



SANFORD UNDERGROUND RESEARCH FACILITY

SOUTH DAKOTA SCIENCE AND TECHNOLOGY AUTHORITY

Hazard Communication Standard

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Revision History

Rev	Date	Section	Paragraph	Summary of Change	Authorized by
03	5/17/2023	3 & 5	5.6	Updated definition, removed sentence in section 5, & reformatted	CCR 746
04	5/29/2024	NA	NA	Update Logo	CCR 946

1.0 Purpose

The purpose of this document is to ensure that all risks associated with hazardous chemicals are managed to prevent harm to personnel. This is accomplished by means of a comprehensive hazard communication program, which includes container labeling and other forms of warning, Safety Data Sheets (SDS) and personnel training.

SDSTA complies with the following regulations to fulfill this standard:

- 29 CFR 1910.1200 Hazard Communication Standard for General Industry
- 26 CFR 1926.59 Hazard Communication for the Construction Industry are utilized throughout this standard.

2.0 Scope

This standard applies to all South Dakota Science and Technology Authority (SDSTA) personnel, Users and Contractors/Subcontractors. This standard applies to all SDSTA activities at Sanford Underground Research Facility (SURF) that expose personnel to hazardous chemicals.

The following chemicals/substances are regulated by separate agencies and are not included in the scope of this standard:

- Solid and Hazardous Waste (as defined by Resource Conservation and Recovery Act)
- Articles
- Wood or Wood Products
- Food or Alcoholic Beverages
- Drugs
- Cosmetics
- Consumer Products (as defined by the Consumer Product Safety Act and Federal Hazardous Substance Act)
- Biological Hazards
- Ionizing and Non-Ionizing Radiation

3.0 Definitions

Article – A manufactured item (1) which is formed to a specific shape or design during manufacture; (2) which has end use functions dependent in whole or in part upon its shape or design during end use; and (3) which does not release a toxic chemical under normal conditions of processing or use of that item at the facility or establishments for example: bolts, pens, bottles, screws, etc. Articles do not require a corresponding SDS sheet.

Container – Any bag, barrel, bottle, box, can, cylinder, drum, reaction vessel, storage tank, or the like that contains a hazardous chemical.

Hazard Analysis – Is the process of deciding what might be a hazard, and what should be done if someone or something is exposed to this hazard. It is the first step to assess risk and used as a tool to aid in work planning and control.

Hazard Class – Describes specific hazardous property(s) of a hazardous chemical ESH-(4000-A)-200339 Hazard Class Details). Each of these classes has chemical specific information found both in its SDS and on its manufacturer’s label that includes:

- A pictogram
- A signal word
- A hazard statement
- A precautionary statement
- The name, address and phone number of manufacturer or distributor

Hazardous Chemical: Any chemical which can cause a physical or health hazard, including petroleum products.

Hazard Rating – A system put forth by the National Fire Prevention Association (NFPA) containing color codes that correspond to a specific hazard. This information is used by emergency personnel when responding to an incident.

Hazmin – A web-based database that manages and provides immediate access to SDSs.

Immediate Use – A hazardous chemical that is under the control of and used only by the person who transfers it from a labeled container and only within the work shift in which it was transferred.

Non-Routine Tasks – Jobs that are performed irregularly or being performed for the first time.

Safety Data Sheet (SDS) – A standardized form containing facts, specific properties and potential hazards of a substance.

Secondary Container – Any container holding a product which is not the original container supplied by the manufacturer. Secondary containers can hold chemicals that are transferred from an original container.

Secondary Containment – Any system, device or control measure that is used to stop a discharge from leaving a specified area.

Work Planning and Control – The use of a formal, documented process for identifying and mitigating risks when planning, authorizing, releasing, and performing work.

4.0 Responsibilities

4.1. SURF Laboratory Director

- 4.1.1. Supports the implementation and enforcement of the Hazard Communication Standard.

4.2. Department Directors

- 4.2.1. Ensure on-site personnel are informed concerning:
 - The presence of the Hazard Communication Standard.
 - The requirement of SDSs for each hazardous chemical on-site.

- 4.3. The procedure for bringing a hazardous chemical on-site (ESH-(4000-FD)-200338 Chemical Approval Flow Diagram).

- The training requirements for those exposed to hazardous chemicals.
- The labeling requirements for hazardous materials.
- Accessibility of SDSs.

