#)
[GFS Chemicals](#)
[Hach](#)
[Mallinckrodt Baker](#)
[Sigma-Aldrich/Fluka/Supelco](#)
[Spectrum Chemicals](#)
[VWR Scientific Products](#)

Gases

[Air Gas](#)
[Air Products](#)
[BOC Gases](#)
[Indiana Oxygen](#)
[Linde Group Gases](#)
[Matheson Tri-Gas](#)
[Praxair](#)

Additional MSDS Resources

[Canadian Centre for Occupational Health and Safety \(IU subscriber\)](#)
[MSDS Search](#)
[CHEMINFO](#)
[Cornell University](#)
[MSDS Search](#)
[Toxic Substances Control Act \(TSCA\) Chemical Substances Inventory](#)
[Environment, Health and Safety Online \(EHSO\)](#)
[Interactive Learning Paradigms, Inc. - MSDS Links](#)
[Kansas State University - MSDS Links](#)
[Laboratory Safety Institute Weblinks](#)
[MSDS SEARCH National Repository](#)
[Oxford University – Chemical Information and MSDS's](#)
[Public Health Agency of Canada - Biological MSDS's](#)
[Purdue Cataloged MSDS Sheets](#)
[Vermont Safety Information Resources, Inc., \(SIRI\)](#)
[SIRI MSDS Search](#)

Chemical Information Databases

[Cambridge Software – ChemFinder \(IU subscriber\)](#)
[CDC Agency for Toxic Substances and Disease Registry \(ASTDR\)](#)
[Chemical Agents](#)
[Medical Management Guidelines](#)
[ToxFAQs](#)
[Department of Transportation \(DOT\) Emergency Response Handbook](#)
[EPA Chemical Fact Sheets](#)
[ETOXNET - Extension Toxicology Network Pesticide Information Profiles \(PIPs\)](#)
[Howard Hughes Medical Institute - Chemical Safety Summaries \(Prudent Practices in the Laboratory\)](#)
[International Program on Chemical Safety \(IPCS\)](#)
[International Agency for Research on Cancer \(IARC\)](#)
[Lab Safety Supply - EZ Facts](#)
[Michigan State University – NFPA Chemical Ratings](#)
[National Institute for Occupational Health \(NIOSH\)](#)
[NIOSH Pocket Guide to Chemical Hazards](#)
[International Safety Cards \(WHO/IPCS/ILO\)](#)
[Immediately Dangerous to Life and Health \(IDLH\) Values](#)
[National Institutes of Health \(NIH\) - Specialized Information Services \(SIS\)](#)
[ChemIDplus Advanced](#)
[TOXNET](#)
[National Toxicology Program \(NTP\)](#)
[National Oceanic and Atmospheric Administration - Cameo Chemical Database](#)
[New Jersey Chemical Fact Sheets](#)
[New Mexico State – NFPA Chemical Ratings](#)
[New Zealand Medicines and Medical Devices Safety Authority - MEDSAFE](#)
[Occupational Safety and Health Administration \(OSHA\)](#)
[Oklahoma State University - NFPA Guide and Glove Permeation Tables](#)
[University of Akron - Hazardous Chemical Database](#)

Appendix B
OSHA FORM 174

MATERIAL SAFETY DATA SHEET		U.S. DEPARTMENT OF LABOR			
MAY BE USED TO COMPLY WITH OSHA'S HAZARD COMMUNICATION STANDARD, 29 CFR 1910.1200. STANDARD MUST BE CONSULTED FOR SPECIFIC REQUIREMENTS.		OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (NON-MANDATORY FORM) FORM APPROVED OMB No. 1218-0072			
IDENTITY (AS USED ON LABEL AND LIST)		NOTE: BLANK SPACES ARE NOT PERMITTED. IF ANY ITEM IS NOT APPLICABLE OR NO INFORMATION IS AVAILABLE, THE SPACE MUST BE MARKED TO INDICATE THAT.			
SECTION I					
MANUFACTURER'S NAME		EMERGENCY TELEPHONE NUMBER			
ADDRESS (NUMBER, STREET, CITY, STATE AND ZIP CODE)		TELEPHONE NUMBER FOR INFORMATION			
		DATE PREPARED			
		SIGNATURE OF PREPARER (OPTIONAL)			
SECTION II—HAZARDOUS INGREDIENTS/IDENTITY INFORMATION					
HAZARDOUS COMPONENTS (SPECIFIC CHEMICAL IDENTITY, COMMON NAME(S), CAS NUMBERS)		OSHA PEL	ACGIH TLV	OTHER LIMITS RECOMMENDED	% (OPTIONAL)
SECTION III—PHYSICAL/CHEMICAL CHARACTERISTICS					
BOILING POINT		SPECIFIC GRAVITY (H₂O = 1)			
VAPOR PRESSURE (MM HG)		MELTING POINT			
VAPOR DENSITY (AIR = 1)		EVAPORATION RATE (BUTYL ACETATE = 1)			
SOLUBILITY IN WATER					
APPEARANCE AND ODOR					
SECTION IV—FIRE AND EXPLOSION HAZARD DATA					
FLASH POINT (METHOD USED)		FLAMMABLE LIMITS	LEL	UEL	
EXTINGUISHING MEDIA					
SPECIAL FIRE FIGHTING PROCEDURES					
UNUSUAL FIRE AND EXPLOSION HAZARDS					
(REPRODUCE LOCALLY)			OSHA 174 SEPT. 1985		

Appendix B

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SECTION V—REACTIVITY DATA			
STABILITY	UNSTABLE		CONDITIONS TO AVOID
	STABLE		
INCOMPATIBILITY (MATERIALS TO AVOID)			
HAZARDOUS DECOMPOSITION OR BYPRODUCTS			
HAZARDOUS POLYMERIZATION	MAY OCCUR		CONDITIONS TO AVOID
	WILL NOT OCCUR		
SECTION VI—HEALTH HAZARD DATA			
ROUTE(S) OF ENTRY	INHALATION?	SKIN?	INGESTION?
HEALTH HAZARDS (ACUTE AND CHRONIC)			
CARCINOGENICITY	NTP?	IARC MONOGRAPHS?	OSHA REGULATED?
SIGNS AND SYMPTOMS OF EXPOSURE			
MEDICAL CONDITIONS GENERALLY AGGRAVATED BY EXPOSURE			
EMERGENCY AND FIRST AID PROCEDURES			
SECTION VII—PRECAUTIONS FOR SAFE HANDLING AND USE			
STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED			
WASTE DISPOSAL METHOD			
PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING			
OTHER PRECAUTIONS			
SECTION VIII—CONTROL MEASURES			
RESPIRATORY PROTECTION (SPECIFY TYPE)			
VENTILATION	LOCAL EXHAUST		SPECIAL
	MECHANICAL (GENERAL)		OTHER
PROTECTIVE GLOVES		EYE PROTECTION	
OTHER PROTECTIVE CLOTHING OR EQUIPMENT			
WORK/HYGIENIC PRACTICES			