

Safety in Welding and Cutting

There are several sources of standards and guidelines to follow when welding and cutting. Wherever possible, follow all the appropriate standards including: ANSI, AWS, OSHA, NEMA, and others. Become trained on the equipment you will be using, and read the owner's manual before using any piece of welding or cutting equipment.

Protective booths or screens should be set up and workers should wear the proper protective clothing, including respiratory protection and ear plugs, especially if they are working out-of-position. The ANSI Z49.1-2012 Standard provides detailed information and guidance regarding ensuring the safety of personnel and property during welding processes.

To obtain a copy of the ANSI Z49.1-2012 Standard, visit: https://pubs.aws.org/content/free_downloads/AWS_Z49.1_SAFETY_IN_WELDING_AND_CUTTING_AND_ALLIED_PROCESSES.pdf.

Fire Hazard Considerations

Any process in which molten metal is spewing about obviously presents hazards. Particular attention should be paid to possible fire hazards, and flammable materials should be removed from the work area. Welding should preferably be done in specially designated areas which have been designed and constructed to minimize fire risks. Good housekeeping should be maintained. For more information, refer to the section on Fire Prevention section of the ANSI Z49.1-2012 Standard, Section 6.

Curtains, Blankets and Pads | Protecting Your Work Area

Welding Curtains: For use in vertical applications with light to moderate exposure to sparks and heat from chipping, grinding, heat-treating, sand blasting and light

horizontal welding. Designed to prevent sparks from escaping the designated work area.

Welding Blankets: For use in horizontal applications with light to moderate exposure to sparks, heat and molten slag. Designed to protect machinery and prevent the ignition of combustibles located in the designated work area.

Welding Pads: For use in horizontal applications with severe exposure to molten substances or heavy horizontal welding. Designed to prevent the ignition of combustibles located adjacent to the underside of the pad.

For more information regarding the protection of personnel and the general area, please refer to ANSI Z49.1-2012, Safety in Welding, Cutting and Allied Processes, Section 4, 4.1.3.

Electrical Shock Considerations

Be aware that electricity will always take the path of least resistance. Check for poor connections (damaged connections can lead to shocks). Stand on a dry surface (wet conditions can lead to shocks). Keep your clothing dry as well. The use of a voltage detector (light stick) is recommended.

Arc Ray Safety

Ultraviolet rays can cause a severe skin burn that is similar to sunburn. Any exposed skin can be burned very quickly. NEVER look at the arc – it can cause temporary irritation or a feeling that something foreign is in the eyes, or in more severe cases, pain, redness, photophobia and blurring of vision.

Ventilation Considerations

Fumes and gases from welding and cutting cannot be classified simply. The composition and quantity of fumes and gases are dependent upon the metal being worked, the process and consumables being used,

coatings on the work such as paint, galvanizing, or plating, contaminants in the atmosphere such as halogenated hydrocarbon vapors from cleaning and degreasing activities, as well as the factors for adequate ventilation.

A good practice to reduce the generation of fumes and gases from paints and primers is to grind or sand the surface to bare metal prior to welding. Note, however, that the method of removal may generate particulates that require worker protection.

In welding and cutting, the composition of the fumes is usually different from just the composition of the electrode or consumables. Reasonably expected fume products of normal operation include those originating from consumables, base metals and coating, and the present atmospheric contaminants. Gaseous products can include carbon monoxide, carbon dioxide, fluorides, nitrogen oxides and ozone. Please see the entire section on Ventilation of the ANSI Z49.1-2012 Standard for more information.

Source: ANSI Z49.1-2012, Safety in Welding, Cutting and Allied Processes, Section 5, 5.1.1-5

Safe Handling of Cylinders

- Cylinders contain gas under high pressure. Special care is to be taken when storing, handling and using cylinders.
- Whenever a cylinder is moved, be sure the protective cap is in place. When stored, securely fasten all cylinders so they cannot be knocked over.
- Do not store or use cylinders in a horizontal position, and do not hang any equipment or cables on cylinders.

See ANSI Z49.1-2012, Section 8.6 for more information about the safe handling of cylinders.

Safe Operating Practices for Depressed Center and Cut-Off Wheels

Safe operating practices must be part of every grinding wheel user's operation. The greatest efficiency and lowest overall abrasive cost can be realized only if proven care and use techniques become standard practice.

