



Understanding the Hazard

Hot Work

Human Element

Hot work can create a severe fire hazard. The way you manage hot work in your facility can make the difference between a minor, temporary risk and a major threat to your business's future. FM Global can help you understand the risk your company may face as a result of this hazard.

UTH topic categories:

- Construction
- Equipment
- Fire Protection
- ▶ **Human Element**
- Natural Hazards
- Process Hazards

This series of publications is designed to help you understand the everyday hazards present at your company's facilities. For more information on how you can better understand the risks your business and operations face every day, contact FM Global.



The Hazard

Businesses become successful because their management takes calculated risks based on research and planning. Yet, every day, these same businesses are willing to risk their very livelihood by allowing uncontrolled hot work in their facilities.

Hot work is any temporary operation involving open flames or producing heat and/or sparks. This includes, but is not limited to, brazing, cutting, grinding, soldering and torch-applied roofing.

By its nature, uncontrolled hot work is a roving fire hazard in your facility. The trend toward outsourcing complicates this issue when contractors are hired who don't have the necessary expertise or knowledge of construction hazards at your facility.

Science of the Hazard

All forms of hot work can ignite combustible material.

Heat Source Temperature Ratings

Electric Arc Welder	10,900°F (6,038°C)
Oxygen/Acetylene Cutting Torch	6,330°F (3,499°C)
Propane Torch	3,595°F (1,979°C)
Welding Torch Slag	> 2,000°F (1,093°C)
Electric Heat Gun 600	600°– 1,350°F (316°– 732°C)
Radial Metal Cutting Saw	> 1,000°F (538°C)
Wheel Grinder	> 1,000°F (538°C)

Ignition Temperature

Styrene	914°F (490°C)
Typical Asphalt	905°F (485°C)
Polyurethane Foam	824°F (440°C)
Lubricating Oil (Motor/Mineral)	500°– 700°F (260°– 371°C)
Mineral Spirits	473°F (245°C)
Wood Products	380°– 800°F (193°– 427°C)
Corrugated Paper	380°– 500°F (193°– 260°C)

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What You Can Do at Your Facility

Now:

- Consider alternative methods to hot work.
- Call your local FM Global office or engineer if you have any questions about planned hot work activity.
- Maintain high levels of housekeeping throughout the facility.
- Do not allow hot work in any area where automatic sprinklers are not in service.
- Implement the FM Global *Hot Work Permit System*.
- Require the use of FM Approved welding pads, blankets and curtains when hot work activities are performed at your facilities.
- Require all contractors to follow the same standard.
- Restrict hot work in areas identified as not suitable.

Soon:

- Establish a policy for hot work that clearly states:
 - Required procedures
 - Authority given to the person responsible
 - Disciplinary action for noncompliance
- Develop and implement a contractor hot work policy that states your company requirements, specific safety issues and insurance coverage expectations. This should be part of contractor training.
- Designate specific facility personnel to manage your hot work and provide ongoing training for all personnel involved.
- Conduct internal audits of your hot work process.

The by-products of hot work (such as sparks and embers) can reach areas that are not easily seen, including:

- Operating HVAC systems
- Openings around pipes extending through walls/floors
- Openings in floors
- Concealed spaces with combustible construction
- Equipment with combustible linings
- Conveyors

A fire in a hidden area often can go unnoticed until it's well established. A hot work fire can smolder for several hours before breaking out in open flames — potentially long after your facility is shut down for the day.

Outside contractors bring a level of expertise to the areas of work they perform. But, these contractors specialize in their particular business activity and not in property loss prevention or the hazards specific to your facility. FM Global loss history shows the risk of fire can more than double when outside contractors perform hot work without facility supervision; during the last 20 years, contractors have accounted for 59 percent of hot work loss. This statistic indicates contractors often don't understand what can burn in your facility or how the hot work they perform can cause a fire.

Loss Experience

Hot work is an increasing cause of fire and explosions throughout the world. FM Global loss history clearly shows there is no industry or type of facility immune to this hazard. During the past 15 years, one out of every 20 fire losses reported by FM Global clients was started by improperly managed hot work. And, each was preventable.

Hot work is one of the three most common causes of fire at FM Global-client properties. In a recent 20-year period, FM Global clients reported 969 hot work losses for a staggering gross dollar amount of more than US\$1.68 billion — or an average of US\$1.7 million per loss.

All Hot Work Fires Are Preventable

There are many points in the hot work process where people have the opportunity to stop a fire before it starts. Effective hot work control starts at the top. When management understands the hazard involved and is committed to mitigating the risk created every time hot work is conducted, hot work loss is preventable. But, being able to implement an effective control program for any human element process requires support from all employees involved. The key is teamwork, education and a clear understanding of the associated hazards and risks.

