

HOT WORK MANAGEMENT

ALLIANZ RISK CONSULTING

INTRODUCTION

Hot work is defined as any activity that involves open flames or produces heat and/or sparks capable of initiating fires or explosions. Examples of hot work include: welding, cutting, grinding, soldering, brazing, torch-applied roofing, etc. Hot work may also include electrical work in areas which may contain flammable or explosive atmospheres. This list is not exhaustive, but should serve to highlight the type of activity which constitutes hot work. Hot work continues to be one of the main causes of fires in industrial and commercial occupancies. See appendix for illustrative examples of hot work losses. In an effort to reduce this fire hazard, Allianz has assembled many of the industry's best practices into a single hot work guidance document. Additional information can be obtained by contacting your local Allianz Risk Consulting (ARC) representative.

If hot work must be conducted outside designated safe hot work areas, it should be properly managed using a permit program, such as that provided by Allianz Risk Consulting. Hot work permits should be required for anyone at the site, whether they are employees or contractors.



Important:

Hot work should be avoided whenever possible and inherently safer methods should always be considered. For example, metal parts could be joined together with bolts instead of welding, or manually cutting with a hand saw instead of using a cutting torch. Whenever possible, hot work operations should be conducted outdoors, away from critical operations and combustible materials.

Properly trained personnel should be assigned the following responsibilities:

Permit Issuer

- Is a supervisory-level company employee (not a contractor)
- Has overall responsibility for proper implementation and management of the hot work program
- Issues hot work permits after adequately assessing the risks in the proposed work area
- Completes final inspection of hot work area to ensure it is safe and final sign-off of the hot work permit

Hot Work Operator

- Is properly trained in the safe use of hot work equipment and the associated hazards
- Verifies hot work equipment is in good operating condition
- Works with the Permit Issuer to follow the established hot work procedures
- Restricts use of hot work to the stated conditions and areas only
- Leaves the hot work area in a safe condition after work is completed

Fire Watch

- Watches for any stray sparks, smoldering fires, or other fire hazards and is ready to provide the initial fire response
- Has a portable fire extinguisher and/or fire hose readily available and is adequately trained in its use
- Works with the Hot Work Operator to ensure safe conditions are maintained during and after hot work
- Has the authority to stop work if unsafe conditions develop
- Completely familiar with site-specific fire alarm locations and emergency notification procedures

Management, contractors, permit issuers, the fire watch, and hot work operators should recognize their mutual responsibility for safety in hot work operations.

All employees and contractors involved with hot work activities should receive annual training and certification. In addition, hot work management procedures should be formally reviewed annually, at a minimum, to assess the effectiveness of the program and any needed changes and/or improvements properly implemented.

EXAMPLES OF HOT WORK MANAGEMENT FAILURE

The following examples of failure in the management of hot work led to asset loss and serve as a reminder of the high level of control required:

- Failure to recognize that hot work may not be necessary when cold work could easily be utilized
- Failure to undertake compliance checking before issuing a permit
- Failure to notify the following shift manager of scheduled hot work
- Failure to leak test burning equipment leading to emission of flammable cutting gas in the hot work area
- Failure to test for flammable vapors, particularly in communicating areas to where the hot work is scheduled
- Failure to clear floors of combustibles below hot work where undertaken above grated floors
- Failure to understand what constitutes "hot work" and not using a permit for grinding activity
- Failure to identify fire protection/detection systems in the work area, leading to erroneous discharge/activation of the system

HOT WORK PERMIT PROCEDURE

1. Hot work permits should be issued for any and all hot work that is conducted outside designated safe hot work areas, such as plant production areas where hot work is the primary function (e.g., a welding department in an assembly line) or a maintenance shop area that is arranged for safe cutting and welding activities. Hot work permits should be issued only by adequately trained employees. Hot work permits should be issued for a fixed period of time that will not exceed a single work shift. Reissuing permits at work shift changes ensures that all work is clearly communicated from one work shift to another and any changes in plant conditions are addressed.
2. Prior to starting hot work, the work area should be carefully inspected by the Permit Issuer to fully understand the scope of work to be conducted and verify all applicable precautions are being followed. The following should be reviewed:
 - A complete description of the task that will be conducted
 - Clarify exactly which areas and equipment will be affected by the work
 - Identify the workers who will conduct the work
 - Review all potential hazards that could be associated with the work (in some cases, a job safety analysis should be conducted prior to initiating the work)
 - Review all tools that will be used during the work and confirm that the cutting and welding equipment is in good condition
 - Verify that automatic sprinkler protection is in service, if applicable
 - Verify that portable fire extinguishers and/or fire hoses are present and in good condition
 - Verify that all combustible materials, including flammable liquids, dust, lint and oily deposits, within 35 ft (11 m) of the work area are removed
 - Verify that combustible materials that cannot be removed are covered with fire resistive blankets
 - Make sure that floors are swept clean of combustible materials
 - Confirm that all wall and floor openings are covered
 - Ducts and conveyor systems that might carry sparks to distant combustibles should be shielded, shut down, or both

- If hot work is done near walls, partitions, ceilings, or roofs of combustible construction, they should be protected by fire-resistive blankets
- If there are any potentially flammable liquid or vapor exposures that cannot be completely eliminated, then continuous gas monitoring with a calibrated portable gas monitoring device should be conducted in areas where flammable vapors may be present. When continuous gas monitoring is not available, lower explosive level (LEL) readings should be recorded at least every four hours.