Do

- Be sure to read any safety material/guidelines provided with the abrasive product.
- Check all wheels for cracks or damage before use.
- Ensure the mounting flanges, back plate or adapter supplied by the machine manufacturer are used and kept in good condition. ANSI Safety Requirement B7.1 provides wheel mounting requirements. Check mounting flanges for equal and correct diameter and use blotters when supplied.
- Ensure the correct wheel guard is in place before starting the wheel. Always use the guard furnished with the machine.
- Before mounting the wheel, use a tachometer to measure the spindle speed.
- Check machine speed against established safe operating speed marked on the wheel. The following formula may be used to calculate wheel speed: $SFPM = \text{Spindle Speed in RPM} \times \text{Wheel Diameter in inches} \times 0.262$.
- Always mount, true and dress the wheel in conformance with the guidelines published in the ANSI Safety Requirements B7.1.
- Allow the wheel to come up to full operating speed for a minimum of one minute before starting to grind and stand out of the plane of rotation.
- When not using the wheel, store the wheel in its original packing materials. This protects the wheel from chips and cracking, as well as provides easy identification of the wheel.

Don't

- Don't use wheels that have been dropped or otherwise damaged.
- Don't use heavy side pressure on any thin Type 1 straight wheel or Type 27 depressed center wheels.
- Never use a grinding wheel with a rated speed less than that of the grinder.
- Never exceed the maximum operating speed marked on the wheel being used.
- Never use a high speed air sander as a portable grinder.

For more information on product safety, ask your Airgas Representative for these publications:

- ANSI B7.1: Safety Requirements for the Use, Care and Protection of Abrasive Wheels
- Federal Hazard Communication Standard 29 CFR 1910.95, 1910.132, 1910.133, 1910.134, 1910.138 and 1910.1200
- Safety Data Sheets
- Other applicable regulations

A Deadly Equation: Pistol Grip Air Sander + Grinding Wheel = Certain Injury!

- Never use a high speed air sander as a portable grinder.
- Use only sanding discs specifically designed for sanders.
- Because the speed of these sanders far exceeds the maximum rated speeds for grinding wheels, a potentially lethal wheel breakage may occur.



Flap Disc Safety

- Store abrasive flap discs at the recommended 40–50% relative humidity and 60°–80° F (15°–29° C).

- Rotate stock. Use flap discs on a first in, first out basis.
- Store flap discs in their original containers and away from water or other fluids.
- Check all flap discs for damage to the flaps and backing plate.
- Select a flap disc suitable for your application.
- Disconnect the tool from power supply before changing a flap disc.
- Match flap disc size with grinder/sander (e.g. 7" flap disc for a 7" grinder/sander).
- Check machine speed against established safe operating speed marked on the flap disc. Never exceed the rated speed of a flap disc.
- Wear proper personal protection such as ANSI-approved, impact-resistant eye and face protection, arm guards, apron, gloves, safety shoes, hearing protection, etc. The use of a respirator is required where harmful materials may be produced by the operation, such as wood dust, toxic metal particles, etc.
- Test run your flap disc in an enclosed area such as a barrel at operating speed for one full minute before using it.
- Use a work piece fixture when grinding or sanding small work pieces that may be thrown during the grinding or sanding operation.
- Use flap discs at the proper angle. Type 27 flap discs should be used at a 0°–15° angle and Type 29 flap discs should be used at a 15°–25° angle to the work piece.
- Don't use on pistol grip air sanders or any other improper tool.
- Don't allow the flap disc to "load up" with the material you are abrading.
- Comply with ANSI B7.7, OSHA, and all safety materials provided with the flap discs, machines, and the tools.

Source: Norton Abrasives

Power Wire Brush Safety

- Store brushes in their original containers in a clean, dry location.
- Inspect wire brushes for damage, rust and deterioration before using.
- Check the speed of the brush and the tool. Use only brushes with speeds rated at or above the tool's rated speed.
- Inspect tools for worn spindle bearings, bent spindle, proper spindle size, or any unusual conditions. Maintain your tools as if your safety depends on it.
- Select brushes carefully for your application. The incorrect brush will not work effectively and can become dangerous.
- Mount brushes properly using the tool's mounting instructions.
- Wear proper personal protection such as eye and face protection, apron, gloves, safety shoes, etc.
- Wear government-approved respiratory protection (when required).
- Run brush in protected area for one minute before using. Avoid standing in front of or in-line with the brush during the one-minute start-up test.
- Inspect rotating brushes for flutter or vibration, as this could be an indication of a poorly installed brush, damaged tool, or damaged brush.
- Always use properly adjusted wheel guards furnished with machine.
- Avoid excessive pressure when using a brush. Excessive pressure causes over-bending of the filaments and heat build-up resulting in filament breakage, rapid dulling and reduced brush life.
- Don't create a fire hazard – shield any nearby flammable materials to prevent ignition from the spark stream (shower) or from latent sparks.
- Comply with ANSI B165.1, OSHA and all safety materials provided with the brushes and the tools.

Source: Norton Abrasives