Hot Work Alternatives

- Install equipment assembled with mechanical connections vs. welded connections.
- Design changes for existing equipment—bolted assembly vs. welded.
- Use alternative equipment:
 - Reciprocating saw, manual hydraulic shear or hand saw vs. cutting torch or powered radial saw
 - Self-tapping screws vs. tack welding or brazing
 - Threaded pipe vs. sweat-soldered pipe

For Less Hazardous Hot Work, Use:

- Heliarc welding vs. electric arc-stick welding.
- Electric heat gun vs. open-flame torch.
- Electric soldering iron vs. torch soldering.
- FM Approved welding pads, blankets and curtains. These are fire-resistant covers that prevent the ignition of combustible material.

These options still require hot work management.

Designate a Hot Work Area

Designate an area specifically constructed, protected and arranged to accommodate safe hot work. These areas do not require any permit system, but appropriate firesafe conditions should be maintained within them.

But What About...

...FM Global's requirement for a 1-hour fire watch followed by a 3-hour monitoring period after welding? You're the only organization I know of that wants to occupy my staff that long.

Hot work loss experience has provided valuable information to back up our time requirements for a fire watch and monitoring. FM Global analyzed its clients' fire and explosion losses where the probable cause was hot work, and found 247 incidents where the hot work permit system either was not used or was used incorrectly. In 38 of these losses (totaling US\$90.1 million), the fire or explosion was discovered three or more hours after the hot work was completed. Furthermore, a disturbing number of these fires occurred while the personnel who were supposed to be keeping watch were on lunch or coffee break.

An example of a fire watch success was also recorded, however. At a hospital, a fire occurred as the result of a contractor installing a new, torch-applied roof system. The client had implemented a fire watch that included an inspection of the work area every 15 minutes. Approximately two hours after the roofers left, the person on fire watch discovered a fire involving the new roof and the exterior insulation finishing system (EIFS) construction of the penthouse walls; he put out the fire using a portable extinguisher, and the estimated gross loss was limited to US\$25,000.

...a lack of personnel?

Hot work is hazardous under the best of conditions. Taking shortcuts when safeguarding a hot work activity increases the risk of fire at your facility. Because hot work often is conducted during off shifts or weekends, the risk is increased even further because a fire is more likely to go unnoticed. Management needs to make a commitment that hot work will be supervised at all times. If adequate personnel cannot be spared to manage hot work activities, wait to have this hazardous work performed until it can be managed properly.

...the fact hot work is not performed at our facility?

Hot work may not be performed today or tomorrow, but what about next year or the year after? No facility is completely exempt from hot work unless management has restricted this type of work. Hot work is not just cutting or welding with an oxy/acetylene torch or using an arc welder. Other, less obvious, forms of hot work often are overlooked and, consequently, not managed. Which of the following hot work scenarios might be conducted in your facility?

- A roofing contractor using a propane torch to heat-seal the asphalt sealer around your roof drains
- A maintenance person using a propane torch to sweat-solder copper fittings on building plumbing or the cooling lines for air conditioning systems
- A contractor employing an electric heat gun during renovation to remove wall coverings

Need More Information?

Ask your FM Global engineer or client service team about the following:

- Exemplary hot work management in similar-sized facilities
- Contractor management strategies
- Effective use of the FM Global *Hot Work Permit System*
- FM Global Property Loss Prevention Data Sheet 10-3, *Hot Work Management*

Ordering Information

For additional copies of *Understanding the Hazard* publications, contact your FM Global engineer or client service team.

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By recognizing these lesser-known forms of hot work and managing them properly, you can reduce the fire hazard involved.

Know the Hot Work Requirements

Hot work management is not just good business sense, but often a requirement of local codes or national standards, such as those instituted by the National Fire Protection Association (NFPA), Occupational Safety and Health Administration (OSHA), and BGVR (the German equivalent of OSHA). The need to manage hot work activities to prevent fire/explosion is clearly stated in NFPA 51B; OSHA 1910.252, *Welding, Cutting and Brazing*, and 1910.119, *Process Safety Management*; and the National Fire Code of Canada. Check with your local, state and national government to see what requirements may govern hot work in your area.

Allowing uncontrolled hot work within your facility is risky business at best. You may be lucky, but how close to a fire do you want to come? Management of the hot work hazard is good business practice—you don't need to get burned to know that having a preventable fire is not good for your business.

Considering all the risks uncontrolled hot work can create in your facility, can you really afford to not manage it? The cost of taking that chance can be the most expensive business decision your company makes.

Don't Let This Happen to You



Failure to properly manage hot work can result in a catastrophic fire.