North Carolina Department of Labor
Occupational Safety and Health Division

Raleigh, North Carolina

Field Information System **Standards Notice 72**

Subject: Security of Compressed Gas Cylinders at Compressed Gas Supplier and Distribution Facilities

A. **References.**

1. **29 CFR 1910.101(b) Compressed gases.** The in-plant handling, storage, and utilization of all compressed gases in cylinders, portable tanks, rail tank cars, or motor vehicle cargo tanks shall be in accordance with Compressed Gas Association Pamphlet P-1-1965, which is incorporated by reference as specified in §1910.6.

2. **Compressed Gas Association (CGA) Pamphlet P-1-2006 – Safe Handling of Compressed Gases in Containers.**

B. **Background.**

CGA Pamphlet P-1-1965 which was incorporated by reference into 29 CFR 1910.101(b) states that it is primarily intended for the guidance of compressed gas users. While portions of this document may be appropriately applied to compressed gas supplier and distribution facilities, this pamphlet is silent on how to deal with the security of large quantities of cylinders during intermittent and/or short term storage associated with cylinder receiving/unloading, sorting, filling, and loading activities.

Since Compressed Gas Association (CGA) Pamphlet P-1-1965 was issued, subsequent editions have provided more detailed information and additional options for gas suppliers and distributors to manage these activities. Specifically, CGA Pamphlet P-1-2006 will be used as a reference for this discussion.

Cylinders in storage are required to be secured to prevent falling or rolling. Typically, upright cylinders are stacked against a wall or other stable structure and chained to prevent them from falling over. Cylinders may also be secured in a horizontal position (more common with small cylinders on carts). One option for gas supplier's facilities and distribution warehouses not in earthquake prone areas is cylinder nesting. Cylinder nesting is a method of securing flat-bottom cylinders upright in a tight mass using a contiguous three-point contact system whereby all cylinders within a group have a minimum of three points of contact with other cylinders, walls, or bracing (see CGA Pamphlet P-1-2006 for drawing). Proper nesting requires a minimum of seven cylinders for unsupported (free standing) cylinders and five for supported cylinders (against wall or similar structure).

Employers in these facilities can use nesting to secure cylinders when chaining is infeasible due to constant movement. Additionally, nesting can be used during activities with unsupported cylinder groups.

C. **Discussion.**

The following are some of the activities which may occur at compressed gas suppliers and distribution facilities:

1. Cylinder Receiving/Unloading. During this activity, the facility receives empty cylinders from customer sites or from other facilities within the company. The cylinders are unloaded from trucks onto the loading dock. Each truck may contain a variety of cylinder styles, sizes and number. As cylinders are unloaded, they are pushed together or "nested" if a sufficient number of cylinders are present. During this process cylinders are typically unsupported.

2. Cylinder Sorting. After the cylinders are unloaded, they are sorted into groups based on where the cylinder is to be filled, the type of gas to be filled, cylinder size, cylinder condition, and current demand. Cylinders to be filled or serviced at other locations may be further separated into groups based on which facility fills which type of gas. Cylinders to be filled on-site may be separated into those that are to be filled immediately and those that are surplus. Cylinders to be filled on-site are moved into the plant via hand truck. Surplus cylinders are placed on pallets and moved onto the yard or left in groups on the dock until needed. Cylinders requiring service are separated and placed on pallets for transport to a regional refurbishment facility. Each of the above sorting steps results in small and large groupings of cylinders that may no longer be considered nested.

3. Cylinder Filling. Cylinders moved into the plant are either immediately connected to the manifold for filling or staged against a wall or in free standing groups to await filling. The staged cylinders are nested if a sufficient number of cylinders are available.

4. Cylinder Servicing and Repair. Cylinder servicing and repair may include painting, retrofitting, and hydrostatic or ultrasonic emission testing. Frequently these cylinders are stored in small groups while awaiting service and/or repair. A sufficient number of cylinders may not be present to properly nest.

5. Cylinder Storage. After filling, cylinders are separated and stored in groups by gas type either along the walls of the dock or secured on pallets and transported to a storage area on the yard. Smaller cylinders may be placed into carts for storage. Proper nesting of cylinders along the wall is dependant on the number of cylinders available. The last cylinders in a grouping may have only two points of contact if a sufficient number of cylinders are not available.

6. Cylinder Picking and Loading. As part of the loading process, drivers will pick cylinders from those stored along the walls or in baskets and move those cylinders via hand truck or cylinder basket to the rear of their vehicles. During this selection process, the remaining grouping may no longer be nested. In addition the picked cylinders will not be nested.

D. **Interpretation.**

When there are a sufficient number of cylinders, the cylinders are required to be nested in accordance with CGA Pamphlet P-1-2006. However, during the activities above, nesting

as defined in the pamphlet may not be possible in every instance. Recognizing these activities exist, OSHNC will accept the following as minimum requirements for these activities:

1. Cylinders must be secured against a wall and maintain at least two points of contact, when possible.

2. Stored cylinders being picked for off site transport must be immediately placed on the delivery truck, or secured on pallets or placed into small groupings with two points of contact, when possible.

3. If the cylinders are free standing and three cylinders are present, the cylinder must be grouped to maintain two points of contact.

4. When it is necessary to break a grouping of cylinders down into smaller units of unsupported cylinders which are not properly nested during the activities or at any other time when an insufficient number of cylinders temporarily remains after an activity, access to the work area by vehicular traffic and non-essential employees will be controlled to prevent the cylinders from being knocked over.

5. After any of the above activities are complete, the remaining cylinders will be placed back into a proper nesting configuration when a sufficient number of cylinders exist.

E. **Effective Date.**

This Standards Notice is effective on the date of signature. It will remain in effect until revised or canceled by the Director.

Signed on Original
Susan Haritos
Health Standards Officer

Signed on Original
Allen Mc Neely
Director

10/23/08
Date of Signature