

## CHAPTER 26

# WELDING AND OTHER HOT WORK

### SECTION 2601 GENERAL

**2601.1 Scope.** Welding, cutting, open torches and other hot work operations and equipment shall comply with this chapter.

- || Compressed gases shall be in accordance with Chapter 30.
- || Flammable gases shall be in accordance with Chapter 35.

**2601.2 Permits.** Permits shall be required as set forth in Section 105.6.

**2601.3 Restricted areas.** Hot work shall only be conducted in areas designed or authorized for that purpose by the personnel responsible for a Hot Work Program. Hot work shall not be conducted in the following areas unless approval has been obtained from the fire code official:

- || 1. In buildings protected with an automatic fire sprinkler system, areas where the sprinkler system is impaired.
- || 2. Areas where there exists the potential of an explosive atmosphere, such as locations where flammable gases, liquids or vapors are present.
- || 3. Areas with readily ignitable materials, such as lint, dust, loose combustible materials or combustible storage that are at risk of ignition from hot work activities.
- || 4. On board ships at dock or ships under construction or repair.
- || 5. At other locations as specified by the fire code official.

**2601.4 Cylinders and containers.** Compressed gas cylinders and fuel containers shall comply with this chapter and Chapter 30.

**2601.5 Design and installation of oxygen-fuel gas systems.** An oxygen-fuel gas system with two or more manifolded cylinders of oxygen shall be in accordance with NFPA 51.

### SECTION 2602 DEFINITIONS

**2602.1 Definitions.** The following words and terms shall, for the purposes of this chapter and as used elsewhere in this code, have the meanings shown herein.

|| **HOT WORK.** Operations including cutting, welding, Thermit welding, brazing, soldering, grinding, thermal spraying, any operation involving open flame torches, any other similar activity.

**HOT WORK AREA.** The area exposed to sparks, hot slag, radiant heat, or convective heat as a result of the hot work.

**HOT WORK EQUIPMENT.** Electric or gas welding or cutting equipment use for hot work.

**HOT WORK PERMITS.** Permits issued by the responsible person at the facility under the hot work permit program permitting welding or other hot work to be done in locations re-

ferred to in Section 2603.3 and pre-permitted by the fire code official.

**1. Hot work program.** Permits issued by the facilities-designated personnel under their hot work permit program allowing welding or other hot work to be done in locations specified in the permit.

**2. Hot Work Operations.** A permit issued by the fire department to allow hot work as required by Section 105.6.

**HOT WORK PROGRAM.** A program, carried out by facilities-designated personnel, allowing them to oversee and issue permits for hot work conducted by their personnel or at their facility. The intent is to have trained, on-site, responsible personnel ensure that required hot work safety measures are taken to prevent fires and fire spread.

**RESPONSIBLE PERSON.** A person trained in the safety and fire safety considerations concerned with hot work. Responsible for reviewing the proposed hot work sites prior to permits being issued, responsible for monitoring the work as the job progresses and verifying that the work has been safely completed.

**TORCH-APPLIED ROOF SYSTEM.** Bituminous roofing systems using membranes that are adhered by heating with a torch and melting asphalt back coating instead of mopping hot asphalt for adhesion.

### SECTION 2603 GENERAL REQUIREMENTS

**2603.1 General.** Hot work conditions and operations shall comply with this chapter.

**2603.2 Temporary and fixed hot work areas.** Temporary and fixed hot work areas shall comply with this section.

**2603.3 Hot work program permit records.** Hot work permits, issued by the responsible person under a hot work program, shall be available for review by the fire code official at the time the work is conducted and for 48 hours after work is complete.

**Exception:** A hot work program shall not be required when a business has no more than two employees who conduct welding, cutting, use open torches or other hot work operations.

**2603.3.1 Qualifications of operators.** A permit for hot work operations shall not be issued unless the individuals in charge of performing such operations are capable of performing such operations safely. Demonstration of a working knowledge of the provisions of this chapter shall constitute acceptable evidence of compliance with this requirement. The responsible person issuing the hot work permit shall make this determination.

**2603.3.2 Records.** The individual responsible for the hot work area shall maintain prehot work inspection reports in accordance with Section 2604.3.1. These reports shall be maintained on the premises for a minimum of 48 hours after work is complete.

**2603.4 Signage.** Visible hazard identification signs shall be provided where required by Chapter 27. Where the hot work area is accessible to persons other than the operator of the hot work equipment, conspicuous signs shall be posted to warn others before they enter the hot work area. Such signs shall display the following warning:

CAUTION  
HOT WORK IN PROGRESS  
STAY CLEAR.

### SECTION 2604 FIRE SAFETY REQUIREMENTS

**2604.1 Protection of combustibles.** Protection of combustibles shall be in accordance with Sections 2604.1.1 through 2604.1.9.

**2604.1.1 Combustibles.** Hot work areas shall not contain combustibles within 35 feet (10 668 mm) horizontally from the work site or shall be provided with appropriate shielding to prevent sparks, slag or heat from igniting exposed combustibles.

