

HOT WORK MANAGEMENT DURING CONSTRUCTION

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, drilling, soldering, brazing, torch-applied roofing, etc. Hot work also includes 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 is a main cause of fires in new and renovation construction projects

Hot work continues to be one of the main causes of fires in new construction and renovation projects. See the appendix for illustrative examples of hot work losses.

In an effort to reduce this fire hazard, Allianz Risk Consulting (ARC) 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 or on the Allianz Global Corporate & Specialty website, as indicated at the end of this document.

IMPORTANCE OF SAFETY SUPERVISION DURING HOT WORK

Hot work causes more construction fires than any other ignition source. It is essential to have the person in charge of fire safety supervise these operations and make sure adequate precautions are taken. If the work cannot be moved to a safe area, take precautions such as, relocate combustible materials or cover them with approved welding blankets, sweep up combustible dust and debris, etc. When absolutely necessary to perform hot work in an area with combustible materials, take appropriate steps as identified in your **hot work permit**.

HOT WORK

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 performing hot work at the site, whether they are employees of the contractor or subcontractors.

Trained personnel should be assigned the following responsibilities:

PERMIT ISSUER

- Has overall responsibility for proper implementation and management of the hot work
- Issues hot work permits after adequately assessing the risks in the proposed work area
- Completes final inspection of the hot work area to ensure it is safe
- Signs-off the hot work permit, if inspection is successful

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 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



Molten metal slag can ignite surfaces many stories below



Hot work permits should be required for anyone performing hot work at the site

Permit issuers, hot work operators and the fire watch, along with the support of construction management, should recognize their mutual responsibility for safety in hot work operations.

All contractor's employees engaged in 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 ensure that any needed changes and/or improvements are properly implemented.

EXAMPLES OF HOT WORK MANAGEMENT FAILURES

The following examples of failure in the management of hot work led to losses and serve as a reminder of the high level of control required. These include the failure to:

- Recognize that hot work may not be necessary when cold work could easily be utilized
- Undertake proper precautions and planning before issuing a permit
- Have a dedicated fire watch during and after hot work
- Be aware that sparks or molten metal can ignite surfaces many stories below
- Leak test burning equipment emitting flammable cutting gas in the hot work area
- Test for flammable vapors, particularly in adjacent areas to where the hot work is scheduled
- Clear floors of combustibles below hot work where undertaken above grated floors
- Understand what constitutes "hot work" and not using a permit for grinding or drilling activity
- Identify fire protection/detection systems in the work area, leading to erroneous discharge/activation of the system

HOT WORK PERMIT BEST PRACTICES

1. Hot work permits should be issued for any and all hot work that is conducted outside designated safe hot work areas (such as, maintenance shop areas that are arranged for safe cutting and welding activities). Hot work permits should be issued only by adequately trained employees
2. Hot work permits must only cover specific, identified activities and locations and be signed off at the end of each work period. Blanket permits covering hot work activities over an extended period or several days must not be allowed. 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 is required:
 - A complete description of the task that will be conducted
 - Clarification of exactly which areas and equipment will be affected by the work
 - Identification of the construction personnel who will conduct the work
 - Review of all potential hazards that could be associated with the work (in some cases, a job safety/hazard analysis should be conducted prior to initiating the work)
 - Review of all tools that will be used during the work and a confirmation that the cutting and welding equipment is in good condition
 - Verification that automatic sprinkler protection is in service, if applicable
 - Coordination of hot work that requires a permit with fire protection impairment permits (i.e., fire protection systems taken out of service). Ensure permit authorizers for hot work permits and impairment permits communicate planned work and active permits
 - Verification that portable fire extinguishers and/or fire hoses are present and in good working condition
 - Verification that all combustible materials, including flammable liquids, dust, lint and oily deposits, within 35 ft. (10 m) of the work area are removed
 - Verification that combustible materials that cannot be removed are covered with approved fire-resistive blankets



A fire watch should not only remain during the hot work, but should remain following completion as dictated by the hot work permit

- Assurance that floors are swept clean of combustible materials
- Confirmation that all wall and floor openings are covered
- Shielding and/or shut-down of ducts and conveyor systems that might carry sparks to distant combustibles
- Protection by approved fire-resistive blankets if hot work is done near walls, partitions, ceilings, or roofs of combustible construction
- Continuous gas monitoring with a calibrated portable gas monitoring device in areas where flammable vapors may be present, if there are any potentially flammable liquid or vapor exposures that cannot be completely eliminated. When continuous gas monitoring is not available, lower explosive level (LEL) readings should be recorded at least every 4 hours

