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# Welding and Cutting

- *29 CFR 1926 - Subpart J*

# Objectives

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In this course, we will discuss the following:

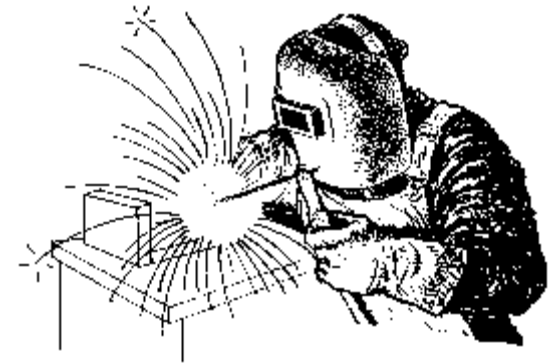
- OSHA's minimum requirements for:
  - Gas welding and cutting
  - Arc welding and cutting
  - Fire prevention
  - Ventilation and protection
- Safe use, handling, and precautions to take when welding and cutting
- Hazard identification and abatement methods



# Subpart J – Welding and Cutting

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- **1926.350** – Gas welding and cutting
- **1926.351** – Arc welding and cutting
- **1926.352** – Fire prevention
- **1926.353** – Ventilation and protection in welding, cutting, and heating
- **1926.354** – Welding, cutting, and heating in way of preservative coatings



# Gas Welding and Cutting

1926.350(a)(1)

- Compressed gas cylinders must have valve protection caps in place and secured except when in use.



# Gas Welding and Cutting

1926.350(a)(2)

- Compressed gas cylinders must only be hoisted while secured, as on a cradle or pallet.
- Cylinders must not be hoisted by magnet, choker sling, or cylinder caps.



# Gas Welding and Cutting

1926.350(a)(3)

- Cylinders shall be moved by tilting or rolling on their bottom edges.



# Gas Welding and Cutting

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1926.350(a)(4)

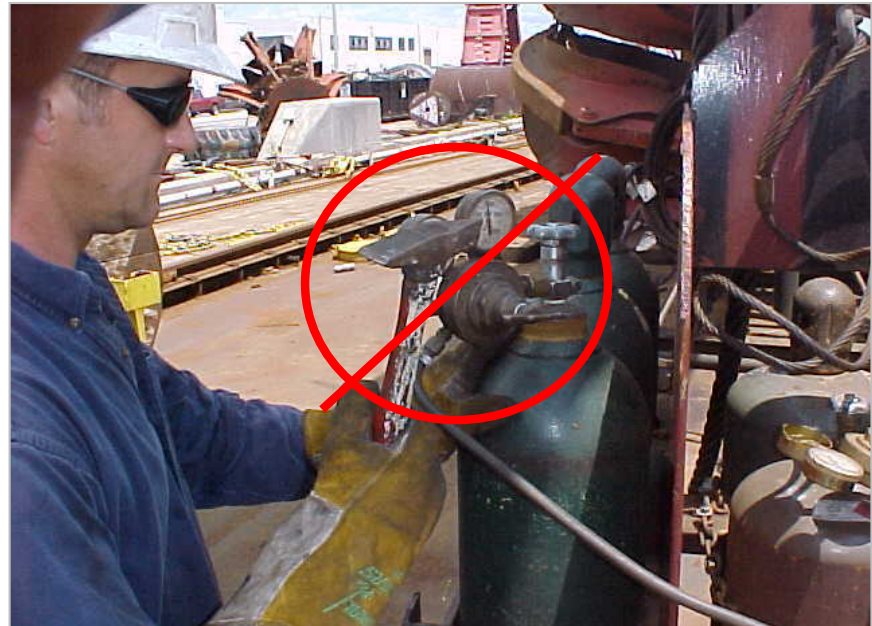
- Cylinders must be secured in a vertical position when transported by powered vehicles.



# Gas Welding and Cutting

1926.350(a)(5)

- Valve protection caps must not be used for lifting cylinders.
- Frozen cylinders must not be:
  - Pried loose with bars under valves or valve protection caps
  - Hit with a tool
  - Thawed by boiling water





# Gas Welding and Cutting

1926.350(a)(7)

- Cylinders must be secured while in use.
- A suitable cylinder truck, chain, or other steadying device must be used to keep cylinders from being knocked over.



