



Hot Works Permits

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PDH: 1

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Hot Work/Welding



Figure 1. Hot work - welding

Hot work is any work that involves burning, welding, using fire- or spark-producing tools, or that produces a source of ignition. Welding and cutting operations are common to drilling and servicing operations.

Test for flammable gases in the work area before starting any hot work. Potentially hazardous areas include, but are not limited to, well heads, fuel tanks, mud tanks, tank batteries, gas separators, oil treaters, or confined spaces where gases can accumulate.

Hazards may include and/or be related to the following:

- Hot Work, Fire, and Explosive Hazards
- Welding, Cutting and Brazing
- Cylinder Storage
- Grinding
- Well Site Ignition Sources

Hot Work, Fire, and Explosive Hazards



Figure 2. Welding with fire control

Workers performing hot work such as welding, cutting, brazing, soldering, and grinding are exposed to the risk of fires from ignition of flammable or combustible materials in the space, and from leaks of flammable gas into the space, from hot work equipment.

Potential Hazard:

- Getting burned by fires or explosions during hot work.

Possible Solutions:

The basic precautions for fire prevention are:

- Perform hot work in a safe location, or with fire hazards removed or covered. [29 CFR 1910.252(a)(1)(i)]
- Use guards to confine the heat, sparks, and slag, and to protect the immovable fire hazards. [29 CFR 1910.252(a)(1)(ii)]

Special Precautions:

- Do not perform hot work where flammable vapors or combustible materials exist. Work and equipment should be relocated outside of the hazardous areas, when possible. [29 CFR 1910.252(a)(1)(ii)]
- Make suitable fire-extinguishing equipment immediately available in a state of readiness. Such equipment may consist of pails of water, buckets of sand, hose, or portable extinguishers dependent upon the nature and quantity of the combustible material exposed. [29 CFR 1910.252(a)(2)(ii)]

- Assign additional personnel (fire watch) to guard against fire while hot work is being performed. Fire watchers are required whenever welding or cutting is performed in locations where anything greater than a minor fire might develop. [29 CFR 1910.252(a)(2)(iii)(A)]
 - Fire watchers shall:
 - Have fire-extinguishing equipment readily available and be trained in its use.
 - Be familiar with facilities for sounding an alarm in the event of a fire.
 - Watch for fires in all exposed areas, try to extinguish them only when obviously within the capacity of the equipment available, or otherwise sound the alarm.
 - Maintain the fire watch at least a half hour after completion of welding or cutting operations to detect and extinguish possible smoldering fires. [29 CFR 1910.252(a)(2)(iii)(B)]

Potential Hazard:

- Getting burned by a flash fire or explosion that results from an accumulation of flammable gases, such as Methane or Hydrogen Sulfide, around the wellhead area.

Possible Solutions:

- Monitor the atmosphere with a gas detector. If a flammable or combustible gas exceeds 10 percent of the lower explosive level (LEL), the work must be stopped.
- Identify the source of the gas and repair the leakage.

Additional References:

- OSHA Standards
 - 29 CFR 1910.106, Flammable and combustible liquids
 - 29 CFR 1910.252, Welding, cutting, and brazing - general requirements
 - 29 CFR 1910.253, Oxygen-fuel gas welding and cutting
 - 29 CFR 1910.254, Arc welding and cutting
 - 29 CFR 1910.255, Resistance welding
- American Petroleum Institute (API)
 - Standards. American Petroleum Institute (API).
 - *RP 54*, Occupational Safety for Oil and Gas Well Drilling and Servicing Operations, (2007, March).
 - *Publication 2201*, Procedures for Welding Or Hot Tapping On Equipment Containing Flammables, (2003).
- National Fire Protection Association
 - *30*, Flammable and Combustible Liquids Code, (2012).
 - *51-B*, Standard for Fire Prevention During Welding, Cutting, and Other Hot Work.
- International Association of Drilling Contractors (IADC)
 - Hot Work Hazard Recognition

Welding, Cutting and Brazing



Figure 3. Welding - hot work

All hot work is potentially hazardous and a hazard assessment should be performed to determine where the hazards exist.

Potential Hazard:

- Injury and illness caused by hot work (such as, welding fumes, UV light, sparks, noise, or skin injury).