3. Following a satisfactory inspection of the work area, the permit issuer issues a signed permit to the hot work operator and 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 at the site
5. A fire watch shall be maintained, per the requirements of the most recent edition of the NFPA 51B: Standard for Fire Prevention During Welding, Cutting, and Other Hot Work, during the performance of hot work and for 1 hour after completion of hot work operations in order to detect and extinguish any smoldering fires. Following the completion of the established fire watch time period, fire monitoring shall be provided and periodic inspections made at least every 30 minutes for an additional 1 to 3 hours, with particular vigilance exercised in the detection of smoldering fire. The permit issuer should determine the total duration based on the actual site conditions (i.e., presence of combustible materials in building construction, combustible materials stored, unprotected wall or floor openings, etc., within 35 ft. (11 m) of the work area, concealed spaces in walls or floors, or other conditions that could allow a fire to develop)
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 off on it
7. Completed hot work permits should be retained for at least one year for review by the contractor's safety managers and Allianz Risk Consulting



Grinding is an often overlooked hot work activity

Subcontractor considerations

If the project is using subcontractors, it is important that they adopt and implement the General Contractor's (GC) hot work program. The GC should take the following steps:

- Prior to allowing the subcontractor to begin work, ensure they are trained and fully understand and have implemented the general contractor's site-wide hot work program. There should not be different programs and permits
- Do not only contractually require the subcontractors adopt the hot work program but also audit and reinforce compliance. Explain that a lack of compliance can result in penalties including project default
- During routine work planning and subcontractor coordination meetings, discuss hot work activities and the hazards involved
- Address any violations, hot work program incidents, and take corrective actions during safety meetings and other meetings as needed

Appendix: Illustrative Hot Work Loss Lessons***Lesson: A proper hot work permit should always be used for torch cutting***

In April of 2013 careless cutting of reinforcing steel near the roof with no hot work permit and fire watch, allowed hot metal slag to fall from many stories above onto a large stockpile of roofing materials and insulation located adjacent to the building at the ground level. Wind was blowing from west to east, pushing the accompanying heat and growing flames toward the building, thereby damaging the adjacent curtain wall system. In addition to the curtain wall damage; the low roof membrane and materials were destroyed, and the concrete slab was affected. The pre-cast stone was also damaged by the firefighting operations. Incidentally, during repairs with the damaged curtain wall removed, the pipes supplying water to the building froze and ruptured resulting in another claim for water damage. The total loss was in excess of \$6mn.

Lesson: Removal or covering of combustibles and maintaining an adequate fire watch after hot work

In November of 2016 when carelessly welding brackets for mounting the curtain wall components on the 19th floor, slag from the welding operation fell onto the 7th floor terrace roof deck, igniting Styrofoam roof insulation, plastic sheeting and vapor barrier materials that were being installed on that level. The fire extended across a terrace roof deck and flames and heat extended up the exterior of the south façade glass curtain wall igniting additional insulation and shattering and damaging 67 curtain wall panels. The fire was very hot, taking several hours to extinguish and caused spalling of concrete on the parapet wall in several locations and destroying formwork. Smoke damage to the building's interior was also a result of the fire. The incident resulted in approximately \$18mn of direct fire damage and an additional \$2.3mn as a result of firefighting efforts.

Lesson: Review all potential hazards that could be associated with the work

During the removal of corroded bolts with an oxyacetylene torch which had been installed to affix tower crane support pads on the 14th floor, debris from the cutting/removal process hit an exposed gas main at ground level, causing escaping gas to ignite. As a consequence damage occurred to the works. The most significant damage was to electrical services. The gas supply to the entire area had to be isolated while repairs were carried out to the pipework. This in turn meant that the nearby large entertainment arena was without gas for at least 48 hours. The repair cost to the mechanical and electrical (M&E) subcontractor was approximately \$2.1mn. In addition to electrical services, there was damage to cladding, glazing and decorations on a number of floors. There were also losses incurred by the restaurants and concessions at the arena, due to the unavailability of the gas supply. The loss also triggered a 6 month delay in project completion and resulted in a total loss of \$10mn.

Allianz Risk Consulting's hot work complimentary client training module is available on the Allianz Global Corporate & Specialty website: agcs.allianz.com

Please request access to this training module from your Allianz Risk Consultant.

Reference:

NFPA 51B, *Standard for Fire Prevention During Welding, Cutting, and Other Hot Work*