

WELDING EXPOSURES

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WELDING, CUTTING AND BRAZING

An estimated 562,000 employees are at risk for exposure to chemical and physical hazards of welding, cutting and brazing. For the construction industry, welders flash (burns to the eyes) accounts for 5.6% of all construction eye injuries. Fifty-eight deaths from welding and cutting incidents, including explosions, electrocutions, asphyxiation, falls and crushing injuries were reported by the Bureau of Labor Statistics in 1993.

HEALTH HAZARDS

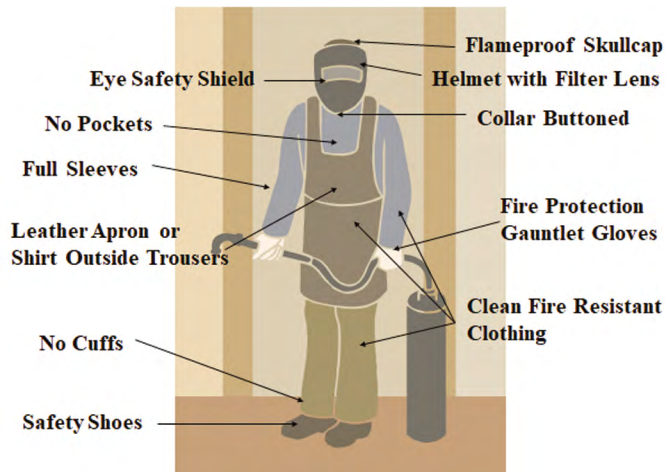
There are numerous health hazards associated with exposure to fumes, gases and ionizing radiation formed or released during welding, cutting and brazing, including:

- Heavy metal poisoning
- Lung cancer
- Metal fume fever (symptoms include respiratory disturbances, infection – influenza, fever – acute bronchitis, pneumonia, chills, shivering, trembling nausea, vomiting).
- Flash burns

PROTECTIVE CLOTHING AND EQUIPMENT

Welders should consider using appropriate clothing this should include:

- Shield or helmet with a properly selected filtered lens.
- Fire resistant gloves & leather apron.
- Heavy work boots
- Leather spats
- Felt skull-cap or beret and preferably overalls.



DANGERS

- The arc itself – the temperature can reach 6,000 degrees Fahrenheit (3,315.556) degrees Celsius.
- The intense ultraviolet and infra-red rays can be harmful to both the welder and anyone else nearby.
- It is not unusual for welders who are not wearing overalls to suffer symptoms similar to extreme sunburn.
- Volatile combination of heat and gas. Fatalities have resulted where drums and other containers have exploded as a result of some welding or cutting work.
- The nature of the previous contents should be established to ensure that any heating does not liberate toxic fumes or cause an explosion.

TRANSPORTING, MOVING & STORING GAS CYLINDERS

- Valve protection caps should be in place and secure.
- Cylinders should be hoisted on cradle, slingboard or pallet only.
- No magnets or choker slings.
- Move by tilting and rolling on the edge.
- Transport by powered vehicle in secured and upright position only.



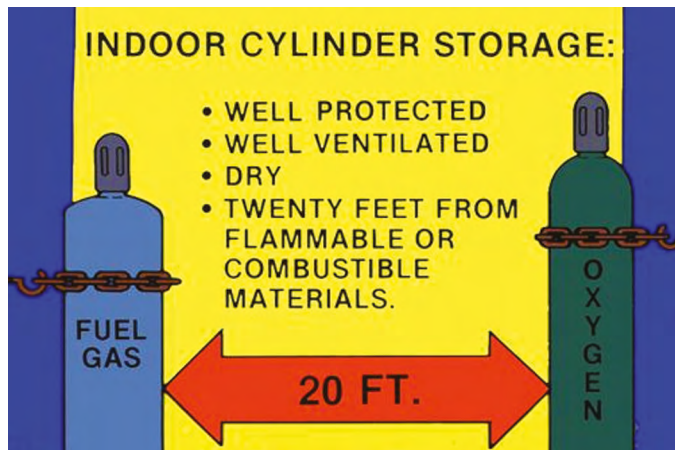
- Unless a special welding cart is provided, cylinders should have their regulators removed and valve protection caps in place before cylinders are moved.



- When cylinders are in use they should be secured by chain, cart or other steading device.

