SANFORD UNDERGROUND RESEARCH FACILITY

SOUTH DAKOTA SCIENCE AND TECHNOLOGY AUTHORITY

Compressed Gasses Standard

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Revision History

Rev	Date	Section	Paragraph	Summary of Change	Authorized by
03	2/24/2026	1, 4, 5 & 6	4.4, 5.1-5.5, 5.9 & 6.1-6.10	Updated document due to change to the document numbering of controlled documents due to the change from DocuShare system to SharePoint system	CCR 1225
04	4/28/2026	1,2,3,4,5 & 6	4.4,4.8.1-4.8.4,5.1-5.7,6.1-6.4	Updated/added definitions, position titles and content.	CCR 1242

1.0 Purpose

The purpose of this standard is to ensure the safe storage, handling, use, and disposal of compressed gas cylinders at Sanford Underground Research Facility (SURF), minimizing risk to personal property and the environment.

South Dakota Science and Technology Authority (SDSTA) reference the following to fulfill this standard:

- NFPA 704
- 49CFR- Transportation

2.0 Scope

This standard applies to all compressed gases at SURF.

3.0 Definitions

Compressed Gas – Gas that is stored and used at pressures greater than nominal atmospheric pressure (15 pounds per square inch absolute). Compressed gas is supplied in cylinders, compressors, portable tanks or through piping systems.

Pressure Vessel– A pressure vessel used to store gases above atmospheric pressure. Vessels include cylinders, portable tanks, spheres, or stationary tanks.

Compressed Gas Cylinder– Pressure vessel designed for pressures higher than 40 psia (276kPa, abs) and having a circular cross section.

Dewar - A specialized insulated container, often double-walled and vacuum-jacketed, used for storing and transporting liquefied gases at extremely low temperatures, especially cryogenic liquids like liquid nitrogen. Dewars minimize heat transfer to keep the contents at a stable, low temperature.

Exhausted Enclosure – A non-combustible enclosure, such as a gas cabinet, laboratory hood, or enclosed compartment, which consists of at least a top, back, and two sides and is connected to an approved exhaust ventilation system.

Flammable Gas – A gas having a flammable range with air at 20°C (68°F) and a standard pressure of 101.3 kPa (14.7 psi).

Gas Cabinet – A fully enclosed, non-combustible exhausted enclosure used to store or use gas cylinders. Meets the following criteria:

- Operates at negative pressure in relation to surrounding area.
- Provided with self-closing limited access points to give access to equipment controls.
- Connected to an exhaust ventilation system.
- Constructed on not less than 0.097 inches (12 gauge) steel.

Qualified Person – A person who, by possession of a recognized degree, certificate or professional standing, or who by extensive knowledge, training and experience has successfully demonstrated the ability to solve or resolve problems relating to the subject matter, the work or the project.

Safety Data Sheets (SDS)- Safety data sheets include information such as the properties of each chemical; the physical, health, and environmental health hazards; protective measures; and safety precautions for handling, storing, and transporting the chemical.

Storage Area – A building, portion of a building, or exterior area used for the storage of compressed gases.

4.0 Responsibilities

4.1. SDSTA Executive Director

4.1.1. Ensures accountability of the requirements of this document with direct reports.

4.2. Environment, Safety and Health (ESH) Department

4.2.1. Provides support in preparation of required WPC documents.
4.2.2. Determines and validate courses specific to pressure safety training for required personnel.
4.2.3. Provides technical assistance as needed or required.

4.3. SDSTA Department Directors

4.3.1. Ensures that direct reports who are or may potentially be exposed to compressed gases are trained to handle, use, and respond.
4.3.2. Ensures accountability of the requirements of this document with direct reports.

4.4. Director of Science

4.4.1. Ensures that Experiment Planning Statements that include compressed gases are evaluated prior to installation or use.
4.4.2. Ensures Authority to Proceed review is followed to control compressor gas hazards.
4.4.3. Coordinates with the Engineering Department on the hazard assessment.

4.5. Engineering Department

4.5.1. Reviews and approves the design, fabrication, installation and testing of research pressure systems.
4.5.2. Reviews and approves pressure system-related formal work authorizations, which are written to ensure that pressure system use is within the design limitations of such systems.
4.5.3. Approves safety notes pertaining to research systems.
4.5.4. Assures that documentation, traceability, and accountability for each unique custom-built research pressure vessel or system are maintained, including description of design, pressure conditions, testing, inspection, operation, repair and maintenance.

4.6. Supervisors

4.6.1. Ensure that direct reports who handle, use, or may potentially be exposed to compressed gases, are trained.
4.6.2. Verify that all required inspections are completed, and any corrective actions are taken.
4.6.3. Ensure all labeling is in place and legible.
4.6.4. Ensure WPC documents are completed prior to work beginning.