Possible Solutions:

- Inspect the work area to ensure that all fuel and ignition sources are isolated by shielding, clearing the area, lockout/tagout, soaking flammable material with water.
- Wear appropriate personal protective equipment, such as face shield, leather welder's vest, and gauntlet gloves. Use cotton or denim clothing.
- Provide UV shielding for arc welding where practical.
- Inspect welding and cutting equipment before use (arc or gas welding/burning).
- Leak test gas torches, gauges, and hoses.
- Review the hot work permit if available.
- Ensure the availability of adequate fire watch/fire protection equipment.
- Ensure adequate ventilation from toxic welding and cutting fumes.

Special Hazard:

- Accumulation of toxic gases within a confined space.
- A hazardous atmosphere exists in oxygen-deficient (atmospheric concentration of less than 19.5 percent) or oxygen-enriched (atmospheric concentration of more than 23.5 percent). [29 CFR 1910.146]

Possible Solutions:

- Ventilate toxic metal fumes mechanically, if entering a confined space, such as inside of a mud tank, water tank, oil tanks, hoppers, sump, pit or cellar.
- Use a written permit system to document authorization to enter, the work to be performed, and the results of the gas monitoring where there is a potential for toxic, flammable, or oxygen-deficient atmosphere. Both a hot work and confined entry permit may be required for welding, cutting or brazing within a confined space.

Additional Information:

- ANSI Z49.1-67 Safety in Welding and Cutting, American National Standards Institute.
- AWS Z49.1-88, Safety in Welding and Cutting and Applied Processes, American Welding Society.

Cylinder Storage



Figure 4. Properly stored cylinders

Potential Hazard:

- Falling or rolling injuries from improper gas cylinder storage

Possible Solutions:

- Ensure cylinders are properly stored in an upright position and chained in separate racks.
- Store full and empty cylinders separately.

Potential Hazard:

- Valve opening or break off, exposing workers to toxic fumes and flammable gas, caused by improper gas cylinder storage

Possible Solutions:

- Store cylinder properly.
- Always remove gauges and regulators, and install protective valve caps before transporting.

Potential Hazard:

- Gas cylinders causing fires or explosions

Possible Solutions:

- Store cylinders in a dry, well-ventilated location.
- Avoid storing flammable substances in the same area as gas cylinders.
- Avoid storing cylinders of oxygen within 20 feet of cylinders containing flammable gases.
- Store all cylinders upright and chained in separate racks.
- Store full and empty cylinders separately.

Grinding



Figure 5. Hand grinding

Potential Hazard:

- Grinding (that results in sparks, noise, eye and skin injury from flying metal filings, grinding wheel pieces, etc.).
- Having fingers or hands caught in the grinding wheel, resulting in amputation.
- Being struck by portable grinder.

Possible Solutions:

- Wear appropriate personal protective equipment, such as face shield. Use cotton or denim clothing.
- Inspect grinding equipment before use.
- Review the hot work permit if available.
- Ensure the availability of adequate fire watch/fire protection equipment.

Well Site Ignition Sources



Figure 6. Ignition source

There are a number of potential sources of ignition for flammable gases and liquids on the drill site. It is necessary to provide for a general ignition safety program which could pre-empt potential hazards of fire and explosion.

Potential Hazard:

- Ignition and explosions of flammable gases or vapors from:
 - Internal-combustion engine sparks
 - Open flames from any source
 - Smoking
 - Welding operations
 - Electric power tools
 - Two-way radios
 - Vehicles with catalytic converters
 - Portable generators

Possible Solutions:

- Provide spark arrestors for internal-combustion engines.
- Post "NO SMOKING" signs wherever a flammable gas or vapor hazard exists.
- Locate "spark producing" equipment or facilities well away from potential hazard areas.
- Prohibit vehicles with catalytic converters from the immediate vicinity of the rig.
- Prohibit open flames from the vicinity of the rig.

Additional Information:

- American Petroleum Institute (API).
 - *RP 54*, Recommended Practice for Occupational Safety for Oil and Gas Well Drilling and Servicing Operations, Wireline Service.

- *RP 500*, 3rd Edition, Classification of Locations for Electrical Installations at Petroleum Facilities Classified as Class 1, Division 1 and Division 2.
- *RP 505*, 2nd Edition, Classification of Locations for Electrical Installations at Petroleum Facilities Classified as Class 1, Zone 0, Zone 1 and Zone 2.
- *Accident Prevention Reference Guide*. International Association of Drilling Contractors (IADC).
- 29 CFR 1910.106, Flammable and Combustible Liquids. OSHA Standard.
- 29 CFR 1910 Subpart S, Electrical. OSHA Standard.