# Gas Welding and Cutting

1926.350(a)(8)

- Valves must be closed when work is finished, cylinders are empty or when moved.



# Gas Welding and Cutting

1926.350(a)(9)

- Cylinders must be secured upright except when being hoisted or carried.



# Gas Welding and Cutting

1926.350(a)(10)

- Oxygen cylinders must be separated from fuel gas cylinders and combustible materials.
  - Either a minimum of 20 feet, **or**
  - A barrier at least 5 feet high having a fire resistance rating of 30 minutes.



# Gas Welding and Cutting

1926.350(b)(1)-(4)

- Cylinders must not be exposed to sparks, hot slag or flame.
- Cylinders must not become part of an electrical circuit or have electrodes struck against them.
- Fuel gas cylinders must be placed with valve end up when in use.
- Fuel gas cylinders shall not be taken into confined spaces.





# Gas Welding and Cutting

1926.350(c)(1)-(2)

- Cylinders must not be used as rollers or supports.
- No damaged or defective cylinder shall be used.



# Gas Welding and Cutting

1926.350(d)(1)

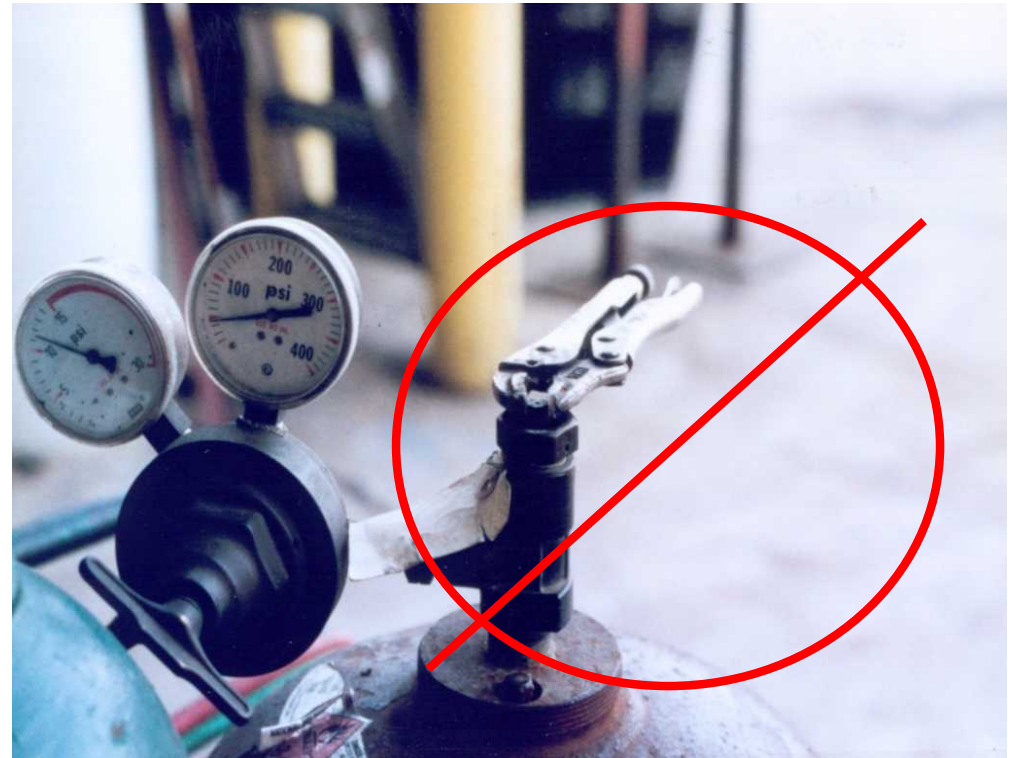
- Before regulators are connected, valve must be slightly opened and then immediately closed to clear away dust or dirt.



