

# Section 5 COMPRESSED GAS & CRYOGENIC COMPONENTS AND SYSTEMS

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## A. Scope

This Design Guide applies to all facilities, including leased properties. It covers all unfired pressure vessels (i.e., storage tanks, compressed-gas cylinders) that have been designed to operate at pressures above 15 psi, including the storage and use of compressed-gas cylinders and cryogenic fluids. This does not cover utilities (i.e., “house air”). Most of the requirements were taken directly from the International Fire Code, as adopted by Seattle/Washington State, with supporting information from the National Fire Protection Association.

## B. Compressed Gas Cylinder in Laboratories

1. Cylinders in laboratories should generally be limited to those in use. Cylinders connected through a regulator or manifold to deliver gas to a laboratory operation, and a single cylinder located alongside, are considered to be in use. Other cylinders should be located in compressed gas storage areas.
2. Provisions should be made for segregation of cylinders of incompatible gases as outlined in the International Fire Code.
3. See requirements for highly toxic gases below in Section F.

## C. Compressed Gas Storage Areas

1. A compressed gas storage area(s) meeting the requirements of applicable codes and standards for fire separation, ventilation, restraint and separation of incompatibles should be provided in the building or an appropriate outdoor location to provide sufficient back up supply and empty cylinder storage for users. Separate space for full and empty cylinders is preferred.
2. Emergency power shall be provided for “H” occupancy gas storage rooms, gas-cabinet exhaust ventilation, gas-detection systems, emergency alarm systems, and temperature control systems.
3. Storage areas shall be secured against unauthorized entry.
4. Rooms with large volumes of cryogenics shall be provided with effective ventilation to mitigate risk in the event of a spill or release. If not practical oxygen alarms should be provided if determined necessary through a risk assessment. The EH&S website has additional information on Liquid Nitrogen and Low Oxygen Alarms.

## D. Compressed Gas Manifolds

1. Where a laboratory operation is projected to use a significant amount of compressed gas and it is not feasible to provide through a fixed tank, a

compressed gas storage area and manifold system should be provided at dedicated room such as a ventilated closet, separate from the laboratory and accessible from common space such as a hallway. Depending upon the material the room may need to be classified as an “H” occupancy.

## **E. Compressed Gas Cylinder Restraint**

1. Approved storage racks (e.g., Unistrut, pipe racks) shall be provided that adequately secure gas cylinders by chains, metal straps, or other approved materials, to prevent cylinders from falling or being knocked over. Chains are preferable to straps. Straps shall be non-combustible.
2. In laboratories, cylinder restraints shall be sufficient to prevent cylinders from tipping over using double chains/straps one-third and two-thirds the height of the cylinder.
3. Chain/strap restraints shall be used to restrain a maximum of three cylinders per chain/strap or per set of chains/straps (if double-chained/strapped).
4. Gas-cylinder securing systems should be anchored to a permanent building member or fixture. This connection is needed to prevent movement during a seismic event.

## **F. Requirements for Gas Cabinets storing Toxic and Highly Toxic Gases**

1. Storage and use of toxic and highly toxic compressed-gas cylinders shall be within exhaust-ventilated gas storage cabinets, laboratory fume hoods, exhausted enclosures, or separate ventilated gas storage rooms without other occupancy or use. It is acceptable to mount lecture bottles connected to a manifold in a fume hood.
2. Gas cabinets shall be connected to a dedicated or fume hood exhaust system.
3. Gas cabinets shall be approved and constructed to meet the requirements of the International Fire Code.
4. Gas cabinets should be fitted with an airflow monitor.