Pressure and Cryogenics

Brief

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BRIEF

Policy Summary

Berkeley Lab's Pressure and Cryogenics Program manages gases and cryogenic liquids used at the Laboratory site by:

- Stating design and build requirements for gas and cryogenic delivery systems
- Identifying required training for those handling and using gases and cryogenic liquids
- Mandating the use of process safety documentation
- Listing usage and handling requirements for gases and cryogenic liquids

Who Should Read This Policy

All Berkeley Lab employees, visitors, affiliates, and subcontractors

To Read the Full Policy, Go To:

The POLICY tab on this wiki page

To Read the ES&H Program Details, Go To:

http://www.lbl.gov/ehs/pub3000/CH7.html

Contact Information

Pressure and Cryogenics Subject Matter Expert
EHSS Division

Policy

<table>
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<tr>
<th>Title:</th>
<th>Pressure Hazard Assessment and Control</th>
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POLICY

A. Purpose
Berkeley Lab’s Pressure and Cryogenics Program manages gases and cryogenic liquids used at the Laboratory site by:

- Stating design and build requirements for gas and cryogenic delivery systems
- Identifying required training for those handling and using gases and cryogenic liquids
- Mandating the use of process safety documentation
- Listing usage and handling requirements for gases and cryogenic liquids

B. Persons Affected

All Berkeley Lab employees, visitors, affiliates, and subcontractors

C. Exceptions

None

D. Policy Statement

1. Pressure system safety is achieved by careful engineering, hazard controls, assuring structural integrity of the components, regulation of pressures and flow, and provision for pressure relief. (Work Process A)

2. Low-pressure gas systems are pressure systems operating below 1 MPa gauge (150 psig) and consisting only of regulator, tubing, gauges, valves, and fittings. Low-pressure gas systems represent the lowest hazard category of pressure systems at Berkeley Lab. (Work Process B)

3. Low-hazard pressure systems consist of equipment with a low hazard level involving routine risks that are accepted as such by the general public. (Work Process C)

4. Pressure systems that do not fall into the low hazard category are high-hazard pressure systems. Specifically, high-hazard pressure systems include:
   a. All pressure vessel systems that contain irritant, toxic, infectious, and/or radioactive fluids at any pressure
   b. All pressure vessel systems with oxygen or flammable contents
   c. All pressurized equipment (including ASME-coded vessels that have been structurally modified) that operate at gas pressures over 1 MPa gauge (150 psig) or at liquid pressures over 10 MPa gauge (1,500 psig), or that contains over 100 kJ (75,000 ft-lb) of stored energy. (Work Process D)

5. Vacuum systems that are back-filled from a pressurized supply must be equipped with a pressure-relief valve to assure that the system will not be subjected to pressures in excess of the Maximum Allowable Working Pressure. (Work Process E)

6. The most severe hazard of cryogenic systems is the possible confinement of even small amounts of cryogenic liquid. (Work Process F)

7. Employees who work with pressure systems over 1 MPa (150 psig) or with pressure vessel systems at any pressure must review training requirements with the EHSS Division pressure safety representative. (Work Process G)

E. Roles and Responsibilities

<table>
<thead>
<tr>
<th>Role</th>
<th>Responsibility</th>
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</thead>
<tbody>
<tr>
<td>Division Directors</td>
<td>Responsible for assuring that all pressure systems are designed, assembled, and operated in accordance with the requirements of this chapter</td>
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</tbody>
</table>
| Environment, Health, Safety, and Security (EHSS) Division | • Administers and maintains the Laboratory Pressure Safety Program  
• Arranges the Laboratory Pressure Safety Training Courses  
• Maintains copies of all AHDs and Safety Notes |
| Engineering Division | Reviews and approves the design, fabrication, installation, and testing of research pressure systems, including vacuum systems, as required by this chapter.  
Reviews and approves pressure-system Activity Hazard Documents (AHDs), which are written to assure that pressure operations are within the design limitations of such systems. This is in addition to the normal review process for AHDs, and it does not cover AHDs required for other reasons. |
|----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Engineering Division Director | Designates qualified engineers as Designated Pressure Engineers to provide guidance on pressure vessel and pressure system design and to review such designs as prepared by vendors and Laboratory personnel  
Approves any Safety Notes for pressure systems |
| Facilities Division | Responsible for the design, fabrication, installation, and testing of all plant facility pressure equipment; and for all requisite AHD's  
Maintains a sufficient staff of qualified and certified pressure installers, who are available to all groups at Berkeley Lab |
| Designated Pressure Engineer | Experienced mechanical design engineers who have specific knowledge regarding pressure safety and have been designated by the Engineering Division Director  
Responsibilities include:  
Completing required training  
Providing advice and guidance to Berkeley Lab staff in matters related to pressure safety  
Reviewing and approving pressure-related Safety Notes and AHDs on behalf of the Engineering Division Director |
| Responsible Designer | A competent mechanical designer, usually a member of the Engineering Division. Responsibilities include:  
Completing required training  
Developing or selecting a safe design in accordance with all applicable codes and standards  
Specifying procurement, fabrication, installation, maintenance, testing, retesting, and labeling requirements  
Preparing all required Safety Notes |
| Responsible User | Accountable for the safe use and maintenance of the equipment, including retesting of pressure systems in accordance with the requirements of the Safety Note or AHD; and for assurance that all training requirements have been met.  
Typically the principal investigator or researcher with overall responsibility for the work |
| Employees | Must complete the Berkeley Lab course Pressure Safety (EHS 0171) if working with compressed gas systems  
Must review training requirements with the EHSS Division pressure safety representative if working with pressure systems over 1 MPa (150 psig) or with pressure vessel systems at any pressure |