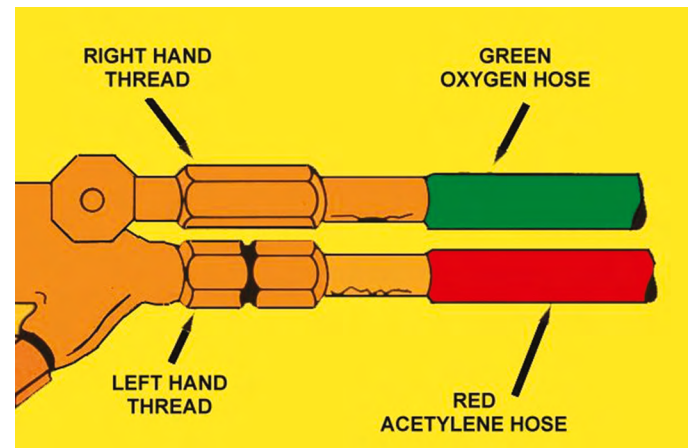


- When work is finished, when cylinders are empty, or when cylinders are moved at any time, the cylinder valve should be closed.
- Cylinders should be secured in an upright position at all times except for hoisting or carrying.
- A distance of 20' should be maintained between oxygen and fuel cylinders when not on carts, or a one hour rated non-combustible wall at least 5 feet high.



FUEL GAS AND OXYGEN MANIFOLDS

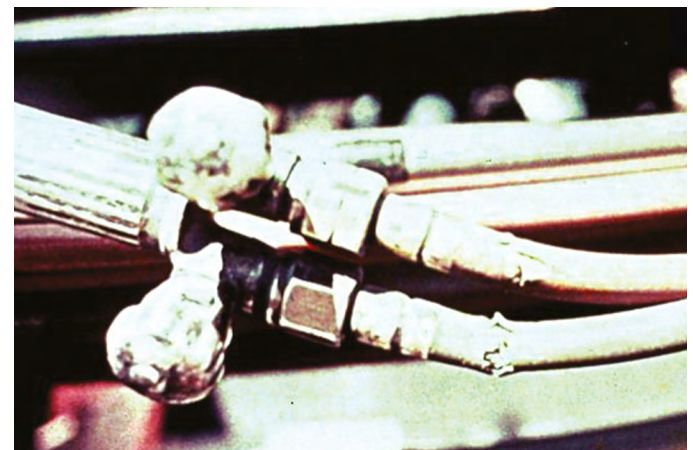
- Green hose for oxygen and right-hand thread.
- Red hose for acetylene and left-hand thread.
- Hose couplings should be the type that rotate to disconnect.
- Boxes used for hose storage should be ventilated.
- Hose kept clear of passageways, stairs and ladders.



TRAINING

THE EMPLOYER SHOULD INSTRUCT EMPLOYEES IN THE SAFE USE OF FUEL GAS AS FOLLOWS:

- Pressure should be reduced through the use of regulators before fuel gas can be burned.
- Before connecting a regulator, the cylinder should be opened slightly and closed (cracking the cylinder) to clear the valve of dirt. This prevents dirt or foreign objects from entering the regulator.
- **NEVER CRACK THE CYLINDER IN THE PRESENCE OF OPEN FLAMES, OR WHERE THE GAS COULD REACH WELDING WORK OR SPARKS.**
- Stand to the side when cracking cylinders.
- Open the cylinder slowly to prevent damage to the regulator.
- Only open the cylinder 1 and ½ turns so it can be closed quickly.
- Leave the valve wrench in place when the cylinder is in use.
- Close cylinder valve, and bleed the regulator before removing the regulator.



WELDING HOSE

- Not more than four of twelve inches covered with tape for fuel and oxygen hoses taped together.
- Hoses should be inspected prior to each shift.
- Defective hose should be immediately removed from service.



