

# Patient Safety Advisory

Veterans Health Administration Warning System  
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- Item:** Oxygen Regulator Fires Resulting from Incorrect Use of CGA 870 Seals.
- Specific Incident:** FDA has received 12 reports in which regulators used with oxygen cylinders have burned or exploded due to suspected improper use of gaskets/washers. None of these reports involve VA facilities. The incidents are related to the reuse of single-use gaskets.
- General Information:** Two types of washers, or CGA 870 seals, are commonly used to create the seal at the cylinder valve / regulator interface. The type required by many regulator manufacturers is a metal-bound elastomeric sealing washer that is designed for multiple use applications. The other common type, often supplied free-of-charge with refilled oxygen cylinders, is a plastic crush gasket suitable for single use applications.
- Recommendations:**
1. **Never** use plastic **crush** gaskets.
  2. Instead **always** use the **sealing** washer specified by the regulator manufacturer.  
(Note: While FDA accepts using crush gaskets, VHA believes the fire risk of reusing them outweighs the additional expense of using sealing washers.)
  3. Always “crack” cylinder valves (open the valve just enough to allow gas to escape for a very short time) before attaching regulators in order to expel foreign matter from the outlet port of the valve.
  4. Always inspect the regulator and CGA 870 seal before attaching it to the valve to insure that the regulator and seal are in good condition and the regulator is equipped with only one integral metal and rubber seal that is in good condition.
  5. Tighten the T-handle firmly by hand, but do not use wrenches or other hand tools that may over-torque the handle.
  6. Open the post valve slowly, while maintaining a grip on the valve wrench so that it can be closed quickly if gas escapes at the juncture of the regulator and valve.
- Addl. Information:** See the attached FDA Public Health Notification
- Source:** FDA and NIOSH Public Health Notification issued April 24, 2006.
- Contact:** Paul Sherman VA Center for Engineering Occupational Safety & Health (CEOSH) at (314) 543-6712.

# FDA AND NIOSH Public Health Notification: Oxygen Regulator Fires Resulting from Incorrect Use of CGA 870 Seals

(You are encouraged to copy and distribute this information)

Issued: April 24, 2006



Dear Colleagues:

This is to alert you to the danger of fires at the interface of oxygen regulators and cylinder valves because of incorrect use of CGA 870 seals, and to point out an important precaution you can take to avoid such fires.

## Background

FDA has received 12 reports in which regulators used with oxygen cylinders have burned or exploded, in some cases injuring personnel. Some of the incidents occurred during emergency medical use or during routine equipment checks. FDA and NIOSH believe that improper use of gaskets/washers in these regulators was a major factor in both the ignition and severity of the fires, although there are likely other contributing factors.

Two types of washers, referred to as CGA 870 seals, are commonly used to create the seal at the cylinder valve / regulator interface: The type required by many regulator manufacturers is a metal-bound elastomeric **sealing washer** that is designed for multiple use applications. The other common type, often supplied free-of-charge with refilled oxygen cylinders, is a plastic (usually Nylon<sup>®</sup>) **crush gasket** suitable for single use applications.

The nylon crush gaskets require higher torque than the elastomeric sealing washers in order to seal the cylinder valve / regulator interface, and if they are used again, they require more torque with each successive use. The cylinder valve / regulator connection is designed to be hand-tightened. If the crush gaskets are re-used, the need for increased torque may require using a wrench or other hand tool, which can deform the crush gasket and damage the cylinder valve and regulator. This can result in leakage of oxygen past the cylinder valve seat and across the nylon crush gasket. According to a forensic analysis supported by FDA and NIOSH, "flow friction" caused by this leakage of compressed oxygen across the surface of the crush gasket may produce enough thermal energy to spontaneously ignite the nylon gasket material.

## Recommendations

**FDA and NIOSH recommend that plastic crush gaskets never be reused**, as they may require additional torque to obtain the necessary seal with each subsequent use. This can deform the gasket, increasing the likelihood that oxygen will leak around the seal and ignite.

The following general safety precautions should also be taken to avoid explosions, tank ruptures and fires from oxygen regulators.

- Always “crack” cylinder valves (open the valve just enough to allow gas to escape for a very short time) before attaching regulators in order to expel foreign matter from the outlet port of the valve.
- Always follow the regulator manufacturer’s instructions for attaching the regulator to an oxygen cylinder.
- Always use the sealing gasket specified by the regulator manufacturer.
- Always inspect the regulator and CGA 870 seal before attaching it to the valve to insure that the regulator and seal are in good condition and the regulator is equipped with only one integral metal and rubber seal that is in good condition. Avoid plastic seals.
- Tighten the T-handle firmly by hand, but do not use wrenches or other hand tools that may over-torque the handle.
- Open the post valve slowly, while maintaining a grip on the valve wrench so that it can be closed quickly if gas escapes at the juncture of the regulator and valve.



Figure 1 : Examples of crush gaskets available for CGA 870 type medical post valves.



Figure 2: Examples of some sealing washers available for CGA 870 Style medical post valves.

## **Reporting to FDA**

To report your experience regarding the devices in this Notification, please use MedWatch, the FDA's voluntary reporting program. You may submit reports to MedWatch by phone at 1-800-FDA-1088; by FAX at 1-800-FDA-0178; by mail to MedWatch, Food and Drug Administration, 5600 Fishers Lane, Rockville, MD 20857-9787; or online at <http://www.fda.gov/medwatch/report.htm>.

## **Getting More Information**

If you have questions about this notification, please contact the April Stubbs-Smith, Office of Surveillance and Biometrics (HFZ-510), 1350 Piccard Drive, Rockville, Maryland, 20850, by Fax at 301-594-2968, or by e-mail at [phann@cdrh.fda.gov](mailto:phann@cdrh.fda.gov). You may also leave a voicemail message at 301-594-0650 and we will return your call as soon as possible.

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Sincerely yours,

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