**2604.1.2 Openings.** Openings or cracks in walls, floors, ducts or shafts within 35 feet (10 668 mm) of the hot work area shall be tightly covered to prevent the passage of sparks to adjacent combustible areas, or shielded by metal fire-resistant guards, or curtains shall be provided to prevent passage of sparks or slag.

**2604.1.3 Housekeeping.** Floors shall be kept clean within the hot work area.

**2604.1.4 Conveyor systems.** Conveyor systems that are capable of carrying sparks to distant combustibles shall be shielded or shut down.

**2604.1.5 Partitions.** Partitions segregating hot work areas from other areas of the building shall be noncombustible. In fixed hot work areas, the partitions shall be securely connected to the floor such that no gap exists between the floor and the partition. Partitions shall prevent the passage of sparks, slag, and heat from the hot work area.

**2604.1.6 Floors.** Fixed hot work areas shall have floors with noncombustible surfaces.

**2604.1.7 Precautions in hot work.** Hot work shall not be performed on containers or equipment that contains or has contained flammable liquids, gases or solids until the containers and equipment have been thoroughly cleaned, inerted or purged; except that "hot tapping" shall be allowed on tanks and pipe lines when such work is to be conducted by personnel qualified to perform the work in accordance with API 2201, *Procedures for Welding or Hot Tapping on Equipment Containing Flammables*.

**2604.1.8 Sprinkler protection.** Automatic sprinkler protection shall not be shut off while hot work is performed.

Where hot work is performed close to automatic sprinklers, noncombustible barriers or damp cloth guards shall shield the individual sprinkler heads and shall be removed when the work is completed. If the work extends over several days, the shields shall be removed at the end of each workday. The fire code official shall approve hot work where sprinkler protection is impaired.

**2604.1.9 Fire detection systems.** When hot work is to be conducted in an area with fire detection devices, special precautions shall be taken to avoid accidental operation of the automatic fire detection systems.

**2604.2 Fire watch.** Fire watches shall be established and conducted in accordance with Sections 2604.2.1 through 2604.2.6. See also Section 106.10.

**2604.2.1 When required.** A fire watch shall be provided during hot work activities and shall continue for a minimum of 30 minutes after the conclusion of the work. The fire code official, or the responsible manager under a hot work program, is authorized to extend the fire watch based on the hazards or work being performed.

**Exception:** Where the hot work area has no fire hazards or combustible exposures.

**2604.2.2 Location.** The fire watch shall include the entire hot work area. Hot work conducted in areas with vertical or horizontal fire exposures that are not observable by a single individual shall have additional personnel assigned to fire watches to ensure that exposed areas are monitored.

**2604.2.3 Duties.** Individuals designated to fire watch duty shall have fire-extinguishing equipment readily available and shall be trained in the use of such equipment. Individuals assigned to fire watch duty shall be responsible for extinguishing spot fires and communicating an alarm.

**2604.2.4 Fire training.** The individuals responsible for performing the hot work and individuals responsible for providing the fire watch shall be trained in the use of portable fire extinguishers.

**2604.2.5 Fire hoses.** Where hoselines are required, they shall be connected, charged and ready for operation.

**2604.2.6 Fire extinguisher.** A minimum of one portable fire extinguisher complying with Section 906 and with a minimum 2-A:20-B:C rating shall be readily accessible within 30 feet (9144 mm) of the location where hot work is performed and shall be accessible without climbing stairs or ladders.

**2604.3 Area reviews.** Before hot work is permitted and at least once per day while the permit is in effect, the area shall be inspected by the individual responsible for authorizing hot work operations to ensure that it is a fire safe area. Information shown on the permit shall be verified prior to issuing the permit in accordance with Section 105.6.

**2604.3.1 Pre-hot-work check.** A pre-hot-work check shall be conducted prior to work to ensure that all equipment is safe and hazards are recognized and protected. A report of the check shall be kept at the work site during the work and available upon request. The pre-hot-work check shall determine all of the following:

1. Hot work equipment to be used shall be in satisfactory operating condition and in good repair.
2. Hot work site is clear of combustibles or combustibles are protected.
3. Exposed construction is of noncombustible materials or, if combustible, then protected.
4. Openings are protected.
5. Floors are kept clean.
6. No exposed combustibles are located on the opposite side of partitions, walls, ceilings or floors.
7. Fire watches, where required, are assigned.
8. Approved actions have been taken to prevent accidental activation of suppression and detection equipment in accordance with Sections 2604.1.8 and 2604.1.9.
9. Fire extinguishers and fire hoses (where provided) are operable and available.

### SECTION 2605 GAS WELDING AND CUTTING

**2605.1 General.** Devices or attachments mixing air or oxygen with combustible gases prior to consumption, except at the burner or in a standard torch or blow pipe, shall not be allowed unless approved.

**2605.2 Cylinder and container storage, handling and use.** Storage, handling and use of compressed gas cylinders, containers and tanks shall be in accordance with this section and Chapter 30.

