

SAFETY BULLETIN

USE OF HIGH FLOW OXY-FUEL GAS AND AIR-FUEL GAS HEATING TORCH APPARATUS

Oxy-fuel and air-fuel gas heating torch apparatus can be used safely. However, *failure to follow basic safety precautions can result in personal injury, death, and property damage*. Following the DOs and DO NOTs in this publication can reduce the chance of a serious accident.

DO:

- DO carefully read and understand the manufacturer's operating instructions before using the equipment. If you do not have the instructions, obtain a copy from the manufacturer or your local distributor. Additional information on the safe operation of oxy-fuel and air-fuel gas apparatus is found in this bulletin;
- DO follow the manufacturer's operating instructions at all times. Contact the manufacturer if you do not understand any part of the instructions;
- DO wear gloves, goggles (use proper shaded lenses), a face shield, flame-resistant clothing with long sleeves, hearing protection, a cap or hard hat and face mask, and a respirator if appropriate. See ANSI/AWS Z49.1, *Safety in Welding, Cutting, and Allied Processes* [1];
- DO ensure the equipment is compatible with the gases prior to use. Using gases other than those recommended by the manufacturer could create a safety hazard.
- DO keep the equipment clean and in good working condition, ensuring that all gas passages are unobstructed. Obstructed passages cause overheating, backfiring, and flashbacks;
- DO obtain safety data sheets (SDS), which provide information about the fuel gas being used. Additional information such as flame temperature, burning speed (velocity), and heat produced ($\text{Btu}_{\text{IT}}/\text{ft}^3$ [J/m^3]) can be obtained from your local gas supplier;
- DO ensure adequate gas supplies are available before starting up. Obtain information about the withdrawal rate (ft^3 [m^3]/cylinder/hour), total volume (ft^3 [m^3]/hour), and minimum pressure (psi [kPa]) required at the heating torch inlets. When required, additional cylinders should be connected to a manifold to maintain the flow rate needed to properly operate the equipment. *Inadequate supply can cause backfire, sustained backfire, and/or flashback*;
- DO ensure that regulators; hoses; fittings; check valves and/or flashback arrestors (if used); and the torch handle are properly sized to provide adequate flow with minimum restriction to the heating tip. Contact the manufacturer or distributor if you need assistance in properly sizing the equipment;
- DO compensate for flow restrictions caused by upstream components such as small inside diameter hose, hose fittings, hose splices, control valves, check valves, or flashback arrestors. The manufacturer's pressures and volume specifications are required at the torch inlet;
- DO ensure that the work area is free of combustible materials. Examine material to be heated for possible hazards such as flammable parts, plastic, paint, or metal coated surfaces, oil, grease, chemical and solvent residue, insulation, and sealed chambers or containers. Unexpected fires, fumes, or explosions can occur;
- DO establish a maintenance schedule and inspect equipment carefully before each use. Leaks, obstructions, or damaged equipment will cause the equipment to malfunction;
- DO replace all faulty or damaged equipment before use to avoid operating problems and possible injury;

- DO contact your federal, state, provincial, territorial, or local authority regarding current regulations and codes;
- DO ensure that the workplace is ventilated to remove fumes and provide an adequate supply of breathable air to avoid ill effects and the possibility of asphyxiation. See ANSI/AWS Z49.1 [1]; and
- DO ensure that the proper fire extinguishing equipment is available and that you are familiar with its use. Provide a fire watch as recommended in ANSI/AWS Z49.1 [1].

DO NOT:

- DO NOT alter equipment from the manufacturer's original design;
- DO NOT attempt to operate heating apparatus if any parts are damaged including the regulators, tips, torch, mixer, O-rings, valves, hoses, check valves and/or flashback arrestors (if used). Fires, flashbacks, or explosions can be caused by using damaged equipment;
- DO NOT apply heat to closed containers such as cylinders, drums, vessels, cans, etc. Heated gas or liquid will expand, which can cause the container to explode. Explosions caused by heating closed containers have resulted in many fatalities.
- DO NOT heat materials that could contain pockets of trapped moisture (i.e., concrete, rocks). Heating these materials can cause them to explode.
- DO NOT enter an unventilated confined space without first ensuring that the oxygen concentration is at a safe level. Use an oxygen analyzer to measure the concentration. See 29 CFR Part 1910.146, CGA P-39, CGA SB-2, and ANSI/AWS Z49.1 for additional information [2, 3, 4, 1];
- DO NOT work in confined areas without an attendant. See 29 CFR Part 1910.146, for confined space entry requirements [2]. Oxy-fuel heating apparatus consumes large amounts of oxygen from ambient air and can quickly deplete the oxygen required to support life in confined areas. Failure to follow these requirements can result in death due to asphyxiation;
- DO NOT allow fuel gas cylinders to run empty. Always leave some pressure in the cylinders to prevent contamination. Low pressure or reduced flow can cause backfire or flashback in oxy-fuel heating apparatus;
- DO NOT empty an oxygen or air cylinder below 50 psi (345 kPa).¹ If the cylinder is allowed to become completely empty, it will lose its positive pressure, and fuel gas or other contamination can enter the cylinder creating hazardous situations (such as cylinder explosion);
- DO NOT use oil or grease to lubricate any components. Oil or grease can burn violently or explode when in contact with oxygen;
- DO NOT handle equipment with oily or greasy hands or gloves. Keep all oil and grease away from the area. Oil or grease can burn violently or explode when in contact with oxygen;
- DO NOT operate equipment below the recommended operating pressures at the torch inlet. If less heat is required, change to a smaller tip to avoid backfires and flashbacks;
- DO NOT allow heating torch apparatus to operate unattended. Without continuous supervision, unexpected backfires, flashbacks, or material fires can occur; and
- DO NOT wrap gas hoses around arms, legs, or any body part. Flashbacks and/or overpressurization can rupture hoses potentially causing severe injury.

¹ kPa shall indicate gauge pressure unless otherwise noted as (kPa, abs) for absolute pressure or (kPa, differential) for differential pressure. All kPa values are rounded off per CGA P-11, *Metric Practice Guide for the Compressed Gas Industry* [5].