



Don't Get Burned
by Hot Work

FM Global[®]



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Preventing fire caused by hot work takes teamwork between management and facility personnel. Executive-level managers need to be involved to enforce a solid program of property loss prevention and monitor workers closely. And, facility personnel need to play their part by following all precautions, no matter how insignificant they may seem.

This brochure defines the key elements of a successful hot work management program. It outlines for executives how to develop and implement an effective hot work policy. And, it details for facility personnel, as well as outside contractors, guidelines for safely performing hot work operations.



No Industry Is Safe

There's a strong chance your business will experience a major fire this year as a result of hot work—any operation that produces flames, sparks or heat. Cutting, welding, brazing, grinding, sawing, sweat soldering, applying roof covering, sealing plastic shrink-wrap by torch, and using a plumber's torch are all examples of hot work.

During the past 14 years, more than 645 serious instances of fire ignited by hot work damaged or destroyed a wide range of businesses insured by FM Global. Collective costs totalled US\$1.1 billion in property loss and interrupted operations—an average of US\$1.7 million per fire. Of those losses, all could have been prevented with proper hot work management.

In fact, one large company issued more than 27,000 FM Global *Hot Work Permits*—formal, written authorization controlling hot work operations—in three years without experiencing a single loss. (For more information on *Hot Work Permits*, see page 8.) And, company officials say this success wouldn't have been possible without top management's enforcement of a strong program.

Management: Create and Audit the Policy

Causes of Hot Work Fire

Each year, the same management oversights prevail:

- Incomplete property loss prevention procedures
- Personnel not following management's guidelines for protecting property
- Untrained personnel or unsupervised contractors taking shortcuts in the procedures
- Weak or out-of-date policies inspiring complacent supervision at the work sites

Implementing a Hot Work Management Program

- Control personnel activities before, during and after each hot work job.
- Put your hot work policy in writing and distribute it to all personnel (including contractors) involved with any part of the hot work process.
- Review and update the policy at least annually, otherwise changes in personnel or downsizing could keep the program from remaining effective.
- Train all personnel in how to follow hot work precautions.

Loss studies show many companies experiencing a hot work loss neglected four steps. Make sure your management program emphasizes them:

1. **Seek another method.** Search for an equally effective way to join, trim or sever without compromising mechanical integrity.
2. **Prepare the area properly.** Follow the Hot Work 35-ft. (11-m) Rule on page 4 and emphasize these precautions:

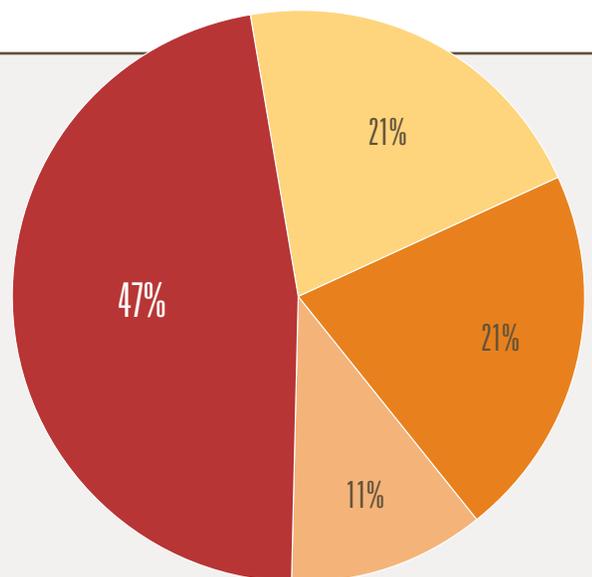
- Monitor the hot work area for at least four hours after the job is finished. Throughout the first hour, the fire watch continuously monitors the work site and adjacent areas. The areas should then be checked throughout the next three hours by appropriate electronic surveillance or another suitable option, such as a trained alternate for the fire watch or a security guard.
- Make sure construction in the work area is noncombustible, including insulation.
- Remove combustible contents, or cover with FM Approved blankets or pads.
- Sweep floors clean; wet down combustible floors. Cover them with wet sand or fire-resistive sheets.
- Remove flammable liquid, dust, lint and oily deposits; purge flammable liquid and vapor from containers.

