Hot Work & Welding Safety & Compliance Game Plan

Welding, cutting, soldering, and other allied processes, aka "hot work," bring together 2 dangerous things that should normally be kept very far apart:

- Flammable and combustible substances; and
- Heat, sparks, flame and other things that can cause those substances to ignite.

Too often, the end result of this potentially lethal combination is deadly fire and explosion. That's why OHS laws require employers who conduct hot work operations to take specific safety measures to safeguard their own workers from risk. Here's a 12-step Game Plan to manage hot work hazards and ensure compliance with OHS regulations.

Step 1. Ensure Hot Work Operations Meet CSA Standards

Most jurisdictions require employers to ensure that hot work operations are carried out in accordance with a specified version of CSA W117.2, *Safety in Welding, Cutting and Allied Processes*. The required version of the CSA standard, if any, varies by province:

CSA W117.02 Standard Versions Required for Hot Work Across Canada

None	CSA W117.2-94	CSA W117.2-01	CSA W117.2-06	CSA W117.2-12	Latest Version
FED, NWT, NU, ON, PEI, SK	BC, QC	YK	AB	MB, NB	NL, NS

Source: Bongarde

Step 2. Inspect Hot Work Area for & Isolate Flammable & Combustible Materials

Before hot work begins, have a competent person inspect the area to identify any combustible, flammable, and explosive materials, dusts, gases, liquids, or vapours that are present or likely to be present. Take measures to control any flammable or combustible substances you identify, which may include:

- Clearing or isolating the combustible, flammable, and explosive substances from the hot work area;
- Moving the hot work operation to a location free from combustible, flammable, and explosive substances;
- Scheduling the hot work for a time in which the combustible, flammable, and explosive substances won't be exposed to an ignition source; or
- Properly shielding the combustible, flammable, and explosive substances to ensure they don't ignite during hot work operations.

Step 3. Perform Any Required Atmospheric Testing in Hot Work Area

You're not allowed to carry out hot work operations in hazardous confined spaces or other locations where testing shows that the atmosphere contains:

- Oxygen at a concentration of 23% of more;
- A flammable substance in concentrations above a specific percentage of its lower explosive limit (LEL);
- Concentrations of harmful substances above their permissible occupational exposure level (OEL); or
- Concentrations of ignitable dusts above safe levels.

Accordingly, atmospheric testing must be performed both before hot work begins and at regular intervals while it's ongoing to guard against the buildup of hazardous conditions. Be sure the worker who performs the tests signs and completes a written record of the tests listing time, date, types of tests, and results.

Step 4. Ventilate Hot Work Area If Necessary

You may have to ventilate the air to protect workers against exposure to nitrous oxide, carbon dioxide, carbon monoxide, argon, chromium, and other hazardous substances contained in welding, soldering, and cutting fumes. OHS laws require use of local exhaust ventilation in areas or at work stations where hot work is performed. Typically comprised of a hood, fan, duct, and air cleaner, local exhaust ventilation systems should be designed to prevent hazardous fumes and gases from entering the worker's breathing zone.

Step 5. Thoroughly Clean Containers that May Have Contained Combustible Substances

Explosions can occur when hot work is performed on containers that previously held combustible substances. Accordingly, employers must ensure that no welding, cutting, or soldering is performed on any container, pipe, valve, or fitting connected to the container or pipe, that holds or may have held an explosive or flammable substance, unless and until it’s completely drained, cleaned, and ventilated by:

- Disconnecting and blocking off the inlet pipes or locking the valves in the closed position;
- Having an employee remove any residual liquid without going inside the container or pipe;
- If steam is available, closing all openings except the vent pipe and steam inlet and blowing steam into the container or pipe and any pipe, valve, or fitting connected to the container or pipe for a period of time suitable for the conditions and the nature of the explosive or flammable substance, with the lids and manhole plates opened during the last one-fifth time of the steaming period;
- If steam isn’t available, keeping the container or pipe and any pipe, valve, or fitting connected to it filled with running water for at least 24 hours;
- Thoroughly ventilating the container or pipe and any pipe, valve, or fitting connected to it after cleaning with forced or induced draft air for a minimum of 2 hours; and
- Having a competent person examine the interior of the container or pipe and any pipe, valve or fitting connected to it after ventilation to ensure that it’s free from residue and test air samples to ascertain that all explosive or flammable vapours have been removed.

Step 6. Establish Safe Work Procedures for Carrying Out Hot Work Operations

Develop and require workers to follow written safe work procedures for each kind of welding, cutting, or soldering operation you carry out at your workplace, including:

- Hot work performed inside confined spaces;
- Hot work on containers that may hold or previously held a combustible substance;
- Gas welding;
- Electric welding;
- Arc welding; and
- Welding from vehicles.

