# An Approach to Best Welding Practice : Part – X

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**"AN APPROACH TO BEST WELDING PRACTICE, Part – X"** is the Tenth Detail Part of **"AN APPROACH TO BEST WELDING PRACTICE"** which was written as a General and Overall approach to the subject matter.

**AN APPROACH TO BEST WELDING PRACTICE. Part – X** is particularly focused on the Safety Aspects especially on the issues of Fire and Explosion hazards for Fusion Welding Processes to obtain the best possible Accident free shop floor operation.

This is a Working Guideline for Supervisors and Operators working in an Engineering Fabrication Plant using welding as the main manufacturing process to initiate awareness for observing Safety Rules and regulations.

## SAFETY

- Safety has been defined in many ways and in different formats.
- Safety means protection and freedom from Hazards.
- Safety means keeping away from danger.
- Safety means systematically tackling dangerous and hazardous situations.

In general, dangers and hazards are caused by :

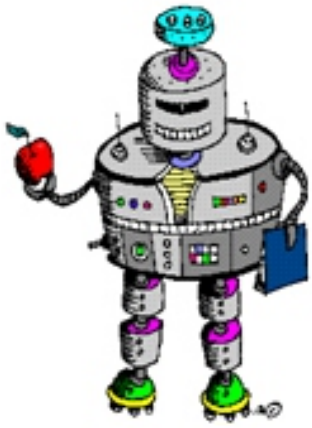
- Tools and Tackles
- Manufacturing Process
- Machineries and Plants
- Human errors

Every manufacturing factory using machineries and equipment impose Hazards which are to be mitigated by all concerned. In order to make the working environment as much safe as possible we must understand, evaluate and mitigate dangers and hazards arising out of the process and associated tools, plant and equipment. At the same time we must formulate the safety rules to follow.

## HAZARDS OF WELDING

- Fire and Explosion hazards
- Electric shock
- Radiation from Arc
- Work-Related Musculoskeletal Disorders






## FIRE AND EXPLOSION

### Fire and Explosion Hazards

- Intense heat and sparks can cause fires or explosions if in the vicinity of combustible or flammable materials. Heat from flames and arcs can start fires. Hot slag or sparks can also cause fires and explosion.
- Welding and cutting should be performed in areas free of combustible materials such as trash, wood, paper, textiles, plastics, chemicals, and flammable dusts, liquids and gases. All combustible materials must be removed well away from the work area. All such materials may also be covered with a protective nonflammable covering.
- Hot sparks or hot metal can fall through cracks or crevices in floors or wall openings and cause a hidden smoldering fire or fires on the floor below. Such openings should be protected from hot sparks and metal.
- Welding, cutting or other hot working to be performed only when the work piece has been completely cleaned so that there are no substances on the work piece which might produce flammable or toxic vapors.
- Welding or cutting must not be done on containers that have held a flammable or combustible material unless the container is thoroughly cleaned or filled with an inert gas
- Use of equipment beyond its ratings must be restricted. For example, overloaded welding cable can overheat and create a fire hazard.
- Fire extinguishers of proper size, type and number for the hazards involved must be placed in stands near the weld site. Fire extinguishing equipment handy for instant use, such as a garden hose, water pail, sand bucket, or portable fire extinguisher are of great help in case of an emergency.
- A fire inspection should be performed prior to leaving a work area and for at least 30 minutes after the operation is completed. After completing operations, inspect the work area to make certain there are no hot sparks or hot metal which could cause a later fire. Use fire watchers when necessary.
- Fire Watch lasting at least 30 min after welding or cutting operations is required if more than a minor fire might develop and if certain combustible materials are present.
- Authorization: A responsible individual must inspect the area and designate precautions, preferably by written permit.
- Floors: Combustible materials must be swept 35 feet away; combustible floors must be wetted or protected (while preventing arc welding shock).

### Prohibited areas for welding:

- Unauthorized by management
- Where sprinklers are impaired
- Explosive atmospheres
- Near storage of large quantities of readily ignitable materials

### Relocation of Combustibles

- Combustibles shall be moved 35 feet away or properly protected or shielded.
- Ducts: Ducts & conveyor systems that might carry sparks must be shut down.
- Combustible walls must be shielded or guarded.
- Noncombustible walls, partitions or ceilings (when welded) require opposite-side moving of combustibles or a fire watch.
- Combustible cover: No welding on certain metal building components having combustible covers or layers.
- Pipes (or any metal) close enough to combustibles to cause ignition by conduction may not be cut or welded.

- **Management responsibilities:**
- Establish proper areas and procedures
- Designate responsible individual
- Ensure training
- Advise contractors of hazards

- **Supervisor responsibilities:**
- Safety of equipment & procedures
- Determine combustibles & hazardous areas
- Protect combustibles from ignition through moving, shielding and scheduling
- Secure authorizations
- Give go-ahead to cutter or welder
- Ensure fire protection
- Ensure fire watches if required

- **General Requirements**
- Used containers must be cleaned of flammable materials or other materials that could release toxic of flammable vapors when heated.
- Venting & purging is required for hollow spaces or cavities.
- Railing or other suitable fall protection must be provided as required.
- Welding cable and other equipment must be kept clear of passageways, ladders and stairways.
- Flammable mixtures of fuel gases and air or oxygen must be guarded against.