F. Definitions/Acronyms

<table>
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<th>Term</th>
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<tr>
<td>MAWP</td>
<td>Maximum Allowable Working Pressure: The maximum pressure at which the design of pressure systems is based</td>
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</table>
MOP: Maximum Operating Pressure: The highest pressure at which a system will operate.

Pressure Installer: Technicians or mechanics, usually in the Facilities Division, who have completed specialized training and have been designated and certified as such by their Department Head. Pressure installers may be assigned to work directly for responsible designers.

Pressure Regulator: A valve or device designed to cut off flow at a set pressure.

Pressure Relief Devices: Valves or rupture disks designed to vent pressure above a set point. Their purpose is to ensure the pressure within the vessel does not exceed MAWP.

Test Pressure: The pressure at which a vessel is tested to validate it can withstand the MOP. Test pressures vary from 125% to 200% of the MAWP.

G. Recordkeeping Requirements

- Pressure Relief Device Certifications: Facilities Division
- Pressure Vessel and System Test Certifications: Facilities Division

H. Implementing Documents

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<tr>
<th>Document Number</th>
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<tr>
<td>07.07.026.001</td>
<td>Chapter 7</td>
<td>Pressure Safety and Cryogenics</td>
<td>Program</td>
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<tr>
<td>07.07.026.002</td>
<td>Chapter 7, Work Process A</td>
<td>General Requirements</td>
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<td>07.07.026.003</td>
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I. Contact Information

Pressure and Cryogenics Subject Matter Expert
EHSS Division

J. Revision History

<table>
<thead>
<tr>
<th>Date</th>
<th>Revision</th>
<th>By whom</th>
<th>Revision Description</th>
<th>Section(s) affected</th>
<th>Change Type</th>
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<tr>
<td>1/2/2012</td>
<td>0</td>
<td>J. Dionne</td>
<td>Re-write for wiki (brief)</td>
<td>All</td>
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<td>1</td>
<td>J. Dionne</td>
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<td>K. Ettinger</td>
<td>Reviewed 8/28/13</td>
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Pressure Hazard Assessment and Control

Document number: 07.07.026.000
Revision number: 1.1
Publication date: 9/10/2013
Effective date: 6/17/2010
Next review date: 9/10/2016
Policy Area: Industrial Hygiene and Safety
RPM Section (home): ESH
RPM Section (cross-reference): none
Functional Division: EHSS
Prior reference information (optional): PUB-3000 Chapter 7

Source Requirements Documents

- 29 CFR 1910, OSHA General Industry Standards
- 29 CFR 1910.101, Compressed Gases (General Requirements)
- 29 CFR 1910.102, Acetylene
- 29 CFR 1910.103, Hydrogen
- 29 CFR 1910.104, Oxygen
- 29 CFR 1910.106(b)(1)(v), Flammable Liquids
- 29 CFR 1910.110, Storage and Handling of Liquefied Petroleum Gases
- 29 CFR 1910.120(q), Emergency Response Program to Hazardous Substance Releases
- 29 CFR 1910.169, Air Receivers
- 29 CFR 1910, Subpart I, Personal Protective Equipment
- 29 CFR 1926, OSHA Construction Industry Standards
- 29 CFR 1926.55, Gases, Vapors, Fumes, Dusts, and Mists
- 29 CFR 1926.153, Liquefied Petroleum Gas
- 29 CFR 1926.306, Air Receivers
- 29 CFR 1926.350, Gas Welding & Cutting
- 49 CFR 171–179, Storage & Transportation Guidance
- CGA pamphlet S-1.1-1963 and 1965 addenda

Other Driving Requirements

- CAC Title 24, Part 9, California Fire Code, Article 49, Welding & Cutting
- CAC Title 24, Part 9, California Fire Code, Article 51, Semi-conductor Fabrication
- CAC Title 24, Part 9, California Fire Code, Article 74, Compressed Gases
- CAC Title 24, Part 9, California Fire Code, Article 80, Hazardous Materials
- CAC Title 24, Part 9, California Fire Code, Article 82, Liquefied Petroleum Gas
- CCR Title 8, Division 1, Chapter 4, Subchapter 1, Unfired Pressure Vessel Safety Orders
- CGA pamphlet S-1.2-1963, *Pressure Relief*

### Implementing Documents

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