# Gas Welding and Cutting

1926.350(d)(2)

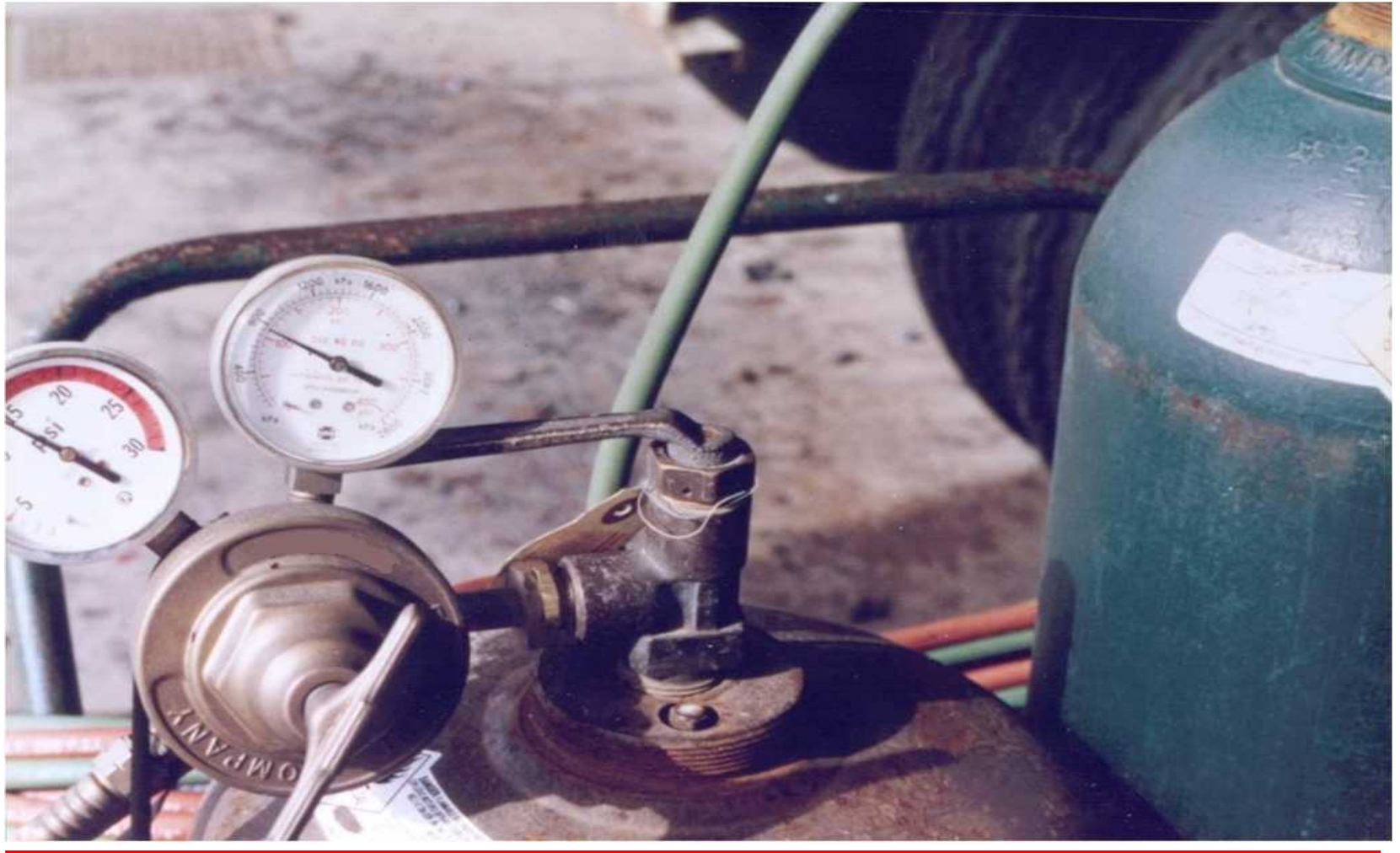
- Where a special wrench is required to close valve, it must be left in position on the stem.





# Gas Welding and Cutting

1926.350(d)(2)



# Gas Welding and Cutting

1926.350(f)(1)

- Fuel gas and oxygen hoses must be easily distinguishable from each other by color or sense of touch.
- Oxygen and fuel gas hoses must not be interchangeable.



