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CHAPTER 26

Welding and Other Hot Work— Part One of Two

General Comments

Welding and other hot work are frequent ignition sources. Statistics from a major property insurance company for a recent five-year period showed 290 hot -work-related ignitions that led to losses of $407 million, or an average of $1.4 million per incident. Of these 290 losses, 42 percent were caused by employees and 58 percent were caused by outside contractors. To compare the magnitude of these losses, this same insurance company saw 395 fires associated with housekeeping and 262 losses associated with smoking. The average poor housekeeping loss was $902,000; the average smoking loss was about $440,000.

Both hot work operations themselves and the equipment and materials associated with such work can create significant ignition and fire hazards. Hot work creates sparks and slag and gives off heat. Materials such as acetylene and oxygen are used in gas welding and an electrical current is used for arc welding. Additionally, these activities tend to occur in buildings that are not designed for these materials and hazards. Hot work often occurs within buildings undergoing renovations, which are even more susceptible to ignition. Hot work can be either temporary or ongoing. Permanent installations generally have the ability to address ignition hazards more consistently.

Several different types of hot work would fall under the requirements found in Chapter 26, including both gas and electric arc methods and any open-torch operations. The important factor in avoiding ignition hazards is preparing for and monitoring hot-work activities. Primarily these precautions relate to basic fire prevention and fire control. Chapter 26 details a program that allows a facility to assign an employee to be the administrator of a hot-work program as defined in Section 2602.1. This administrator would be allowed to issue permits for work on site, would be required to perform prework inspections and would be responsible for ensuring that the correct safety measures are taken. The fire code official has the authority to make periodic checks of these records, so they must be made available for at least 48 hours after the work ends. This chapter provides specific requirements for the protection of combustibles and for fire watches.

Personnel undertaking hot work will have varying levels of familiarity with the building or facility where the work is being done. Often the person undertaking hot work is not an employee at the facility and may not be under the direct control of the hot work program manager. The qualifications of the hot work operator are discussed in Section 2603.4.

Purpose

This chapter covers requirements for safety in welding and other types of hot work by reducing the potential

for fire ignitions. Many of the activities of this chapter focus on the actions of the occupants. As noted, welding and other hot work are responsible for a large percentage of fire ignitions that usually result in large losses.

SECTION 2601
GENERAL

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

☿*Welding and cutting operations, whether electric or gas, are methods for joining or separating metals. In either case, a strong heat energy source is applied to the material, commonly known as the work piece, to perform the required operation. Specific hazards associated with each type of welding or cutting apparatus and process may vary greatly, but, in each case, two elements are always present that may cause or contribute to the spread of fire—a heat energy source and air or oxygen. As a result, efforts to control fuels and reduce the impact of fires if they occur are the focus of these requirements.*

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

☿ *The process of issuing permits gives the fire code official an opportunity to carefully evaluate and regulate hazardous operations. Permit applicants should be required to demonstrate that their operations comply with the intent of the code before the permit is issued. See the commentary to Section 105.6 for a general discussion of operations requiring an operational permit. The process also notifies the fire department of the need for prefire planning for the hazardous property and helps to verify that proper procedures will be followed. The actual permit requirements for hot work are in Section 105.6.23. This section lists several specific instances where a permit would be required for hot work operations. One of the items would allow a single permit to be issued to allow a hot work program. This program will be explained in more detail in this chapter, but essentially it allows a person on site to manage the hot work activities. This program has a number of safety requirements, including fire department review of documentation at the facility for a minimum of 48 hours after the work is completed. Generally, this type of permit provides much needed flexibility for facilities where hot work is a common occurrence.*

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. 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 storage of large quantities of bulk sulfur, baled paper, cotton, lint, dust or loose combustible materials.
4. On board ships at dock or ships under construction or repair.
5. At other locations as specified by the fire code official.

☿ *This section describes restrictions on the areas where hot work can take place. Normally hot work ac-*

tivities are restricted to designated areas; however, there are times when hot work may be needed in specific locations, such as in a building undergoing renovation. This section presents this list as a way to verify that when hot work is needed, notification of the activity is made and special precautions are undertaken. In addition, this section also authorizes the fire code official to add other areas where special approval would be necessary. The code cannot anticipate all potentially hazardous situations. For this reason, this section does not explicitly prohibit hot work in these areas; it simply requires special approval.

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

☿ *This section is focused on any cylinders or containers used to store gases used in hot work operations, primarily oxygen and acetylene. Oxygen is an oxidizing gas and acetylene is a highly flammable gas and an unstable reactive Class 2. This section requires that any specific requirements within Chapter 26 be addressed along with the general requirements found in Chapter 30 regarding compressed gases.*

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.

☿ *This section references NFPA 51 for any oxygen-fuel gas systems where any number of oxygen containers are manifolded. The scope of this standard specifically states that it addresses only situations where two or more cylinders are manifolded.*

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.