4.4. Managers, Supervisors, Contractors and Project Managers

- 4.4.1. Ensure employees are trained on accessing SDSs and understand the SDS sections.
- 4.4.2. Ensure employees understand and are knowledgeable of the chemical hazards used or exposed to within their work area.
- 4.4.3. Ensure that hazardous chemicals are approved and the corresponding SDSs are submitted prior to being brought onto the site (ESH-(4000-FD)-200338 Chemical Approval Flow Diagram).
- 4.4.4. Know how to read and explain the hazards presented on the SDS (ESH-(4000-A)-200339 Hazard Class Details).
- 4.4.5. Regularly review inventories of hazardous chemicals in their work area to determine if the chemical has a corresponding SDS in the Hazmin database.
- 4.4.6. Notify ESH with updated information on hazardous chemical location.
- 4.4.7. In the event a hazardous chemical, including petroleum products, is relocated, review its hazards with newly affected personnel and notify ESH of the expanded usage/new location so that the SPCC Plan and/or Hazmin database can be updated.

4.5. Workers and Users

- 4.5.1. Review SDS documents for hazardous chemicals in their work area:
 - Understand the risks associated with the hazardous chemical they may be exposed to.
 - Know the hazards and symptoms of hazardous chemical exposure present in the work area.
 - Know how to access SDSs electronically and/or via hard copy format.
 - Follow the appropriate measures specified in the SDSs.
 - Know how to read and apply the information on labels.

4.6. Environment, Safety and Health Department

- 4.6.1. Review SDSs for completeness, hazardous chemical management and waste disposal considerations.
- 4.6.2. Ensure there is a current printed list of hazardous chemicals on-site located in the Environmental Manager's office.
- 4.6.3. Approve hazardous chemicals for on-site use.
- 4.6.4. Approve SDSs for incorporation into the Hazmin® database.
- 4.6.5. Review and update the Hazard Communication Standard on an as-needed basis.
- 4.6.6. Responsible for the development and maintenance of training materials.

5.0 Instructions

5.1. Hazardous Chemical Management

- Hazardous chemicals shall be managed in accordance with information provided in the SDSs or as otherwise specified by the ESH Department.

5.2. Approval of Hazardous Chemicals

- All hazardous chemicals at SURF shall be approved by the ESH Department prior to arrival on-site. To receive approval, the following information must be submitted to ESH (ESH-(4000-FD)-200338 Chemical Approval Flow Diagram):
 - o The hazardous chemical's current SDS.

- o The approximate amount of the hazardous chemical to be used on-site.
- o The location of the hazardous chemical usage.
- Chemicals used in experiments (including compressed gases and cryogenic materials) must be approved by ESH and added to a chemical inventory before they can be brought onto SURF property. The inventory shall include the name of the responsible person, arrival date at SURF and storage information (quantities, locations and containment descriptions). An inventory is required for chemicals that remain onsite for extended periods (JHAs cover modest amounts of chemicals that are immediately removed from site after use). Approved chemicals must have a recent SDS on file. SDSTA maintains an inventory template for chemicals.
- A hazardous chemical may be rejected or restricted based on certain hazardous attributes, quantity request, location or because the SDS does not conform to regulatory standards.

5.3. Hazardous Chemical Transportation and Storage

- An approved Hazardous Chemical may be transported from one work area to another at SURF provided all affected parties are aware of the chemical movement. Movement of materials on public roadways shall comply with applicable Department of Transportation (DOT) regulations.
- Underground transportation and storage, including transportation via shaft, shall be as follows:
 - o Hazardous chemicals are to be transported and stored in DOT compliant packaging or as otherwise specified in the SDS.
 - o Water soluble hazardous chemicals greater than five gallons (19 liters) must be transported and stored in secondary containment.
 - o Flammable, self-heating and pyrophoric materials are not allowed underground except in limited circumstances requiring special approval by ESH. Refer to the SDS to determine the specific hazard class.

5.4. Hazardous Chemical Awareness

- A list of the hazardous chemicals known to be present at SURF is located on the Hazmin database and can also be provided by the ESH Department.
- Personnel exposed to a hazardous chemical in a work area shall be informed of its hazards in accordance with this standard.