Top Ignition Sources of Fire and Explosion (2000 through 2004)

(Gross loss in percentages)

Every year, hot work is among the top five causes of increasingly severe and frequent fire and explosion at properties insured by FM Global. Contractors performing the hot work accounted for 59 percent of the total cost and 52 percent of the gross loss amount.

■ Others, including exposure, smoking, friction, spontaneous ignition, overheating and burner flame	47%
■ Electrical	21%
■ Hot work	21%
■ Arson	11%



3. Make sure both fire protection and hot work equipment work properly.

Sprinklers, fire hose and extinguishers need to be available, be in service and operate properly. Hot work equipment should be in good condition.

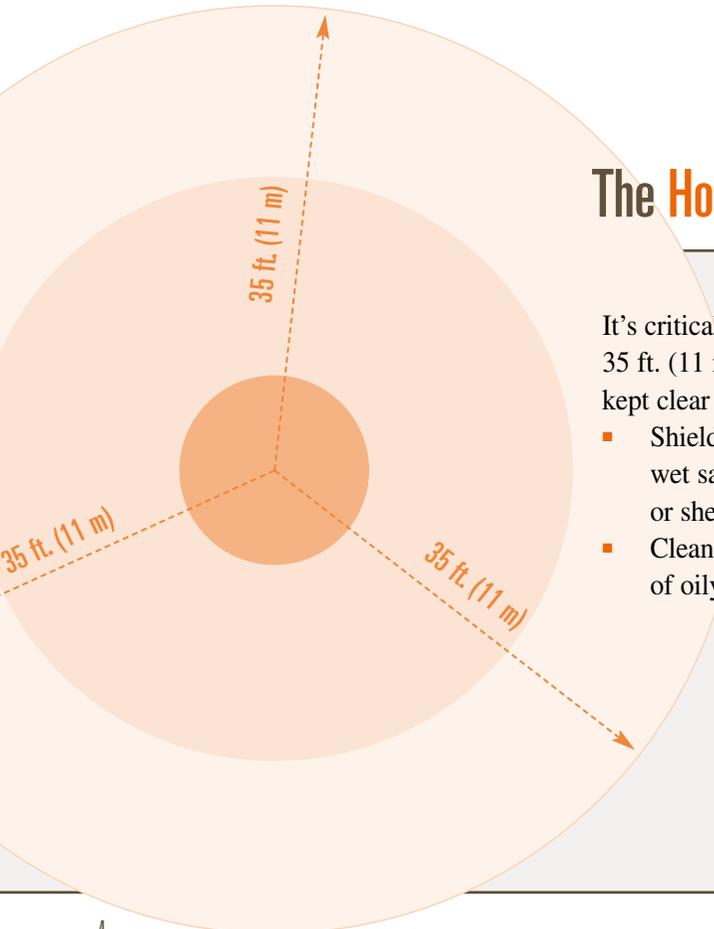
4. Train the fire watch:

- Make sure the fire watch checks adjoining areas, including above and below the work area and watches for fire during the hot work operation. This is especially critical where openings exist.
- Train the fire watch in using fire protection (extinguishers and charged hose lines) and sounding the fire alarm.

How Effective Is Your Hot Work Management Program?

- Do you have a written management policy covering plant or corporate intention to control hot work? Is it clearly communicated to all employees and contractors?
- Do you clearly communicate detailed, written hot work property loss prevention procedures to all employees and contractors?
- Do the procedures include all of the following:
 - » a requirement to seek alternative methods to hot work, particularly during the design phase of all new construction, repair and maintenance projects?