# Gas Welding and Cutting

1926.350(f)(2)

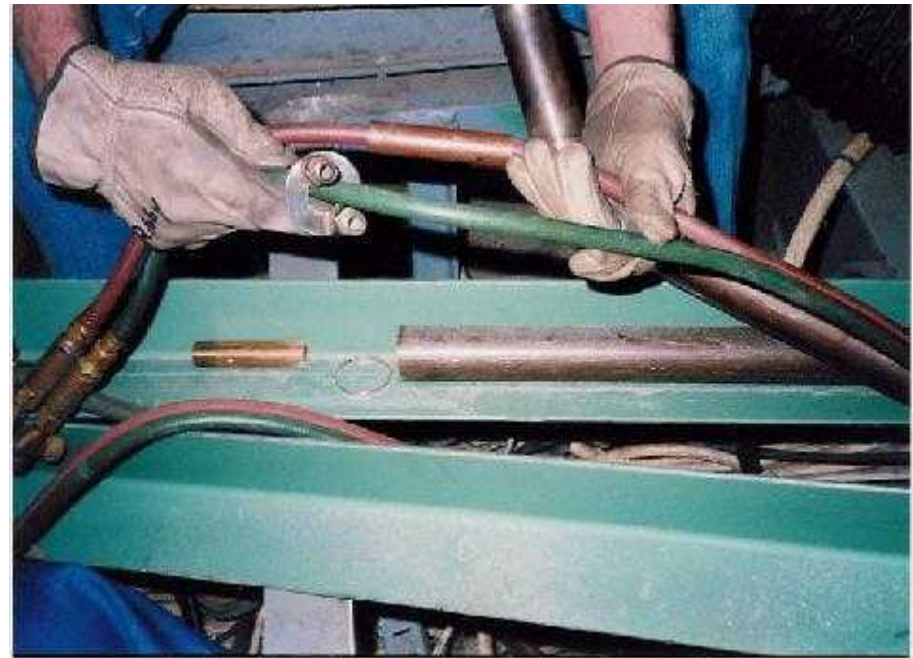
- When parallel sections of oxygen and fuel gas hoses are taped together, not more than 4" out of 12" shall be covered by tape.



# Gas Welding and Cutting

1926.350(f)(3)-(4)

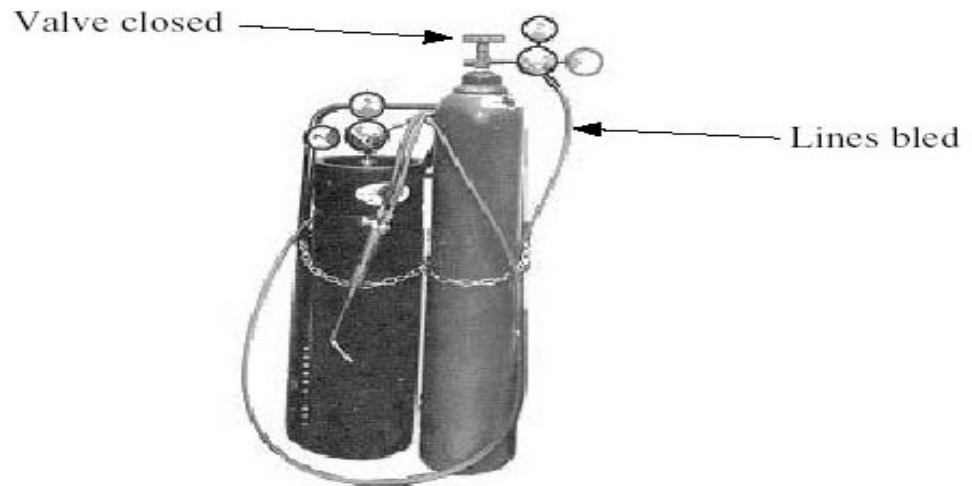
- Hoses must be inspected before use.
- Defective hose must not be used.
- Hose subjected to flashback, severe wear or damage must be tested to twice the normal working pressure.



# Gas Welding and Cutting

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- When not in use or work is completed:
  - Close valve
  - Bleed lines of pressure





# Gas Welding and Cutting

1926.350(f)(7)

- Hoses, cables, and other equipment must be kept clear of passageways, ladders and stairs.