- Maximum pressures of 15 psi for acetylene must be observed (with certain rare exceptions).
- Approved apparatus.
- Competent personnel in charge of supply equipment

❖ **CYLINDER HANDLING**

- Cylinders, if mishandled, can rupture and violently release gas. Sudden rupture of cylinder, valve, or relief device can injure or kill. Therefore:
- Use the proper gas for the process and use the proper pressure reducing regulator designed to operate from the compressed gas cylinder. Do not use adaptors. Maintain hoses and fittings in good condition. Follow manufacturer's operating instructions for mounting regulator to a compressed gas cylinder.
- Always secure cylinders in an upright position by chain or strap to suitable hand trucks, undercarriages, benches, walls, post, or racks. Never secure cylinders to work tables or fixtures where they may become part of an electrical circuit.
- When not in use, keep cylinder valves closed. Have valve protection cap in place if regulator is not connected. Secure and move cylinders by using suitable hand trucks. Avoid rough handling of cylinders.
- ❖ Locate cylinders away from heat, sparks, and flames. Never strike an arc on a cylinder.

**CYLINDERS & CONTAINERS**

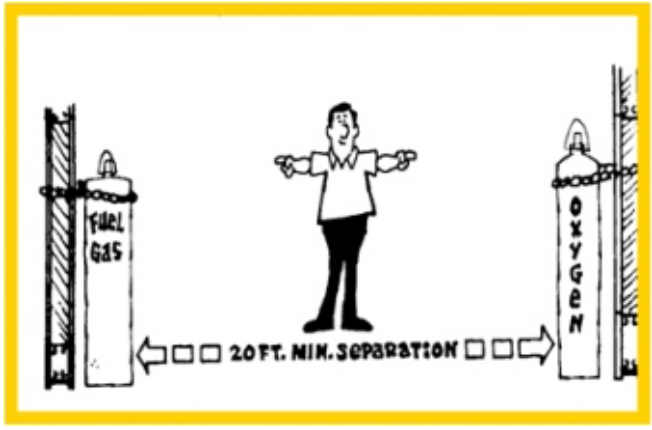
**Approval & Marking:**

- DOT compliant
- Legibly marked
- ANSI compliant connections
- Valve protection
- Away from heat sources (such as radiators)

**When inside buildings:**

- Well-protected, ventilated, dry location at least 20 ft from combustibles
- Assigned storage spaces, protected from damage & tampering
- When empty: closed valves
- When not in use: hand-tight valve protection caps


- Protect oxygen cylinders from fire hazards such as acetylene:



- Distance: ≥ 20 ft from fuel-gas cylinders or combustibles, or
- Barrier: ≥ 5 ft high noncombustible partition with half-hour fire-resistance rating
- Cylinders, cylinder valves, couplings, regulators, hose, and apparatus kept free from oily or greasy substances
- Oxygen cylinders shall not be handled with oily hands or gloves
- A jet of oxygen must never be permitted to strike an oily surface, greasy clothes, or enter a fuel oil or other storage tank

❖ **When transporting cylinders by a crane:**

- Use a cradle or suitable platform
- Never use slings or electric magnets
- Valve-protection caps always in place

- Never use valve-protection caps to lift cylinders from one vertical position to another
- Never use bars under valves or valve-protection caps to pry cylinders loose may use warm (not boiling) water

❖ **Before cylinders are moved:**

- Regulators shall be removed
- Valve-protection caps, when provided for, shall be put in place
- Unless cylinders are secured on a special truck

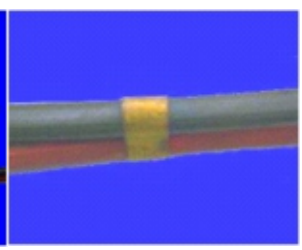
- Cylinders without fixed hand wheels shall have keys, handles, or non-adjustable wrenches on valve stems while cylinders are in service
- Fuel-gas cylinders shall be placed with valve end up whenever they are in use
- Liquefied gases shall be stored and shipped with the valve end up

❖ **Before connecting a regulator to a cylinder valve:**

- Open the valve slightly; close immediately
- Open the valve while standing to one side of the outlet; never in front of it
- Never crack a fuel-gas cylinder valve near other welding work or near sparks, flame, or other possible sources of ignition
- Always open the cylinder valve slowly
- Never open an acetylene cylinder valve more than 1.5 turns of the spindle, and referably no more than 3/4 of a turn

❖ Replace hose with leaks, burns, worn places, defects

❖ When parallel lengths of oxygen and fuel hose are taped together, not more than 4 of 12 inches covered by tape



❖ **Check**

- How long must a fire watch continue?

  At least 30 minutes

- How far away must combustible materials be kept from welding?

  A radius of 35 feet

- Who is responsible for making fire watchers available?

  Supervisor.

- During work in confined spaces, what must be left outside?

  Gas cylinders & welding machines.

❖ Wear flameproof gauntlet type gloves, heavy long-sleeve shirt, cuffless trousers, high-topped shoes, and a welding helmet or cap for hair protection, to protect against arc rays and hot sparks or hot metal. A flameproof apron may also be desirable as protection against radiated heat and sparks.

❖ Hot sparks or metal can lodge in rolled up sleeves, trouser cuffs, or pockets. Sleeves and collars should be kept buttoned, and open pockets eliminated from the front of clothing.

❖ Protect other personnel from arc rays and hot sparks with a suitable non flammable partition or curtains.

❖ Use goggles over safety glasses when chipping slag or grinding. Chipped slag may be hot and can fly far. Bystanders should also wear goggles over safety glasses.


**Examples & Diagnosis : What is wrong ? Which is right ?**


A _____
B _____
C _____
D _____
E _____
F _____
G _____
H _____

**CONCLUSION**

A burn injury in the size of a PALM only can be fatal. By all means Fire and Explosions must be avoided in all working areas. Apart from making the working area safe it is again a management responsibility to train the workmen in Fire Drills for making them safety conscious.