



Oxyfuel Safety: Check Valves and Flashback Arrestors

INTRODUCTION

Check Valves and Flashback Arrestors are safety devices for protecting workers using oxyfuel cutting and welding equipment. A check valve is a device that is designed to prevent the unintentional backflow of gases. A flashback (flame) arrestor is a device that prevents the propagation of a flame upstream. Note that these devices reduce the volume of gases available at the tip/nozzle.

NATURE OF THE HAZARD

Always be sure there is enough fuel in both cylinders to complete the operation before starting a job. Reverse flow of a gas generally happens when one cylinder goes empty during operation, creating an imbalance of pressure in the system. A clogged or blocked tip can also cause a backflow. An extremely hazardous situation can develop when oxygen and fuel gases are mixed inside the hoses. Reverse flow check valves alone will not stop a flashback in the system. When conducting oxy-fuel cutting and welding operations, operators can experience backfires or flashbacks.

A backfire is defined as the momentary recession of the flame into the torch, potentially causing a flashback or sustained backfire. It is usually signaled by a popping sound, after which the flame may either extinguish or reignite at the end

of the tip. The user hears a “pop” and the flame is extinguished. This can happen at high gas exit velocities at the nozzle/tip or if the nozzle/tip gets too close to the work piece. The flame may re-ignite automatically or the use of an igniter may be necessary. This is not normally a safety concern and, in fact, many manufacturers induce backfires during design and production tests to insure flame integrity of torches and tips.

A sustained backfire is defined as the recession of the flame into the torch body with continued burning characterized by an initial popping sound followed by a squealing or hissing sound, potentially burning through the torch body.

A flashback is defined as the recession of the flame through the torch and into the hose, regulator, and/or cylinder, potentially causing an explosion. This is a potentially hazardous situation, particularly if the flame reaches the hoses where an explosion can result causing a rupture or separation of the hose. A flashback is generally caused by the reverse flow of gases upstream into the hoses or other equipment. This reverse flow is usually the result of 1) improper shutdown and/or startup procedures or 2) by allowing cylinder pressures to become too low or 3) by a check valve that is not working properly.

As with any cutting or welding operation, workers need to be aware of their surroundings where work is performed. Always have approved fire extinguishers nearby and have all personnel trained in their proper use. Flashbacks can damage equipment and cause injury to nearby workers and equipment. Proper workplace precautions such as barriers and other protections should be utilized to minimize fire hazards and injury.

HOW TO AVOID THE HAZARD

- Equipment with integrated check valves and/or flashback arrestors is available.
- Check valves and/or flashback arrestors can be added to existing equipment. Properly maintained and operated systems are safe.
- Inspect the entire system before use, and repair or replace defective or damaged parts.
- Have only qualified people make any needed repairs.
- Be sure that there is enough gas in both cylinders to complete the job.
- Follow the manufacturers recommended procedures for proper start-up and shut-down of the equipment used.
- Don't allow the tip to touch the work.

SUMMARY

Flashback arrestors and check valves are not intended to replace proper practices for

safe operation. They can provide an increased level of protection in addition to the manufacturers recommended operating procedures. Check valves and flashback arrestors should be installed at the location specified by the manufacturer. Some manufacturers incorporate flashback arrestors and check valves with their torches.

INFORMATION SOURCES

American National Standards Institute (ANSI). *Safety in Welding, Cutting, and Allied Processes*, Z49.1, published by the American Welding Society, 8669 Doral Blvd., Doral, FL 33166; telephone 800-443-9353; web site: www.aws.org.

National Fire Protection Association (NFPA), *Standard for Fire Prevention During Welding, Cutting, and Other Hot Work*, NFPA 51B, published by the National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02269-9101; Phone: 617-770-3000; Web site: www.nfpa.org.

CGA TB-3, *Hose Line Flashback Arrestors*, Compressed Gas Association, Inc., 4221 Walney Road, 5th Floor, Chantilly, VA 20151; Phone 703-788-2700; Web site: www.cganet.com.

CGA E-5, *Torch Standard*, Compressed Gas Association, Inc., 4221 Walney Road, 5th Floor, Chantilly, VA 20151; Phone 703-788-2700; Web site: www.cganet.com.

CGA P1, *Safe Handling of Compressed Gases in Containers*, Compressed Gas Association, Inc., 4221 Walney Road, 5th Floor, Chantilly, VA 20151; Phone 703-788-2700; Web site: www.cganet.com.

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