☿ *Definitions of terms can help in the understanding and application of the code requirements. The purpose for including those definitions that are associated with the subject matter of this chapter is to provide more convenient access to them without having to refer back to Chapter 2. It is important to emphasize that these terms are not exclusively related to this chapter but are applicable everywhere the term is used in the code. For convenience, these terms are also listed in Chapter 2 with a cross reference to this section. The use and application of all defined terms, including those defined in this section, are set forth in Section 201.*

HOTWORK. Operations including cutting, welding, Thermit welding, brazing, soldering, grinding, thermal spraying, thawing pipe, installation of torch-applied roof systems or any other similar activity.

☿ *This term describes the scope of what would be considered hot work as it is regulated in this chapter. The scope is broad and would include any activity that produces sparks, slag or other waste products. This would include both gas and electric methods. Torch-applied roof systems are also included.*

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

☿ *This definition helps to locate which areas would be considered part of the hot work area to better understand the level of susceptibility to ignition.*

HOTWORK EQUIPMENT. Electric or gas welding or cutting equipment use for hot work.

☿ *In the past, chapters dealing with hot work focused primarily on gas welding. Electric welding, though it does not deal with oxygen and fuel gases, still presents ignition hazards.*

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

☿ *As applied in Chapter 26, this permit differs from a typical permit in that it is not directly issued by the fire code official. Instead, a hot work operations facility is given permission to designate a person, perhaps the safety officer, to issue permits as needed. This results in flexibility for facilities where hot work is a common occurrence. These permits are issued under what is called a hot work program, which is also de-*

fined in this section.

HOTWORK PROGRAM. A permitted program, carried out by approved 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.

☿ *This kind of program is described in the definition for "Hot work permits." This program allows someone on site to control the issuing of permits for hot work. The person who is charged with this responsibility must be trained in hot work operations and have the necessary authority. Having such a program at a facility encourages a better understanding of fire safety and perhaps more incentive to play an active role in the prevention of fires. This program reduces the administrative burden on the fire department and ensures that hot work operations can proceed as needed.*

RESPONSIBLE PERSON. A person trained in the safety and fire safety considerations concerned with hot work. Responsible for reviewing the sites prior to issuing permits as part of the hot work permit program and following up as the job progresses.

☿ *This is the person designated to administer the hot work program. Without this definition, the term "responsible person" is a vague descriptor. The definition includes the scope of responsibilities for this person.*

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.

☿ *This is a very specific operation that relates to hot work that uses a torch to adhere the materials. It is not considered welding, but still falls within the definition of "Hot work."*

SECTION 2603

GENERAL REQUIREMENTS

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

☿ *This section is generally applicable to all hot work activities, which would include welding and cutting, but also includes activities such as torch-applied roof system activities. The requirements are primarily related to the hot work permit program, qualifications and general administrative provisions related to fire safety procedures.*

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

☿ *These provisions are applicable to both temporary and permanent activities because the same fire hazard exists in both cases. Temporary situations generally pose a greater hazard, however, because they typically occur in areas not designed for such ignition hazards. For example, hot work is fairly common in buildings undergoing renovation.*

2603.3 Hot work program permit. Hot work permits, issued by an approved 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.

☿ *Because individual facilities are allowed to manage the process of issuing permits, permit information must be available to the fire code official for periodic review. As noted in the definition for "Hot work permits," the records must be available for at least 48 hours following completion of work. The 48-hour period gives the fire code official the time necessary to verify that permitting was done according to established procedures if a fire should occur. This section does not require that the permits be submitted to the fire code official; it asks only that they be available for review. This section, along with Section 2603.5, is part of the package that allows a periodic random check of the permitting and hot work administrative procedures.*

2603.4 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 definitions for "Hot work program" and "Responsible person" in Section 2602.1 are specifically aimed at the individual who coordinates issuing and managing permits. The qualifications of the operator and administrative follow -through are a critical aspect in preventing hot work fires and are the subject of this section. Operators of welding and cutting apparatus must demonstrate understanding of, competence in and responsibility for their activities. A thorough understanding of proper welding and cutting safety precautions as outlined in this chapter and NFPA 51 is a minimum requirement. Operators should also be familiar with general industry standards, as well as federal and state Occupational Safety and Health Administration (OSHA) regulations, manufacturers' recommendations regarding equipment being operated and standards of good practice as detailed by the American Welding Society (AWS), NFPA or other professional safety organization. Operators must be capable of physically demonstrating their knowledge of proper safety practices when required by the code official. Written competency examinations are not required by this section.*

2603.5 Records. The individual responsible for the hot work area shall maintain "prework check" 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.

☋ *This section is specific to the hot work program administrator and requires that the prework checks be available for review for at least 48 hours. This allows periodic checks by the fire code official and would allow reasonable time for review of documentation after a fire to determine if welding or cutting was implicated in any fire situation during the previous permit period.*

2603.6 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.

☋ *Signage, as with many other code applications, is used as a method to warn of hazards. This is especially critical in areas where people unfamiliar with the hazards may be present. For example, this may be more important during renovations in an occupied office building. The signage requirements apply to both temporary and fixed situations, and the visibility of the signs must be consistent with the requirements of Chapter 27.*

The remainder of **Chapter 26, Welding and Other Hot Work**, starting with Section 2604, Fire Safety Requirements, will appear in the August issue of ***Campus Firezone.***