Figure 1: SURF's Hazardous Chemical Label

The image shows a template for a hazardous chemical label. At the top, there is a field for "Product ID:". Below that is a "Signal Word:" section with three options: DANGER, WARNING, and N/A. The central part of the label features a diamond-shaped hazard pictogram area. The diamond is divided into four quadrants: top-left (blue) labeled "HEALTH", top-right (red) labeled "ENV", bottom-left (yellow) labeled "REACTIVITY", and bottom-right (white) labeled "SPECIFIC HAZARD". To the right of the diamond is a grid of ten hazard pictograms, each with a corresponding checkbox below it. The pictograms include: a flame (Flammable), a gas cylinder (Gases under pressure), a skull and crossbones (Acute toxicity), a biohazard symbol, a hand being burned (Skin corrosion/irritation), a flame over a liquid (Highly flammable), a flame over a gas cylinder (Extremely flammable), a flame over a liquid in a container (Highly flammable gas), a flame over a gas cylinder (Extremely flammable gas), a flame over a liquid in a container (Highly flammable liquid), and a flame over a gas cylinder (Extremely flammable gas). Below the pictogram grid are three horizontal fields: "Hazard Statement:", "Precautionary Statement:", and "Personal Protective Equipment:".

- All personnel at SURF will be provided access to SDSs, informed of precautionary measures needed to protect themselves and apprised of the labeling system used on-site.

5.5. Labeling

- Any container holding a product which is not the original container supplied by the manufacturer at SURF shall be labeled using the label shown in Figure 1 with the exception of the materials specified bulleted below. This label is available at the SURF Warehouse and the ESH Department.
 - Any consumer product where the product is used in the workplace for the purpose intended by the manufacturer, and the use results in a duration and frequency of exposure which is not greater than the range of exposures that could reasonably be experienced by consumers when used for the purpose intended. (Examples include, but are not limited to, Ice Melt and Dishwashing Soap). If these products are transferred from their original container the secondary container must be labeled with the consumer product name (e.g., Ice Melt, Dishwashing Soap). The label shown in Figure 1 is not required, nor are the labeling requirements in Section in 5.5.2
- Each SDSTA Hazardous chemical label shall be completed with the following information that can be found on the product's SDS:
 - Product Identifier: describes how the hazardous chemical is identified. The identifier on the label must be the same name as on the SDS.
 - Signal Word: indicates the relative level of severity of the hazard and alerts the reader to a potential hazard on the label. There are only two signal words, 'Danger' and 'Warning.'
 - ◆ **DANGER** identifies chemicals and products that present **a great**, often immediate hazard, to the person handling the chemical.
 - ◆ **WARNING** identifies chemicals and products that present **a lesser**, but still potentially harmful, degree of hazard.
 - Hazard Statement: describes the nature and degree of the hazard(s) associated with the chemical.
 - Precautionary Statement: describes recommended measures that should be taken to minimize or prevent exposure to the hazardous chemical or improper storage/handling.










Health Hazard  • Carcinogen • Mutagenicity • Reproductive Toxicity • Respiratory Sensitizer • Target Organ Toxicity • Aspiration Toxicity	Flame  • Flammables • Pyrophorics • Self-Heating • Emits Flammable Gas • Self-Reactives • Organic Peroxides	Exclamation Mark  • Irritant (skin and eye) • Skin Sensitizer • Acute Toxicity (harmful) • Narcotic Effects • Respiratory Tract Irritant • Hazardous to Ozone Layer (Non Mandatory)
Gas Cylinder  • Gases under Pressure	Corrosion  • Skin Corrosion/ burns • Eye Damage • Corrosive to Metals	Exploding Bomb  • Explosives • Self-Reactives • Organic Peroxides
Flame over Circle  • Oxidizers	Environment (Non Mandatory)  • Aquatic Toxicity	Skull and Crossbones  • Acute Toxicity (fatal or toxic)

Figure 2: Hazard Pictograms

- o Pictograms: aid in visualizing the hazard. The nine pictograms are shown in Figure 2.
- o Hazard Rating: alerts emergency personnel of a potential hazard using a system shown in Figure 3 and described below.