# Gas Welding and Cutting

1926.350(g)(1)

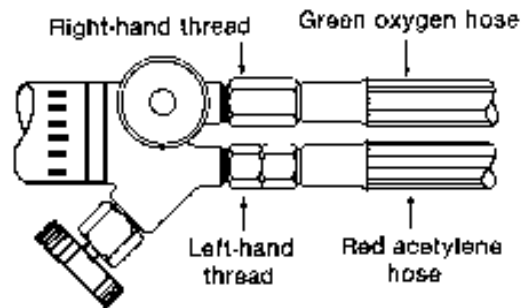
- Torch tip openings must only be cleaned with devices designed for that purpose.



# Gas Welding and Cutting

1926.350(g)(2)

- Torches must be inspected before each use for leaking valves, hose couplings and tip connections.
- Defective torches must not be used.





# Gas Welding and Cutting

1926.350(g)(3)

- Torches must not be lit from matches, cigarette lighters, other flames or hot work.
- They must be lighted by friction lighters or other approved devices.



# Gas Welding and Cutting

1926.350(h)

- Pressure regulators and gauges must be maintained in safe working order.

Oxygen regulator exploding



# Gas Welding and Cutting

1926.350(i)

- Oxygen cylinders and fittings must be kept away from oil and grease.



# Arc Welding and Cutting

1926.351(a)(1)

- Only manual electrode holders designed for arc welding must be used.





# Arc Welding and Cutting

1926.351(a)(2)

- Current-carrying parts passing through a manual electrode holder to be held by the user must be insulated against the maximum voltage.



# Arc Welding and Cutting

1926.351(b)(2)

- Cables must be free of repair or splices for 10 feet from holder unless insulated to equal value of cable.
- Worn or exposed cable must be protected by insulation equal to original value of cable or not used.



# Arc Welding and Cutting

1926.351(c)(1)

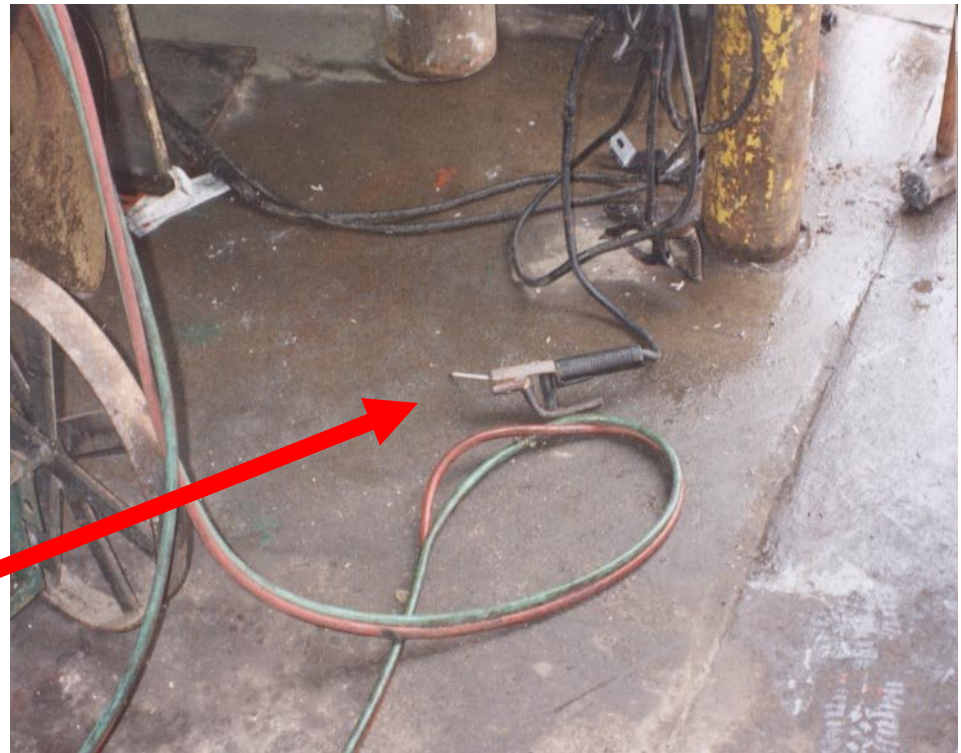
- Ground return cables must have maximum current carrying capacity of unit served.



# Arc Welding and Cutting

1926.351(d)(1)

- Unattended electrode holders must be made safe by removing electrodes and placed or protected to prevent injury.





