



PRÉVENTEX WELDING, CUTTING AND THE OXYGAS PROCESS

Préventex

Association paritaire du textile

Volume 19, Number 2
July 2002

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Reference: Diane Bruneau,
Prevention Counsellor

Welding is not among the most frequent operations in our industry. The most widely used process for welding or cutting material is the “oxygas” technique, or gas welding with a torch combining oxygen and acetylene. Workers using this technique generally have welding experience but are not necessarily certified welders. Instead of playing with fire, it would be wise to take a few precautions.

MAIN HAZARDS

There are eight major types of hazards associated with the oxygas process. Six of these very significant risks apply to textile mills.

Gas and fumes

Molten metal releases metal molecules into the air that rapidly combine with oxygen to form metal oxides. The oxides in turn condense into fumes generally visible as a cloud surrounding the welding area. Other complex substances mix with the metal oxides following the combustion of residues on welded parts such as solvents, grease or other products. The cloud particles are very fine and can remain suspended in the air up to eight hours before settling.

Fire and explosion

Fire and explosion hazards related to welding and cutting have two main causes: use of combustible or flammable material near sources of heat, or fires involving pressure gas containers.

Fires generally result from the proximity of flammable or combustible material and a source of heat. Heat is generated by the following:

- ◆ **Flame and torch.**
- ◆ **Secondary flame from oxygas process.**
This is the flame produced at the pipe opening, which is invisible to workers wearing protective eyewear.
- ◆ **Flying molten metal particles and slag.**
The trajectory of molten metal is affected by gas pressure and the exact location of the work area: the higher the area, the wider the horizontal trajectory of hot metal particles and sparks.
- ◆ **Temperature of welded material.**
- ◆ **Combination of oxygen under pressure and grease or oil.** Contact between oxygen under pressure and grease or oil (pipe or relief valve joints) provokes a violent reaction that can cause temperatures to rise sufficiently high to ignite combustible material in proximity.
- ◆ **Flame or gas backfires in torch.**
Backfires can cause pipes or compressed gas containers to explode, releasing gases that can ignite fires or cause severe injury.

Radiation and sparks

The oxygas process does not present hazards related to radiation or arc welding and therefore welders are not exposed to eye flashes. Sparks and projected metal particles, however, can cause burns and lesions to the face and eyes.





The Préventex newsletter is published by
Préventex – Association paritaire du textile

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Legal deposit:
September 1st, 1994
ISSN 0825-4230
Printing: 2500 copies

PREVENTION METHODS

Four ways to protect against fumes and contaminants

Lowering the production of fumes and contaminants

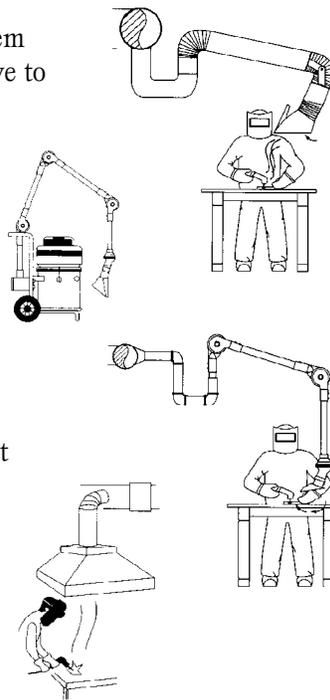
CSA Standard W117.2-94 (*“Safety in Welding, Cutting and Allied Processes”*), recommends taking the following precautions: metal should be scraped clean before welding, use of chlorine-based solvents should be avoided, and solvents should be allowed to dry completely in order to avoid the accumulation of residues. The procedure itself can also be modified.

Local or source suction

Section 107 of the Regulation respecting occupational health and safety requires that ventilation and extraction be provided where contaminants are released (dust, gas, fumes, steam or fog generated at permanent workstations).