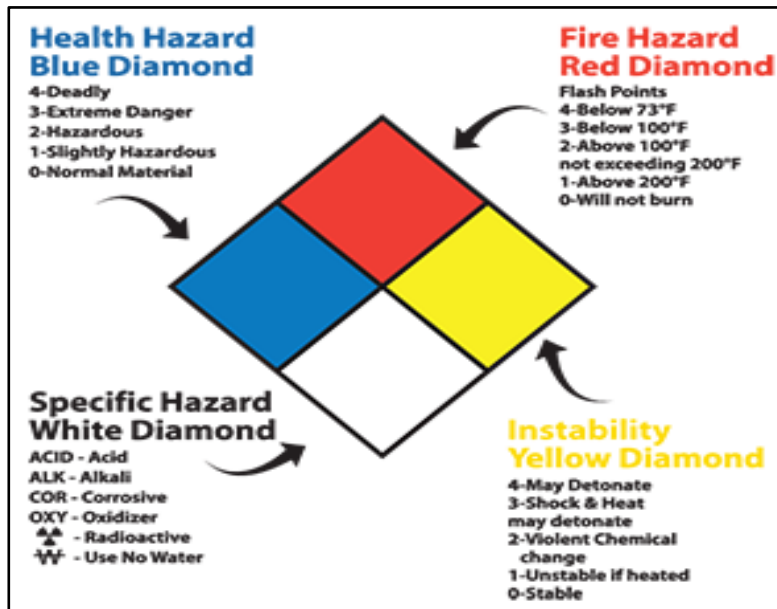


Figure 3: Hazard Ratings (NFPA 704)

- o The five ratings range from 4 to 0, with 4 being the most severe and 0 posing the least risk. The number in each inner quadrant represents the hazard rating for each of the 3 categories. Each material is assigned a rating in these three categories: health (blue), flammability (red), and instability (yellow). The white box is reserved for special hazards such as water reactivity, oxidizers or simple asphyxiant gases. The health, flammability, and instability ratings of a material vary according to its physical and chemical characteristics.
- SDSTA does not require a SDSTA hazardous chemical label to be placed on portable secondary containers that are intended for immediate use, however the contents must be indicated on the container.
- Pipes and tanks containing hazardous chemicals shall also be labeled. Space considerations often limit information on these labels to an identifier name.

5.6. Safety Data Sheets

- The SDSs of all approved hazardous chemicals on-site shall be readily accessible during each work shift. The SDS's are entered and maintained in the Hazmin database for access in internet capable locations. In the event Hazmin is not available there is a SDS backup thumb drive in a wall file holder in the Environmental Manager's office.
- In addition to providing a chemical inventory to SDSTA, a separate database shall be maintained by science users for each of their experiments.
- SDSs shall be a component of the hazard analysis for each task associated with hazardous chemicals and must be reviewed prior to performing the task.
- The SDSs at SDSTA are made up of 16 sections as described below:

SDS Section and Heading		Specific Information Elements
1	Identification	<ul style="list-style-type: none"> • Product identifier (e.g. Product name) • Other means of identification (e.g. product family, synonyms, etc.) • Recommended use • Restrictions on use • Supplier identifier <ul style="list-style-type: none"> ○ Name, full address and phone number(s) • Emergency telephone number and any restrictions on the use of that number, if applicable.
2	Hazard Identification	<ul style="list-style-type: none"> • Hazard classification (class, category or subcategory) of substance or mixture or a description of the identified hazard for Physical or Health Hazards Not Otherwise Classified • Label elements: <ul style="list-style-type: none"> ○ Symbol (image) or the name of the symbol (e.g., flame, skull and crossbones) ○ Signal word ○ Hazard statement(s) ○ Precautionary statement(s) • Other hazards which do not result in classification (e.g., molten metal hazard)
3	Composition/ Information on Ingredients	<ul style="list-style-type: none"> • When a hazardous product is a material or substance: <ul style="list-style-type: none"> ○ Chemical name ○ Common name and synonyms ○ Chemical Abstract Service (CAS) registry number and any unique identifiers ○ Chemical name of impurities, stabilizing solvents and/or additives* • For each material or substance in a mixture that is classified in a health <i>Hazard Class</i>**: <ul style="list-style-type: none"> ○ Chemical name ○ Common name and synonyms ○ CAS registry number and any unique identifiers ○ Concentration <p>NOTE: Confidential business information rules can apply</p>
4	First-Aid Measures	<ul style="list-style-type: none"> • First-aid measures by route of exposure: <ul style="list-style-type: none"> ○ Inhalation ○ Skin contact ○ Eye contact ○ Ingestion • Most important symptoms and effects (acute or delayed) • Immediate medical attention and special treatment, if necessary
5	Fire-Fighting Measures	<ul style="list-style-type: none"> • Suitable extinguishing media • Unsuitable extinguishing media • Specific hazards arising from the hazardous product (e.g., hazardous combustion products) • Special protective equipment and precautions for fire-fighters
6	Accidental Release Measures	<ul style="list-style-type: none"> • Personal precautions, protective equipment and emergency procedures • Methods and materials for containment and cleaning up