- » a process for evaluating the need for hot work?
- » an assigned, named position to manage the hot work program?
- » an assigned, trained, authorized hot work supervisor?
- » employee education and empowerment to stop unsafe hot work operations?
- » control and education of contractors?
- » formally stated consequences for violating procedures?
- Are firesafety supervisors:
 - » knowledgeable in fire hazards pertaining to building contents, operations and facility construction?
 - » fully trained in hot work property loss prevention supervision?



The Hot Work 35-ft. (11-m) Rule

It's critical that any area within 35 ft. (11 m) of the hot work is kept clear of combustible material:

- Shield combustible flooring with wet sand, fire-retardant tarpaulins or sheet metal.
- Clean up the area, especially of oily deposits and trash.

- Cover any storage or other combustible material that cannot be moved out with FM Approved blankets or pads. Block off any duct openings. Ductwork provides an easy path for sparks to travel to other areas of the facility or to ignite deposits or linings within the ductwork.

- » available (or on call) 24 hours a day?
- » contacted for all hot work (inside and outside of facility buildings)?
- » authorized to stop all hot work?
- » required to visit all sites before approving hot work?
- » required to personally complete the *Hot Work Permit*?
(This tag is conspicuously posted at the job site by the firesafety supervisor.)

Managing Outside Contractors

The trend toward outsourcing maintenance and renovations has its risks. A contractor may have the technical expertise to perform hot work, but he or she is not likely to have a full understanding of property loss prevention.

Before allowing contractors to start any job, it's crucial you make sure they:

- sign a contract agreeing to faithfully follow your hot work policy and understand the job will not proceed without one; and
- demonstrate proficiency in your company's hot work safety training program and ability to carry out procedures.

It also is essential to:

- Make it clear to all contractors (and facility personnel) your policies and regulations are to be followed or they will face potential job termination.
- Obtain references from other customers of any contractors you might be considering.

- Make sure bids and contracts clearly state your hot work policy. A few days before hot work begins, inform contractors in writing they are responsible for following your policy.
- Discuss the planned work with each contractor. Inquire about the contractor's expertise and concern for the possible hazards, especially as they relate to the building and work environment where the hot work will be conducted.
- Confirm contractors have proper insurance.
- Avoid signing any hold-harmless clause created by any contractor.
- Avoid waiving your company's subrogation rights.

- Cover or fill any openings in exposed walls, the floor and the ceiling with noncombustible material or FM Approved fire-stop material.
- Relocate any combustible material on the other sides of the walls being worked on. Clean dust and deposits outside and inside enclosures and ducts.

- If hot work will occur at an elevated location (i.e., on building framing, the ceiling or underside of the roof), provide a fire-retardant covering under the work area.
- Close all doors and fire doors. First, check to be sure there is no significant gap under the door or along its sides. Sparks can roll under a closed door and ignite combustible material outside the hot work area.

- Shut down ducts and conveyor belts, which can carry sparks to distant combustible material.

An alternative to the 35-ft. (11-m) rule is to designate an area only for hot work. This assumes the item being worked on can be moved into this area. Isolate the area from the rest of the facility using noncombustible screens or partitions. And, never let it become a temporary storage area.



Empowering Personnel and Making Them Accountable

Combustible products ignite from hot work just about anywhere—in offices, storage, manufacturing, even resorts. As a result, it's crucial that facility personnel play their part in controlling hot work operations by following every precaution, no matter how insignificant it might seem. Cutting just one corner undermines the whole hot work management effort and creates opportunity for another near miss or major loss. And, property loss can amount to job loss. (For more information on the role of facility personnel, see page 7.)

The Importance of Fire Protection

Manual fire protection (extinguishers, hose, etc.) should be operating and in place before the job starts. If automatic sprinkler protection is provided for the area, make sure the system is in service. The presence of sprinkler protection means either the area contains or is constructed of combustible material. And that one word—combustible—is a critical reason for conducting hot work with great care.

