

Pressure, Vacuum, and Cryogenic Systems: Cryogen Requirements

Department: Chemical and General Safety

Program: Pressure, Vacuum, and Cryogenic Systems

Owner: Program Manager

Authority: ES&H Manual, Chapter 14, Pressure, Vacuum, and Cryogenic Systems¹

All pressure systems must be in conformance with the requirements of Chapter 14, and this exhibit provides the additional required information specific to cryogen systems. If you need further clarification on the unique characteristics of this type of system or the specific codes, regulations, and standards, please contact the program manager.

Unique Characteristics

Systems that contain or convey cryogens must incorporate the following:

- The cryogen source and all associated piping must meet the safety requirements for pressure vessel and process piping
- The insulation method employed on such systems must meet certain design requirements to assure that the material remains liquid until it reaches the point of use
- If the cryogenic liquid has additional hazardous characteristics such as flammability, additional codes and regulations bear upon the installation
- The use of a cryogenic material inside a building is regulated by codes and regulations that mandate a certain level of hazard control and/or alerting for the potential of a material release that could result in an oxygen-deficient atmosphere. In particular, the California state codes levied by Title 10, *Code of Federal Regulations*, Part 851, “Worker Safety and Health Program” (10 CFR 851)² require a certain level of mechanical ventilation in rooms to control the oxygen deficiency hazard potential where cryogens may be used or where there is a potential for a release. Additionally, these codes specify installing flammable gas monitors if the material is flammable.

Note Cryogen systems are subject to these regulations in consideration of the unique characteristics and expansive properties of a gas or liquid stored at a temperature below -90°C (-130°F or 183 K).

1 *SLAC Environment, Safety, and Health Manual* (SLAC-I-720-0A29Z-001), Chapter 14, “Pressure, Cryogenic, and Vacuum Systems”, http://www-group.slac.stanford.edu/esh/hazardous_activities/pressure/policies.htm

2 “Code of Federal Regulations: Main Page”, <http://www.gpoaccess.gov/cfr/>

Additional information on 10 CFR 851 and its implementation is available from the following site: “Worker Safety and Health Program Final Rule - 10 CFR 851”, <http://www.hss.energy.gov/healthsafety/WSHP/rule851/851final.html>

Required Regulations, Codes, and Standards

In addition to those listed in Section 3, “Standards”, of Chapter 14, the following regulations, codes, and standards apply.

*Note Use the most current edition unless otherwise indicated.*³

American Society of Mechanical Engineers (ASME) Standards

- ASME B31.3-2002, “Process Piping”
- ASME B16 series, “Standards of Pipes and Fittings”

National Fire Protection Association (NFPA) Standards

- NFPA 55, “Standard for the Storage, Use, and Handling of Compressed Gases and Cryogenic Fluids in Portable and Stationary Containers, Cylinders, and Tanks”

California Fire Code

- Chapter 30, “Compressed Gases”
- Chapter 32, “Cryogenic Fluids”
- Chapter 27, “Hazardous Materials – General Provisions”

California Mechanical Code

- Chapter 5, “Exhaust Systems”
- Chapter 14, “Process Piping”

Compressed Gas Association (CGA) Standards

- CGA P-12, “Safe Handling of Cryogenic Liquids”
- CGA P-30, “Portable Cryogenic Liquid Containers: Use, Care, and Disposal”
- CGA P-56, “Cryogenic Vaporization Systems: Prevention of Brittle Fracture of Equipment and Piping”
- CGA P-35, “Guidelines for Unloading Tankers of Cryogenic Oxygen, Nitrogen, and Argon”
- CGA P-56, “Cryogenic Vaporization Systems: Prevention of Brittle Fracture of Equipment and Piping”

Related Documents

- Hazardous Materials: Cryogenic Gas Safe Handling Guideline (SLAC-I-730-0A09T-002)⁴
- *SLAC Environment, Safety, and Health Manual* (SLAC-I-720-0A29Z-001), Chapter 36, “Cryogenic and Oxygen Deficiency Hazard Safety”⁵

3 See the “SLAC Research Library Community Pages”, <http://www-group.slac.stanford.edu/library/CommunityPages.asp>, for available standards.

4 <http://www-group.slac.stanford.edu/esh/eshmanual/references/hazmatGuideCryo.pdf>

5 http://www-group.slac.stanford.edu/esh/hazardous_substances/cryogenic/policies.htm

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- Hazardous Materials: Personal Protective Equipment Requirements (SLAC-I-730-0A09S-017)⁶
- Pressure, Vacuum, and Cryogenic Systems: Codes, Regulations, and Standards List (SLAC-I-730-0A21V-001)⁷

6 <http://www-group.slac.stanford.edu/esh/eshmanual/references/hazmatReqPPE.pdf>

7 <http://www-group.slac.stanford.edu/esh/eshmanual/references/pressureListStandards.pdf>

