

North Dakota State University

Welding & Cutting

I. Introduction

NDSU employees are continually exposed to construction projects in various stages. Each project brings unique challenges and duties to staff. By outlining and following the recommended safe operating procedures, we learn to prevent injury and safeguard ourselves and coworkers against a job related injury or death.

II. Purpose

To reduce the risk of work related injury or death by maximizing personal safety during construction and mechanical operations.

III. Goals

To ensure all employees know and understand the safe operating procedures involved with construction and mechanical operations.

IV. Procedures

A. General Safety - Safe Operation

1. The operator must be properly trained and instructed by an experienced welder.
2. Cutting or welding shall be permitted only in areas that are or have been made fire safe.
3. Personal protective equipment is mandatory - this is to include, but is not limited to, the following:
 - a. Maximum eye protection is necessary - this includes, but is not limited to, goggles with side shields and a welding shield or helmet
 - b. Wool or flame resistant coveralls, welding gloves and apron to protect skin from radiation burns, electric shock or fire.
 - c. Shoes or boots with rubber soles, steel-cap toes, and high tops.
 - d. Avoid clothing with cuffs or pockets that can trap hot metal.
4. Rubber mats or wooden platforms provide extra protection during electric welding and cutting.
5. Ensure all equipment used is maintained in a safe condition.
6. Identify and report defective or dangerous equipment so that it can be repaired.
7. Work in a well lit and adequately ventilated location.
8. Maintain a high standard of housekeeping.
9. Ensure any unsafe condition is made safe before working.
10. DO NOT enter dangerous areas - those that are highly flammable or toxic.
11. Do not use welding cables at currents in excess of their rated capacity.
12. Never strike an arc in the presence of other people whose eyes are not shielded.
13. Do not strike an arc on a compressed gas cylinder.

14. Do not weld on containers that are near combustibles or were used to hold combustible or flammable material - purge the containers first.
15. Do not pick up objects marked "HOT" without testing.
16. Keep flying sparks, hot slag, hot objects and open flames away from hoses.
17. Do not use matches for lighting torches. Use suitable friction lighters, stationary pilot flames or some other source of ignition. Do not light torches from hot work when in a small or confined space.
18. Do not move individual cylinders without a cap over the cylinder valve.
19. Be sure all individual cylinders are secure so they don't tip or fall.
20. Do not use a hammer or wrench to force open a cylinder valve. If the valve cannot be opened by hand, notify a supervisor.

NEVER ATTEMPT TO REPAIR CYLINDER VALVES

21. Do not use regulators or cylinder valves as hooks for hanging torches and hoses.
22. Always protect hoses from being stepped on or run over - a connection may be ripped, or the equipment may be pulled over. Avoid tangles and kinks.
23. Be very careful when the unit or surrounding area is wet or damp - it can cause a serious electrical shock or possible death.
24. When welding or cutting is to be discontinued for some time, close the cylinder valves first and then release gas pressure from the regulators by opening the torch valves until flow stops. Next, release the pressure adjusting screw and then close the torch valves. If the equipment is to be dismantled or repaired, follow the same procedure.

FIRE EXTINGUISHING EQUIPMENT SHALL BE MAINTAINED IN A STATE OF READINESS FOR INSTANT USE.

B. Electric Arc Welding

IN CASE OF FIRE DO NOT THROW WATER ON ANY ELECTRICAL DEVICE. DISCONNECT AC POWER AND USE A FOAM EXTINGUISHER OR SAND TO SMOTHER THE FLAME.

1. Never force connections which do not fit easily.
2. Assure that the electrode holder is fully insulated and the welding cables are free of worn or frayed insulation.
3. See that the ground terminal lug is connected through the input cable or by separate conductor to the power system ground. An ungrounded machine can cause death by electrocution.
4. Do not reposition the voltage bars while power source is connected to the machine. To do so could cause a serious electrical shock and possible death.
5. Turn off the POWER switch and disconnect the power before opening the welder cabinet.
6. Do not make or break any connections or perform any maintenance while the welding machine is in operation. The high voltage created by this machine can cause death by electrocution.