# Arc Welding and Cutting

1926.351(d)(3)

- When the welder leaves, stops work, or moves the welding machine, power supply switch must be turned off.



# Arc Welding and Cutting

1926.351(d)(4)

- Arc welding or cutting equipment which is faulty or defective must not be used.



# Arc Welding and Cutting

1926.351(e)

- Arc welding/cutting operations shall be shielded or screened off to protect employees in the vicinity from direct rays and sparks.



# Fire Prevention

1926.352(a)-(b)

- To the extent possible, hot work must be performed in designated areas free of fire hazards.
- Hot work done in areas not free of fire hazards
  - Precautions taken to confine heat, sparks, and slag - cannot contact flammable or combustible material.





# Fire Prevention

1926.352(d)

- Fire extinguishing equipment must be readily available and maintained in readiness for use.



# Fire Prevention

1926.352(e)

- When normal fire prevention precautions are not sufficient, additional personnel must be assigned to guard against fire during hot work.



# Fire Prevention

1926.352(h)

- Drums and containers of flammable or combustible liquids must be kept closed.
- Empty containers must be removed from the hot work area.



# Ventilation and Protection

1926.353(a)(1)

- Local exhaust ventilation must keep smoke and fumes in the breathing zone within safe limits.
  - As defined in Subpart D - Occupational Health and Environmental Controls





# Ventilation and Protection

1926.353(a)(6)

- Oxygen must not be used for ventilation, cooling or cleaning.



# Ventilation and Protection

1926.353(b)(1)-(3)

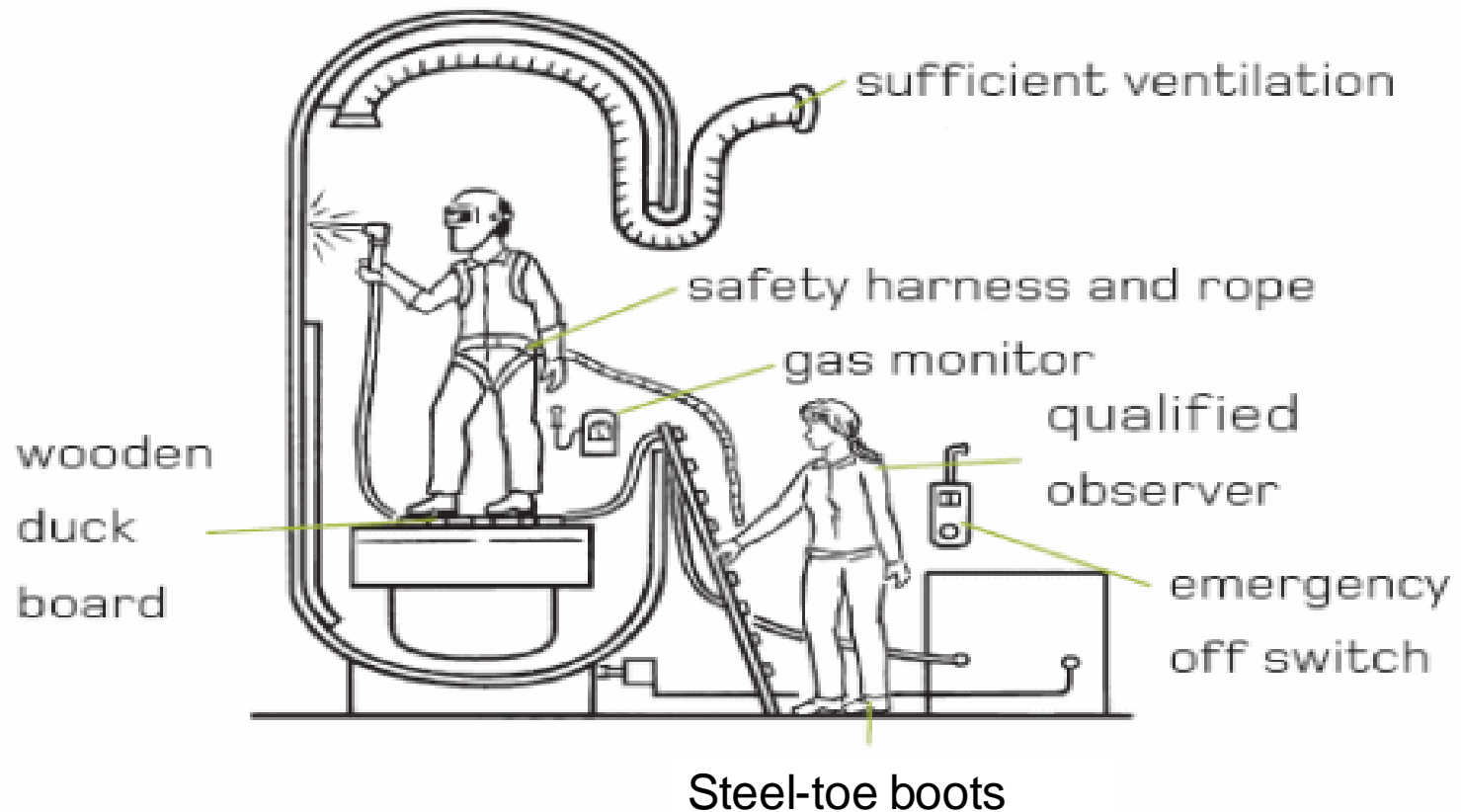
- When hot work is performed in a confined space:
  - General mechanical or local exhaust must be provided, **or**
  - Employees in the space must wear supplied air respirators, **and**
  - An attendant on the outside must be equipped and prepared to provide emergency aid.