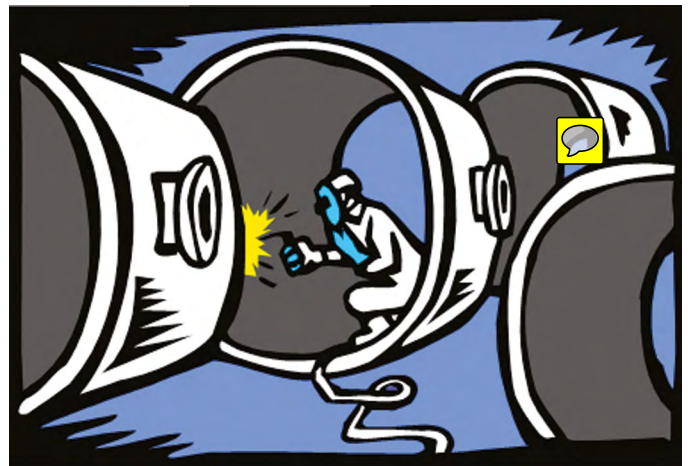
ARC WELDING

- Manual electrode holders should be designed for that purpose and capable of carrying the maximum rated electrode current.
- Only fully insulated holders should contact hands.
- Arc welding cables should be completely insulated and flexible type.
- Free of splice minimum ten feet from electrode cable end.
- Cables in need of repair are not allowed.
- Ground return cables should have sufficient current carrying capacity for maximum voltage.
- No grounding on pipelines containing gases or flammable liquid.
- When using pipelines for ground return, continuity of ground should be verified for all joints.
- Employers should instruct employees that electrodes should be removed from holders when unattended.
- No hot electrodes dipped in water.
- Machine power opened when leaving machine or stopping work.
- Faulty equipment should be reported immediately to the supervisor.
- Always shield operations with a flameproof screen to protect surrounding employees' eyes.



FIRE PREVENTION

- Move objects to be welded to a safe location or remove fire hazards from the area or confine the heat, sparks and slag to protect the immovable fire hazards.
- No welding where paint or dust hazards are present.
- Extinguishing equipment present and ready.
- When necessary, additional personnel should be assigned to guard against fires.
- Employee should be trained to recognize welding fire hazards.
- When welding over walls, floors and ceilings where sparks may travel, precautions should be taken in the adjacent areas.



- When welding in confined spaces has ended remove torch and hose. This eliminates the possibility of accumulation of hazardous atmospheres in confined spaces.
- Before welding drums or hollow structures which have contained toxic or flammable materials either completely fill with water before proceeding or thoroughly clean, ventilate and TEST!
- General ventilation to maintain welding smoke and fumes with safe limits.
- When welding in confined spaces, mechanical ventilation or local exhaust should be provided.
- If ventilation equipment blocks access / egress to confined space, an air line and attendant are required.
- Any employee performing welding, cutting or heating should have eye protection.

PRESERVATIVE COATINGS

- Before welding or cutting on a coated surface whose flammability is not known, scrapings should be taken and tested.
- If scraping burn, coatings should be removed before proceeding

TABLE E-1 - Eye and Face Protector Selection Guide



1. GOGGLES, Flexible Fitting - Regular Ventilation
2. GOGGLES, Flexible Fitting - Hooded Ventilation
3. GOGGLES, Cushioned Fitting - Rigid Body
4. SPECTACLES, Metal Frame, with Sideshields (1)
5. SPECTACLES, Plastic Frame - with Sideshields (1)
6. SPECTACLES, Metal-Plastic Frame - with Sideshields (1)
7. WELDING GOGGLES, Eyecup Type - Tinted Lenses (2)
- 7A. CHIPPING GOGGLES, Eyecup Type - Clear Safety Lenses
8. WELDING GOGGLES, Coverspec Type - Tinted Lenses (2)
- 8A. CHIPPING GOGGLES, Coverspec Type - Clear Safety Lenses
9. WELDING GOGGLES, Coverspec Type - Tinted Plate Lens (2)
10. FACE SHIELD (Available with Plastic or Mesh Window)
11. WELDING HELMETS (2)

GUIDE FOR SELECTION OF SHADE NUMBERS:

WELDING OPERATION	SHADE #
Shielded Metal-Arc Welding 1/16, 3/32, 1/8, 5/32 Inch Electrodes	10
Gas-Shielded Arc Welding (nonferrous) 1/16, 3/32, 1/8, 5/32 Inch Electrodes	11
Gas-Shielded Arc Welding (ferrous) 1/16, 3/32, 1/8, 5/32 Inch Electrodes	12
Shielded Metal Arc Welding 3/16, 7/32, 1/4 Inch Electrodes	12
Shielded Metal Arc Welding 5/16, 3/8, Inch Electrodes	14
Atomic Hydrogen welding	10-14
Carbon Arc Welding	14

OSHA STANDARDS – (29 CFR 1910)

- 1910.252 General Requirements, Welding, Cutting, and Brazing;
- 1910.253, Oxygen-Fuel Gas Welding and Cutting; and
- 1910.254, Arc Welding and Cutting.

CONSTRUCTION INDUSTRY (29 CFR 1926)

- 1926 Subpart J, Welding and cutting

OTHER REFERENCE MATERIALS

Safety in Welding and Cutting, by the American Welding Association: and

NFPA Standard 51B, 1962 Standard for Fire Prevention in Use of Cutting and Welding Processes.

ANSI Z49.1, *Safety in Welding, Cutting, and Allied Processes*.

All Photos and charts were obtained directly from the OSHA Training Institute and are approved for free distribution.

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