7	Handling and Storage	<ul style="list-style-type: none"> • Precautions for safe handling • Conditions for safe storage (including incompatible materials)
8	Exposure Controls/ Personal Protection	<ul style="list-style-type: none"> • Control parameters, including occupational exposure guidelines or biological exposure limits and the source of those values • Appropriate engineering controls • Individual protection measures (e.g. personal protective equipment)
9	Physical and Chemical Properties	<ul style="list-style-type: none"> • Appearance (physical state, color, etc.) • Odor • Odor threshold • pH • Melting point/Freezing point • Initial boiling point/boiling range • Flash point • Evaporation rate • Flammability (solid; gas) • Lower flammable/explosive limit • Upper flammable/explosive limit • Vapor pressure • Vapor density • Relative density • Solubility • Partition coefficient - n-octanol/water • Auto-ignition temperature • Decomposition temperature • Viscosity
10	Stability and Reactivity	<ul style="list-style-type: none"> • Reactivity • Chemical stability • Possibility of hazardous reactions • Conditions to avoid (e.g., static discharge, shock, or vibration) • Incompatible materials • Hazardous decomposition products
11	Toxicological Information	<p>Concise but complete description of the various toxic health effects and the data used to identify those effects, including:</p> <ul style="list-style-type: none"> • Information on the likely routes of exposure (inhalation, ingestion, skin and eye contact) • Symptoms related to the physical, chemical and toxicological characteristics • Delayed and immediate effects, and chronic effects from short-term and long-term exposure • Numerical measures of toxicity, including acute toxicity estimates (ATEs)
12	Ecological Information	<ul style="list-style-type: none"> • Ecotoxicity • Persistence and degradability • Bio-accumulative potential • Mobility in soil • Other adverse effects

13	Disposal Considerations	Information on safe handling for disposal and methods of disposal, including any contaminated packaging
14	Transport Information	<ul style="list-style-type: none"> • UN number • UN proper shipping name • Transport <i>Hazard Class(es)</i> • Packing group • Environmental hazards • Transport in bulk, if applicable • Special precautions
15	Regulatory Information	Safety, health and environmental regulations specific to the product
16	Other Information	Date of the latest revision of the <i>SDS</i>

- o These impurities and stabilizing products are those that are classified in a health hazard class and contribute to the classification of the material or substance.
- o Each ingredient in the mixture must be listed when it is classified in a health hazard class and is present above the concentration limit that is designated for the hazard class in which it is classified or is present in the mixture at a concentration that results in the mixture being classified in any health hazard class.

5.7. Training

- New employees and users shall receive general hazard communication training through the General Safety Basic class. Refresher classes are offered through Annual Refresher Training. This training shall include the following:
 - o The requirements of the Hazardous Communication Standard.
 - o An explanation of the SDSs.
 - o The labeling system.
 - o Where hazardous chemicals exist.
- Personnel exposed to a hazardous chemical for a task related activity shall be trained in the following:
 - o Methods and observations that may be used to detect the presence or release of a hazardous chemical in the work area.
 - o The physical, health and other hazards associated with the chemicals in the work area.
 - o The controls employees should take to protect themselves from the hazards of a chemical.
- Personnel working in or near unlabeled tanks and pipes or performing non-routine tasks shall be trained to the hazards associated with the work.
- SDSs of a task specific chemical are a component of the hazard analysis and will be reviewed prior to the commencement of the task with all affected workers.

6.0 Documented Information/Related Document

- 6.1.** ESH-(4000-A)-200339 Hazard Class Details
- 6.2.** ESH-(4000-FD)-200338 Chemical Approval Flow Diagram
- 6.3.** 29 CFR 1910.1200 Hazard Communication Standard for General Industry
- 6.4.** 26 CFR 1926.59 Hazard Communication for the Construction Industry
- 6.5.** NFPA 704: Standard System for the Identification of the Hazards of Materials for Emergency Response