Photo courtesy of OSHA.  
This picture shows actual disaster site work conditions and may not illustrate proper safety and health procedures.

# Welding in Confined Spaces

1926.353(c)(1)



Welding in confined spaces

# Ventilation and Protection

1926.353(d)(1)(ii)

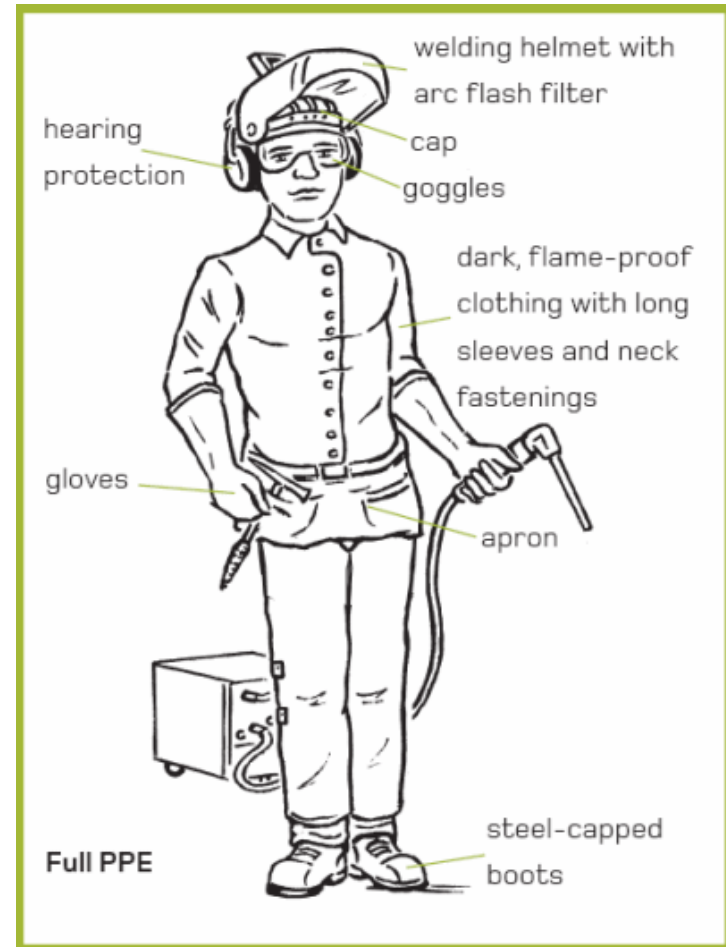
- Employees exposed to welding arcs or sparks must be protected by filter lenses.
  - Meet the requirements of Subpart E
    - » 1926.102 - Eye and face protection



# Ventilation and Protection

1926.353(d)(1)(iii)

- Workers exposed to radiation must be suitably protected to prevent burns by ultraviolet rays.
- Welding helmets and hand shields must be free of leaks and openings.