4.7. Project Managers

4.7.1. Ensure that contractors/subcontractors comply with the work practices described in this standard.

4.7.2. Ensure that Safety Data Sheets (SDS) are provided before being brought on site.

Be aware of the entire compressed gas cylinder lifecycle (e.g. disposal costs) when planning.

4.8. Procurement Department

4.8.1. Purchases cylinders that can be returned to the provider when empty or no longer needed when able.

- For gases that cannot be purchased in returnable containers, it must be verified in advance with the ESH Department that arrangements can be made for proper disposal.
- If the product only comes in non-returnable or disposable cylinders, arrangements must be made for its final disposal as a condition of its purchase.

4.8.2. Ensures SDS Sheets are provided.

4.8.3. Ensures chemicals are approved by ESH prior to purchase.

4.8.4. Ensures equipment manuals are provided as applicable.

4.9. Infrastructure Technicians

4.9.1. Install and maintain all required gas labeling inside the shaft.

4.9.2. Review appropriate WPC documents.

4.10. Workers

4.10.1. Complete required training for handling, use or exposure to compressed gases as presented in this standard.

4.10.2. Use and maintain pressure systems, including re-evaluation and/or re-testing of pressure system components in accordance with the requirements of applicable formal work authorization documents.

5.0 Instructions

5.1. Labeling

5.1.1. Cylinders must bear an identification tag stating the name of the gas or mixture, hazard statement, signal word, and pictogram.

5.1.2. Cylinders must have a label identifying “full” or “empty”.

5.1.3. Cylinders must be labeled with a DOT label when transported on public roadways.

5.1.4. Mixed gas cylinders must be clearly labeled with the contents and quantities.

5.1.5. Unmarked or illegibly marked cylinders shall be re-labeled if identifiable or returned to the supplier.

5.1.6. Gas lines must be labeled with the name of the gas and direction of the gas flow. See ENG-1000-S-001 Pipe Marking and Labels Standard for more details.

5.1.7. Do not use cylinder color coding as the sole identifier.

5.1.8. Defacing or removing any markings, labels, decals, tags, or stencil marks which have been applied/attached for the identification of a cylinder is prohibited. It is illegal to change the stamped marks on any compressed gas cylinder.

5.1.9. NFPA 704 diamond panel hazard warning signs must be posted at entrances to work areas (e.g., laboratories, welding shops, etc.) containing compressed gases having a Health, Fire or Reactivity hazard rating of 3 or 4, or an Oxidizer or Simple Asphyxiant hazard rating.

5.2. Storage

5.2.1. Gas cabinets must be labeled with the NFPA 704 diamond panel hazard warning sign including the names of the gases contained in the cabinet.

5.2.2. Storage facilities must be posted with an NFPA 704 diamond panel hazard warning sign and with a "NO SMOKING" sign if flammable gases are present. When storage areas are within SURF's no smoking jurisdiction, no sign is required.

5.3. Handling and Use

5.3.1. See ESH-7000-WI-003 Handling and Use of Compressed Gas Cylinders.

5.4. Transportation-See ESH-7000-WI-006 Transportation of Compressed Gas Cylinders

5.5. Inspections and Maintenance.

- The following information applies to the use of system piping, regulators, manifolds, and other apparatuses:
  - Keep piping, regulators, and other apparatuses gas tight to prevent leaks.
  - Verify systems are depressurized before connections are tightened or loosened and before any repairs.
  - All new connections shall be tested with a soapy water type solution.
  - The system shall be slowly and partially pressurized and leak-tested before fully pressurizing the system.
  - Fluorescent light can be used to check for grease or oil in regulators and valves.
  - Valve and Regulators:
    - Valves and regulators shall undergo periodic maintenance and repair per the manufacturer's guidance for users. Valves and regulators shall only be repaired by qualified people.

Perform a visual inspection before each use to detect any damage, cracks, corrosion, or other defects.

5.6. Disposal

- Proper identification of the contents of all cylinders is required prior to disposal.
- Refillable cylinders shall be returned to the vendor. Return cylinders with at least 30 pounds of pressure to reduce the risk of foreign materials entering the empty vessel.
- If a refillable cylinder is encountered that does not have a manufacturer's label, contact the vendor or ESH.

5.7. Training

- Hazard communication training is required for workers who handle, use, or may potentially be exposed to compressed gases.
- Additional training may be required and documented in the WPC documents based on the specific hazards presented by the storage and/or use of compressed gases.

6.0 Documented Information/Related Documents

6.1. ENG-1000-S-001 Pipe Marking and Labels Standard
6.2. ESH-6000-A-003 SURF Incident Specific Responses
6.3. ESH-7000-WI-003 Handling and Use of Compressed Gas Cylinders.
6.4. ESH-7000-WI-006 Transportation of Compressed Gas Cylinders