7. Keep connections tight between the regulators, adaptors and cylinder valves. Test for leaks with soapy water, never with an open flame.
8. Do not try to relight a torch that has “blown” out without first closing both torch valves. Relight in the usual manner.
9. Do not use regulators or cylinder valves as hooks for hanging torches and hoses.
10. When flame cutting, direct the torch so that sparks, hot metal or the severed section will not fall on the cylinder hose, your legs, or feet. Direct the flame away from the cylinders.
11. When someone receives an electric shock and “locks on” to a live component, the power must be switched off before the patient is handled. Apply first aid and seek medical advice.

C. Oxyacetylene welding

1. Acetylene

- a. Refer to acetylene by its correct name “acetylene” and not by the word gas.
- b. Maintain all cylinders in an upright position when in use and during storage. See *NDSU Safe Operating Procedure – Compressed Gas Cylinders* for more guidelines to properly handle cylinders.
- c. Avoid using sparks, flames, and heat near acetylene cylinders.
- d. Never use acetylene directly from cylinders without reducing the pressure through a suitable regulator connected to the cylinder valve.
- e. Turn the acetylene cylinder so that the valve outlet points away from the oxygen cylinder.
- f. When opening an acetylene cylinder turn the key 1/4 turn.
- g. The acetylene cylinder key for opening the cylinder valve must remain on the valve stem while cylinder is in use so that the acetylene cylinder can be turned off quickly in an emergency.
- h. Acetylene apparatus - such as regulators, hose or other pieces should never be used for oxygen.
- i. Never transfer acetylene from one cylinder to another, nor refill an acetylene cylinder, nor mix any other gas in an acetylene cylinder.
- j. Should a leak occur in an acetylene cylinder, move it into the open air, keeping it well away from fires, open lights or other sources of ignition. Notify your supervisor and the manufacturer immediately.
- k. Never use acetylene at pressures above 15psi. The use of pressures higher than 15psi is dangerous because the acetylene is unstable at such levels and will be inclined to separate violently.
- l. Flashbacks can result if improper adjustment is done on the torch valves.
- m. Keep all valves properly adjusted, use correct pressures, and keep

the tip outlet clean and free of obstruction.

- n. Remove regulators before moving cylinders. When empty, replace cap over cylinder valve and mark the cylinder "MT".

2. Oxygen

- a. Remember that oxygen gas is a major fire and explosion hazard. Oxygen supports combustion - DO NOT use oxygen near flammable materials such as grease or oil.
- b. Always refer to oxygen as "oxygen" and not by the word "air".
- c. Do not use oxygen to refresh air.
- d. Do not use oxygen as a substitute for compressed air.
- e. Do not use oxygen or compressed air to dust off clothes.
- f. Never store oxygen and acetylene cylinders together. They must be kept separated. See *NDSU Safe Operating Procedure – Compressed Gas Cylinders* for more guidelines to properly handle cylinders.
- g. Never allow oil or other readily oxidizable material to come in contact with oxygen cylinders, valves, regulators, hoses, or fittings. Oxygen in contact with oil, grease, other hydrocarbons and oil-based substances can cause spontaneous ignition and explosion.
- h. Apparatus' used for oxygen (regulators, hoses or other pieces) should never be used with any other gas.
- i. Oxygen cylinder valves should be fully open when in use.
- j. Never mix gases in an oxygen cylinder.
- k. Be sure that the cylinder valve is tightly closed before handling the cylinder.
- l. Never use oxygen directly from the cylinders without a suitable regulator attached to the cylinder valve.
- m. Do not leave torches or hoses which are connected to the supply within confined space.
- n. Do not cut or weld drums with a hazard diamond on the label.
- o. Do not use drums as a welding or cutting platform. Never oxy-cut or weld near empty drums.
- p. Do not use PVC piping to carry compressed air to various parts of your workshop or beyond.

V. TRAINING

The department supervisor is responsible for providing training to their employees, on a regular basis, to enable them to recognize and prevent hazards associated with welding and cutting.