You should also establish general safety rules for hot work such as:

- A ban on leaving welding equipment unattended unless proper safety measures are taken, such as removal of the electrodes from an electric welding machine;
- Banning workers from laying down a welding or cutting torch until the gases are completely shut off and hanging a welding or cutting torch or other equipment so as to come in contact with a gas cylinder;
- Banning workers from wearing loose, ragged, or oil-soaked clothing while performing or working near hot work operations;
- A requirement that workers remove any coating on metal that could emit harmful contaminants before performing hot work on it;
- Obligating workers to use all required PPE, protective clothing, and safety equipment;
- Requiring workers to keep passageways, ladders, and stairs clear of hoses, cables, and other hot work

equipment;
- Requiring use of glass-fibre blankets or fire-retardant welding tarpaulins to guard against the risk of falling sparks and slag;
- Requiring steps to be taken to protect any workers below the operation from sparks, debris, and other falling hazards where hot work is performed above an area where other workers may be present; and
- Requiring recently welded or flame cut work to be marked 'HOT' to warn other workers.

Your procedures should also incorporate the manufacturer's instructions for each item of equipment you use.

Step 7. Properly Inspect Hot Work Equipment

Require workers who carry out hot work to inspect their equipment before each use to ensure that the item and all of its safety features, such as devices designed to prevent flashback or reverse gas flow, work properly and are free from leaks, oil, grease, or other defects. Workers should report any problems they find to their supervisor and not use the equipment. Immediately remove defective equipment from service and don't use it again until it's properly repaired.

Step 8. Consider Implementing a Hot Work Permit System

Although required only in one province—Alberta—you might want to establish a permit system for hot work. As with confined space entry, requiring a hot work permit ensures that all necessary safety measures are taken out before the operation can begin. Specifically, ban hot work unless and until a written permit is issued listing:

- The nature of the hazard;
- The type and frequency of atmospheric testing required;
- The safe work procedures and precautionary measures to be taken; and
- The required PPE and protective equipment.

Step 9. Require Workers to Use Proper PPE for Hot Work

Ensure workers who carry out or work near hot work operations to use appropriate PPE, including:

- Respirators that are an approved type and suitable for use when welding, soldering, or cutting when atmospheric testing determines that workers are exposed to respiratory hazards;
- Safety glasses, face shields, and other eye and face protection guarding against harmful radiation, molten metal, and flying particles;
- Head protection to guard against falling debris and sparks;
- Hand protection, including fire retardant gauntlet type gloves and arm protection;
- Aprons made of leather or other fire retardant material offering equivalent protection to protect the torso and limbs; and
- Compliant safety boots and foot protection.

Step 10. Require Workers to Use Wear Fire Retardant Clothing for Hot Work

In addition to PPE, workers exposed to hot work hazards must also wear fire retardant clothing. Work clothing made of polyester, acetate, nylon, acrylic, or polypropylene fibres,

or mixtures of these fabrics with wool or cotton **don't** meet OHS requirements for flame retardant clothing, unless they're specifically manufactured as flame resistant. That's because those materials aren't flame resistant and will melt while burning, causing deep and extensive burns to the skin. Workers should also avoid clothing made of laminated fabric containing polyurethane sponge as it may readily ignite and burn.

Step 11. Furnish & Require Use of Other Protective Equipment for Hot Work

Employers must ensure that workers use other appropriate fire equipment and other protective equipment for hot work, which may include:

- Fire extinguishers of a suitable type and capacity that are immediately available in well-marked locations known to workers where welding or cutting is done;
- Screens, curtains, or partitions made of or treated with a flame resistant material or coating, and having a non-reflective surface finish near arc welding operations to protect workers from arc flash radiation; and
- When used for support during welding, cutting, burning, or soldering operations, tables, jigs or work benches that are made of fire resistant materials.

Step 12. Ensure Workers Are Properly Trained to Perform Hot Work

Don't require or permit workers to carry out any hot work unless they have the necessary training to perform the operation safely. At a minimum, such training should cover:

- Your hot work safety policies and safe work procedures;
- The OHS requirements for the particular hot work operation in your jurisdiction;
- The selection, use, and maintenance of hot work equipment;
- How to inspect the equipment and what to do if they detect leaks or defects in the equipment;
- Selection and use of appropriate PPE and clothing for the particular hot work operation; and
- Protections for other workers who work near or whose health and safety may be affected by hot work.