Other FM Global Hot Work Resources

Be sure to take advantage of other FM Global resources that provide more complete information on controlling hot work:

- *Hot Work Management* kit (P9601)
- *Hot Work Permit* form (F2630)*
- *Hot Work Permit System Wall Hanger* (P9311)*
- *Pocket Guide to Hot Work Loss Prevention* (P9602)*

**Available in several languages.*

Facility Personnel: Know the Hazards, Follow the Policy

The Hazard

The hot work hazard is often hidden, even to the most experienced workers. For example:

- Almost everything surrounding you can burn. Sparks and molten globules become uncontrolled ignition sources, often flying or rolling long distances. One spark landing on or near combustible material—like insulation, wood particles or flammable liquid vapor—is enough to ignite a fire.
- Sparks can settle in areas you can't see, such as the tops of high ledges, floor openings, vents or recessed walls or ceiling openings. And, they can smolder unnoticed for hours before igniting a blaze.
- Combustible material is not always visible. Cutting into a metal wall can ignite the inside wall. With enough heat, anything combustible on the other side—or close to it—can catch fire.
- The flame of a hot torch can reach up to 6,000°F (3,316°C). Hot work on vessels or tanks can ignite fire and explosion fueled by flammable deposits, vapor or gas that often are invisible unless the vessels or tanks are properly inerted and checked beforehand.

- Poorly maintained hot work equipment, such as hose and connections leaking gas, can ignite fire.

As a result, it's important facility personnel play their part in minimizing the risk of loss created by the hot work hazard. Although the firesafety supervisor and fire watch are responsible for specific duties, as outlined below, all employees need to assume accountability for following the precautions outlined in your hot work policy.

The Firesafety Supervisor

The firesafety supervisor's duties include enforcing the company's hot work policy and managing the activities of the fire watch and all outside contractors. Before authorizing any hot work job, he or she must ask two questions:

1. Is hot work the only option? Explore all other options first. Can work be completed some other way? Often the answer is yes. Consider:
 - Cutting with a hand or electric saw, or pipe cutter
 - Using a mechanical way to join items together with nuts and bolts, screwed fittings or couplings
 - Using hand-filing instead of grinding



- Installing threaded pipe instead of welded or soldered where local codes permit
 - Avoiding torches (many types of FM Approved roof coverings can be installed without torches)
2. Can hot work be performed in the area?
 - Visit the proposed hot work site, even if you're familiar with it.
 - Tour surrounding and adjacent areas (adjoining rooms and areas on the floor above and below).
 - Forbid hot work on equipment with combustible lining.
 - Avoid hot work on metal piping and ducts passing through combustible construction if high temperatures could affect that construction.

- Prohibit hot work in any area where the hazard cannot be eliminated or controlled, and clearly post “NO HOT WORK” signs or equivalent. Examples of such areas include:

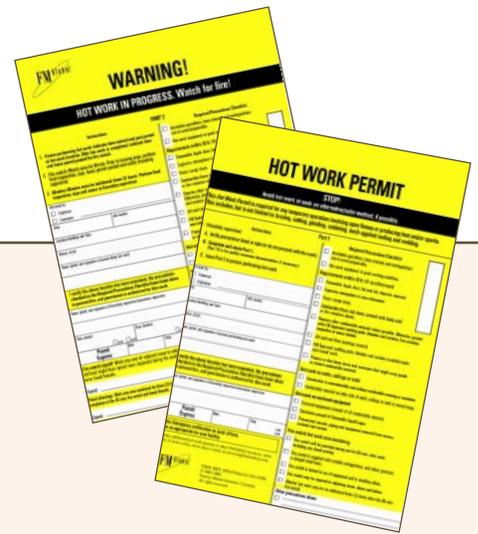
- » Any hazardous process involving flammable liquid, gas and dust that cannot be shut off
- » Concentrations of flammable vapor, gas or dust that cannot be eliminated
- » Walls, ceilings or floors that have combustible facings or combustible insulation
- » Combustible storage that cannot be relocated or covered completely with a fire-retardant cover