Dilution of contaminants

The general ventilation system should only serve to dilute the low percentage of contaminants that is not evacuated by the system installed at source, and to renew oxygen. Where source treatment is not possible, the general ventilation system should be used to dilute a maximum level of contaminants.



Respiratory protection

Where no source treatment is possible, individual protection equipment should be used: filter masks (disposable, with cartridge or assisted ventilation) or air supply masks.

Heat source control

- ◆ Ensure that pipe extremities are clear and away from combustible material.
- ◆ Inspect welding area to detect any dormant fire hazard; maintain vigilance up to 30 minutes after work is completed.
- ◆ Never point the torch toward gas containers or other combustible material.
- ◆ Mark hot parts.
- ◆ Clean the tip of oxygen container or other combustible material with clean cloth.
- ◆ Use a striker, never a regular lighter or matches.
- ◆ Rest the torch on designated support and never on the gas container or the generator.

Combustible material control

- ◆ Make sure no combustible materials are within 15 meters of the welding area; otherwise, protect them with metal sheeting or screens.
- ◆ Check regulators, pipes and couplings for leaks with approved device.
- ◆ Take leaking gas containers outside.
- ◆ Provide approved fire extinguisher on location.
- ◆ Avoid storing welding or cutting accessories near oil or grease containers.
- ◆ Clean areas where dust accumulates every day.
- ◆ Cover floors made of combustible material with fireproof screen; alternatively, hose them or cover them with damp earth.

Prevention of flame and gas backfires

- ◆ Adjust gas pressure to make the speed inside the tip higher than the speed of flame projection.
- ◆ Drain pipes one by one before lighting the torch. If a bottle needs replacement, empty flexible pipes completely before lighting the torch again.
- ◆ Clear any metal debris from tip of torch.
- ◆ Once work is completed, close off the torch valves then the valves on each container. Open the torch valves to lower the pressure in pipes and close them off again. Unscrew the adjusting screw on the relief valves. Make sure the pressure

gauge indicates “0” and the bottle valve is closed.

- ◆ Use check valves to prevent gas and flame backfire. Install them near the torch handle on oxygen and combustible material conduits. Compensate for the loss of additional charge in conduits by increasing the gas pressure. If a high volume of oxygen is used, such as with large cutting tips, replace them with check valves on the relief valve.

Safety measures for pressure containers

Storage

- ◆ Check that all gas containers have a WHMIS label on delivery.
- ◆ Install an information sign with a no smoking warning where pressure gas containers are stored.
- ◆ Store containers in a well-ventilated area and restrict access to authorized personnel.
- ◆ Avoid storing containers in cupboards, lockers or near stairs, lifts, rolling bridges, freight elevators, halls and doors.
- ◆ Identify empty containers and store them away from full containers, with valve closed and protection cap in place. Return them to supplier without delay.
- ◆ Store containers away from oil or grease.

Temperature

- ◆ Do not expose containers to extreme temperatures. Bottles may explode at over 55°C.

Tying up and protection cap

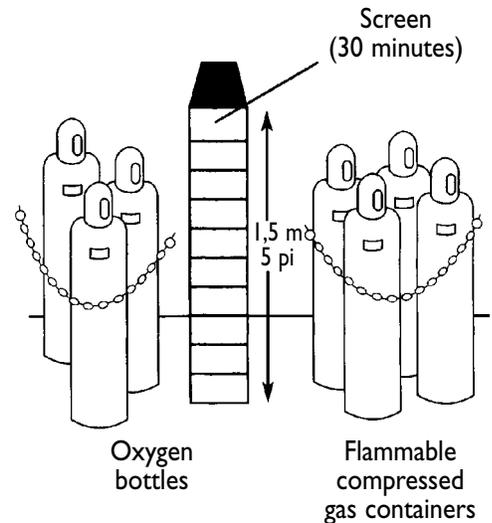
- ◆ Stand bottles upright and secure them with a chain to avoid tipping over. Close off valve and install protection cap.