3. Following a satisfactory inspection of the work area, the Permit Issuer issues a signed permit to the Hot Work Operator. The Permit Issuer assigns a person to be a designated Fire Watch.

4. Copies of the hot work permits should be displayed in the hot work area and in a central location (e.g., office of the Permit Issuer, control room, HSE office, etc.) until the job is complete and the permit has been closed. This allows the Permit Issuer (and all other interested parties) to have a central location to immediately identify the type and location of hot work being performed in the facility.

5. A fire watch should remain on continuous active duty during the hot work and for 60 minutes following the completion of the hot work in order to detect and extinguish any smoldering fires. After this initial 60 minute period, a fire watch should also make periodic site inspections at least every 30 minutes for a total fire watch period of up to 3 hours (180 minutes). The Permit Issuer should determine the duration of the fire watch based on the actual site conditions and the potential for a smoldering fire. Allianz Risk Consulting recommends a fire watch duration of 180 minutes after hot work is complete, which may be reduced by 30 minutes for each positive condition checked below:

- Building is protected by automatic sprinklers.
- There are no combustible materials (i.e. wood, plastic, asphalt/tar, etc.) used in the roof/ceiling, wall or floor construction, including any insulation. Do not give credit if uncertain.
- All combustible materials, including any flammable liquids, combustible dust, lint or oily deposits, are located at least 35 ft (11 m) away from the work area.

For example, a building protected by automatic sprinklers with a roof containing plastic foam insulation whereby all combustibles are located 35 ft (11 m) away would require a minimum 120 minute fire watch after hot work is complete (180 – 60 = 120 minutes). A continuous fire watch would be provided for the first 60 minutes followed by two site inspections at 30 minute intervals.

Note: A continuous minimum fire watch period of 3 hours after hot work is completed is recommended for torch-applied roof installation or repair.

6. Upon completion of the fire watch, the hot work permit is returned to the Permit Issuer who should then complete a final inspection of the work area before finally signing it off.

7. Completed hot work permits should be retained for at least one year for review by Allianz Risk Consulting.

Total number of checked boxes (#) = ____

Minimum fire watch duration =
180 min. – (# x 30 min.) = ____ min.

APPENDIX: ILLUSTRATIVE HOT WORK LOSS LESSONS

Lesson: Was hot work actually necessary?

In March 2007, an estimated \$300,000 loss was caused by hot work undertaken to apply mineral felt covering to a steel canopy. A hot work permit was in place; however, the hot work ignited an EPDM membrane behind insulated panels. The fire was quickly extinguished by responding fire crews; however, it was necessary to cut away cladding panels and part of the main roof in the process. Investigations subsequently revealed that hot work was not necessary, and cold work would have been more appropriate in the circumstances.

Lesson: Removal or covering of combustibles and maintenance of an adequate fire watch in a warehouse

While an arc welder was being used on the second floor, sparks dropped through an opening to cardboard boxes below and the boxes ignited. There was no fire watch on the first floor, and when the fire was discovered 15 minutes later, employees could not put it out. They finally called the fire department, but were too late to save the two-story building. The total loss was \$1.6 million.

Lesson: Inadequate covering of combustibles, fire watch and emergency response in a food processor

An oxyacetylene cutting torch was being used in a metal-lined freezing tunnel, with some pipes passing through the walls of the tunnel and making a loose fit with these walls. Sparks evidently passed through a crack to ignite polystyrene foam insulation. The ignition occurred during a rest period and was not discovered until the rest period was over. Further time was lost during a fruitless effort to extinguish the fire with extinguishers and a small hose. The fire department, when finally called, was confronted with a tough task due to the heavy smoke and the spread of fire to the concealed and undivided attic space. The total loss was \$2.3 million.

Lesson: Inadequate supervision of contractor in a metal worker

A contractor was stripping out a plating shop using heat and the work area contained plastic tanks. The contractor had their own hot work permit system in place to manage the work. The facility was unaware of the need to supervise the contractor's work and as a result was not aware that the contractor had left the site after completion of the work. The plating shop roof and contents were completely destroyed by a fire. The cause of the fire was an ignition of combustible materials, which lay hidden until the contractor had left the premises.

This document and hot work permits are available for download in various languages from the Allianz Global Corporate & Specialty website: <http://www.agcs.allianz.com/insights/white-papers-and-case-studies/hot-work-management/>. In addition, a complimentary Hot Work Management eLearning course is available covering types of hot work, loss lessons, managing hot work, and ARC hot work procedures.