Authorizing the Hot Work Job

If there is no alternative to hot work and the area in question is firesafe, the firesafety supervisor uses the three-part FM Global *Hot Work Permit* to authorize the hot work. Before signing the permit, he or she discusses with the hot work operator and the fire watch exactly what the work will involve, and ensures precautions on the permit have been taken. Then, one part of the permit is displayed prominently in the work area, while the others remain with the supervisor—

one for quality assurance and the other for filing. Precautions listed on the permit include:

1. Identify what combustible material and types of flammable liquid are in the immediate and surrounding area. Then:
 - Shut off, drain and purge flammable-liquid piping systems.
 - Relocate flammable liquid and combustible material at least 35 ft. (11 m) away from the work area.
 - Remove lint or dust deposits.
 - Clean up scrap material from the floor and nearby equipment.
 - Look for concealed spaces and openings into adjacent areas, and spaces below, adjacent or above the work area. Seal openings (basements, the floor above the work area, spaces above the ceiling, ductwork, hollow walls, etc.) tightly with noncombustible or fire-retardant material.
 - Use FM Approved welding pads, blankets and curtains to fully shield items that cannot be moved due to their size, including combustible walls, ceilings and floors.
 - Plug floor, ceiling and wall openings with an appropriate fire-stop material.
2. Verify existing automatic fire protection systems remain in service and appoint only trained personnel to use the portable equipment.
 - Bring portable fire extinguishers to immediate and surrounding areas.
 - Lay out fire hose and charge them.
 - If automatic sprinklers are not installed in the area of hot work operations, alert the local fire service that hot work is being performed.
 - Advise the plant emergency response team and security personnel about the hot work activity, including its location and involved personnel.
3. Assign a qualified fire watch to monitor the hot work area and other areas exposed to stray sparks or heat, including areas not directly visible from the immediate hot work area.



4. Make sure only qualified employees or contractors perform the hot work; review their credentials for the job.
5. Verify all hot work equipment is in good working condition, especially hose attachments. This includes contractor equipment.
6. Make sure all personnel involved with the hot work job know when and how to summon emergency assistance, should it be needed (location of phones, numbers, etc.).
7. Assign personnel to adjacent areas, including the floor above and below, to watch for possible fire during the hot work operation. This is especially critical when openings exist.
8. Issue the *Hot Work Permit* to expire at the end of the shift or after eight hours, whichever is shorter.
9. After investigating the hot work site and verifying all items listed above, complete the *Hot Work Permit*, including:
 - Name of person (employee or contractor) performing the job
 - Date of job and job number
 - Location of hot work
 - Nature of job
 - Date and time of expiration

10. Ensure the person performing the hot work hangs the completed permit in a visible place in the work area.
11. Reinspect the hot work area and surrounding space at the end of the monitoring period. If all is safe, sign the permit, remove it from the area, and keep it for a record.

The Fire Watch

The fire watch reports to the firesafety supervisor. The job of the fire watch is twofold: prevent fire and be ready to respond if one starts. Specifically, the fire watch:

- Stays near the person performing hot work
- Closes all fire doors
- Makes sure the work area remains free of combustible material and tarpaulins are not moved
- Monitors the hot work area for at least four hours after the job is finished. Throughout the first hour, he or she continuously monitors the work site and adjacent areas. During the next three hours, the areas should be checked by appropriate electronic surveillance or another suitable option, such as a trained alternate for the fire watch or a security guard

- Pays particular attention to hot work jobs at elevated locations, on the building roof, or in walls, and inside buildings with multiple floors; these areas often are not watched carefully enough and frequently have ignited from stray sparks smoldering long after workers have left the job site
- Never leaves the area while work is in progress or during breaks (such as coffee or lunch) unless relieved by a qualified replacement
- Stops the hot work if improper conditions develop
- Is ready to sound the alarm and use an extinguisher or fire hose if a fire starts

Follow All Hot Work Permit Precautions

FM Global's *Hot Work Permit* has long been reliable for helping companies prevent fire caused by hot work, but it is just a tool, effective only if it is followed carefully. Used properly, a permit tracks each step of a hot work job, and serves as a guide, a warning tag and careful record.

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