Equipment located inside of buildings shall be stored in a well ventilated dry location at least 20 feet (6096 mm) from combustible materials, elevators, stairs or means of egress

**2605.3 Precautions.** Cylinders, valves, regulators, hose and other apparatus and fittings for oxygen shall be kept free from oil or grease. Oxygen cylinders, apparatus and fittings shall not be handled with oily hands, oily gloves, or greasy tools or equipment.

**2605.4 Acetylene gas.** Acetylene gas shall not be piped except in approved cylinder manifolds and cylinder manifold connections, or utilized at a pressure exceeding 15 pounds per square inch gauge (psig) (103 kPa) unless dissolved in a suitable solvent in cylinders manufactured in accordance with DOTn 49 CFR. Acetylene gas shall not be brought in contact with unalloyed copper, except in a blowpipe or torch.

**2605.5 Remote locations.** Oxygen and fuel-gas cylinders and acetylene generators shall be located away from the hot work area to prevent such cylinders or generators from being heated by radiation from heated materials, sparks or slag, or misdirection of the torch flame.

**2605.6 Cylinders shutoff.** The torch valve shall be closed and the gas supply to the torch completely shut off when gas welding or cutting operations are discontinued for a period of 1 hour or more.

**2605.7 Prohibited operation.** Welding or cutting work shall not be held or supported on compressed gas cylinders or containers.

**2605.8 Tests.** Tests for leaks in piping systems and equipment shall be made with soapy water. The use of flames shall be prohibited for leak testing.

### SECTION 2606 ELECTRIC ARC HOT WORK

**2606.1 General.** The frame or case of electric hot work machines, except internal-combustion-engine-driven machines, shall be grounded. Ground connections shall be mechanically strong and electrically adequate for the required current. Installation shall be in accordance with manufacturer's recommendations and the *National Electrical Code*.

**2606.2 Return circuits.** Welding current return circuits from the work to the machine shall have proper electrical contact at joints. The electrical contact shall be periodically inspected.

**2606.3 Disconnecting.** Electrodes shall be removed from the holders when electric arc welding or cutting is discontinued for any period of 1 hour or more. The holders shall be located to prevent accidental contact and the machines shall be disconnected from the power source.

**2606.4 Emergency disconnect.** A switch or circuit breaker shall be provided so that fixed electric welders and control equipment can be disconnected from the supply circuit. The disconnect shall be installed in accordance with the *National Electrical Code* and marked "EMERGENCY DISCONNECT".

**2606.5 Damaged cable.** Damaged cable shall be removed from service until properly repaired or replaced.

### SECTION 2607 CALCIUM CARBIDE SYSTEMS

**2607.1 Calcium carbide storage.** Storage and handling of calcium carbide shall comply with Chapter 27 of this code and Chapter 7 of NFPA 51.

### SECTION 2608 ACETYLENE GENERATORS

**2608.1 Use of acetylene generators.** The use of acetylene generators shall comply with this section and Chapter 4 of NFPA 51A.

**2608.2 Portable generators.** The minimum volume of rooms containing portable generators shall be 35 times the total gas-generating capacity per charge of all generators in the room. The gas-generating capacity in cubic feet per charge shall be assumed to be 4.5 times the weight of carbide per charge in pounds. The minimum ceiling height of rooms containing generators shall be 10 feet (3048 mm). An acetylene generator shall not be moved by derrick, crane or hoist while charged.

**2608.3 Protection against freezing.** Generators shall be located where water will not freeze. Common salt such as sodium chloride or other corrosive chemicals shall not be utilized for protection against freezing.

**SECTION 2609  
PIPING MANIFOLDS AND HOSE SYSTEMS FOR  
FUEL GASES AND OXYGEN**

**2609.1 General.** The use of piping manifolds and hose systems shall be in accordance with Section 2609, Chapter 30 and Chapter 3 of NFPA 51.

**2609.2 Protection.** Piping shall be protected against physical damage.

**2609.3 Signage.** Signage shall be provided for piping and hose systems as follows:

1. Above-ground piping systems shall be marked in accordance with ASME A13.1.
2. Station outlets shall be marked to indicate their intended usage.
3. Signs shall be posted, indicating clearly the location and identity of section shutoff valves.

**2609.4 Manifolding of cylinders.** Oxygen manifolds shall not be located in an acetylene generator room. Oxygen manifolds shall be located at least 20 feet (6096 mm) away from combustible material such as oil or grease, and gas cylinders containing flammable gases, unless the gas cylinders are separated by a fire partition.

**2609.5 Identification of manifolds.** Signs shall be posted for oxygen manifolds with service pressures not exceeding 200 psig (1379 kPa). Such signs shall include the words:

LOW-PRESSURE MANIFOLD  
DO NOT CONNECT HIGH-PRESSURE CYLINDERS  
MAXIMUM PRESSURE 250 PSIG

**2609.6 Clamps.** Hose connections shall be clamped or otherwise securely fastened.

**2609.7 Inspection.** Hoses shall be inspected frequently for leaks, burns, wear, loose connections or other defects rendering the hose unfit for service.