Quantity

Apply sections of the National Fire Code (Canada 1995) relating to maximum quantities of stored gas in facilities.

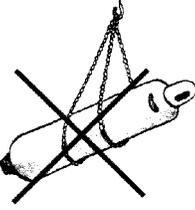
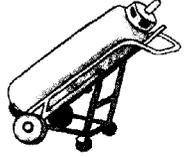
Distance or screen

Store gas containers at a minimum distance of 5 meters away from any flammable or combustible material, or place a screen at least 1.5 meter high designed to withstand fire for a minimum of 30 minutes.



Maintain a distance of 6 meters between oxygen bottles and containers of combustible gas, or install a screen. A distance of one meter is sufficient between propane containers and flammable compressed gas containers.

Handling and storage

- ◆ Make sure the valve is closed and the protection cap is on before moving the container. 
- ◆ Do not use the protection cap to lift the container. Use a trolley, or tip it over and roll it on its base. Never drag containers along the floor. 
- ◆ Use a lift or a platform to raise containers, never magnets or slings. 
- ◆ Never drop or clang bottles, especially acetylene containers.
- ◆ For transportation in a vehicle, stand bottles upright and tie them up, with valve closed and protection cap on.

- ◆ Place bottles equipped with relief valve in an upright position; secure them and close valves.

Use

- ◆ Use a clean relief valve appropriate to the bottle size and type of gas used. Make sure the cylinder is secured to the wall in an upright position or placed in a specially designed trolley.
- ◆ Keep the container away from the material being welded but close enough to be accessible in case you need to turn off the valve quickly.
- ◆ Never position yourself directly in front or behind the relief valve when turning on the valve. Never open the valve near an area where cutting or welding is done.
- ◆ Use only warm water to thaw out valves; never use boiling water or a flame.

Inspection of pipes and fittings

- ◆ Inspect pipes and fittings weekly. Replace defective pipes without delay (cracks, peeling material, etc.)
- ◆ Use the right type of pipes, appropriate to the intended use.
- ◆ Avoid tangled pipes and never use longer pipes than required.

Flanges

- ◆ Always use appropriate flanges to extend pipes.

Relief valves

- ◆ Inspect manual relief valves to detect damaged stripping and the presence of dust, residues, oil, grease or other flammable substances. Check that internal filter is clean and in place.

FIRE PERMIT

Before starting work

- ◆ Inspect location, identify all potential hazards and apply required protection measures. Note your observations in a “Fire Permit” register and ask workers to read and sign the register.
- ◆ Eliminate all flammable material from the work area.
- ◆ Cover objects that cannot be moved with fireproof material.
- ◆ Cover cracks, corners and receptacles on machines.
- ◆ Protect the floor if necessary.
- ◆ Identify the contents of recipients and piping.
- ◆ Drain recipients and piping containing flammable liquids; fill with water or inert gas.
- ◆ Use an explosion meter to ensure all explosion hazards have been removed.

While work is going on

- ◆ Wear flame-resistant clothing with no pockets or folds.
- ◆ Choose appropriate individual protective gear.
- ◆ Ask a colleague to supervise work and be ready to intervene if required (fire, fume emission, etc.)
- ◆ Check adjoining rooms for danger signs such as fires.

Once work is completed

- ◆ Carefully inspect location, overheated areas, work area and adjoining rooms.
- ◆ Evacuate cinders and incandescent debris.
- ◆ Maintain surveillance for several hours after work is completed.
- ◆ Wait until the next day to put flammable material back into place.

We are often asked whether welding certification is mandatory at all times. According to CSA Standard W117.2-94 (Safety in Welding, Cutting and Allied Processes), any person required to work with a welding device should receive appropriate training. However, training is not compulsory for maintenance workers.

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Note: This document is available at the Préventex document center, number MO-021674

Préventex wishes to thank Serge Simoneau, coordinator at ASPME, for its collaboration.