# Ventilation and Protection

1926.353(e)(2)

- Employees performing any type of welding, cutting or heating must be protected by suitable eye protective equipment.
  - In accordance with requirements of Subpart E

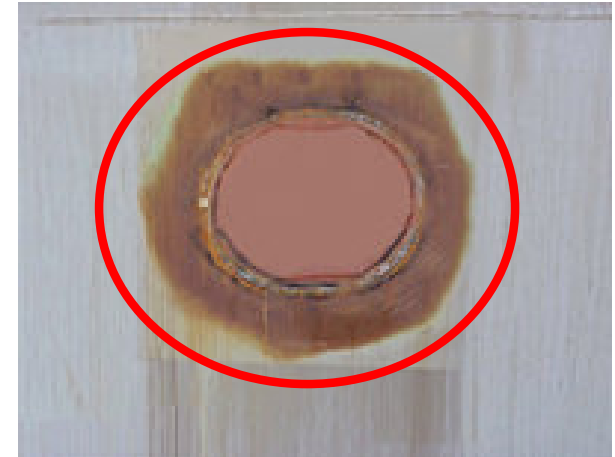




# Welding, Cutting and Heating

1926.354(a)-(b)

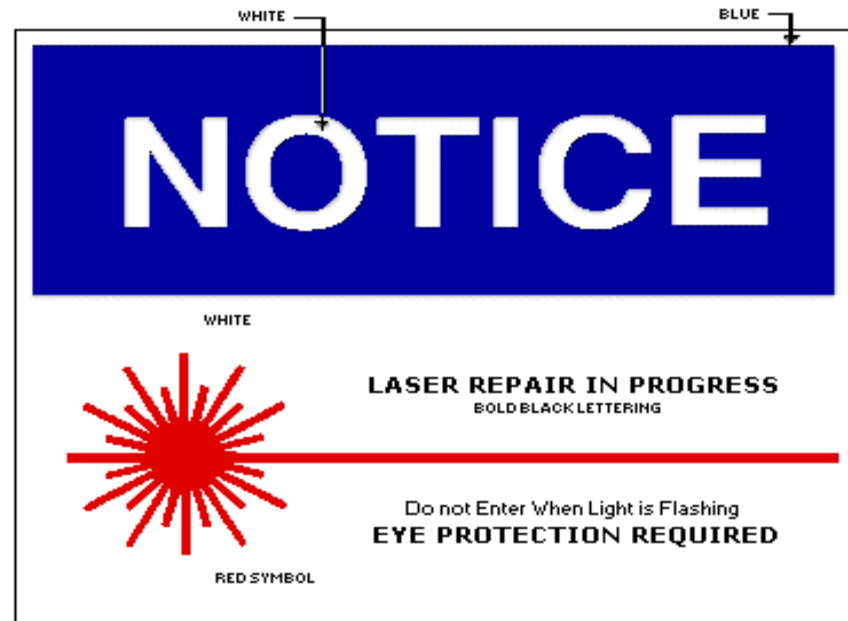
- Before hot work is commenced on any surface covered by a preservative coating:
  - Test must be made by competent person to determine flammability.
  - If flammable, must be stripped from area to be heated to prevent ignition.



# Future of Welding

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- Laser welding is one of the newest processes.
- Even low power lasers can be hazardous to a person's eyesight.

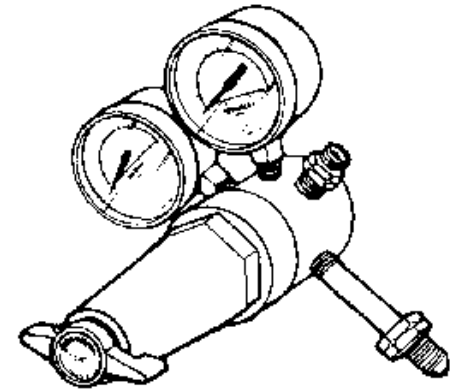


# Summary

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During this course, we discussed:

- OSHA's minimum requirements for:
  - Gas welding and cutting
  - Arc welding and cutting
  - Fire prevention
  - Ventilation and protection
- Safe use, handling, and precaution to take when welding and cutting
- Hazard identification and abatement methods



**Thank You For Attending!**

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**Final Questions?**

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