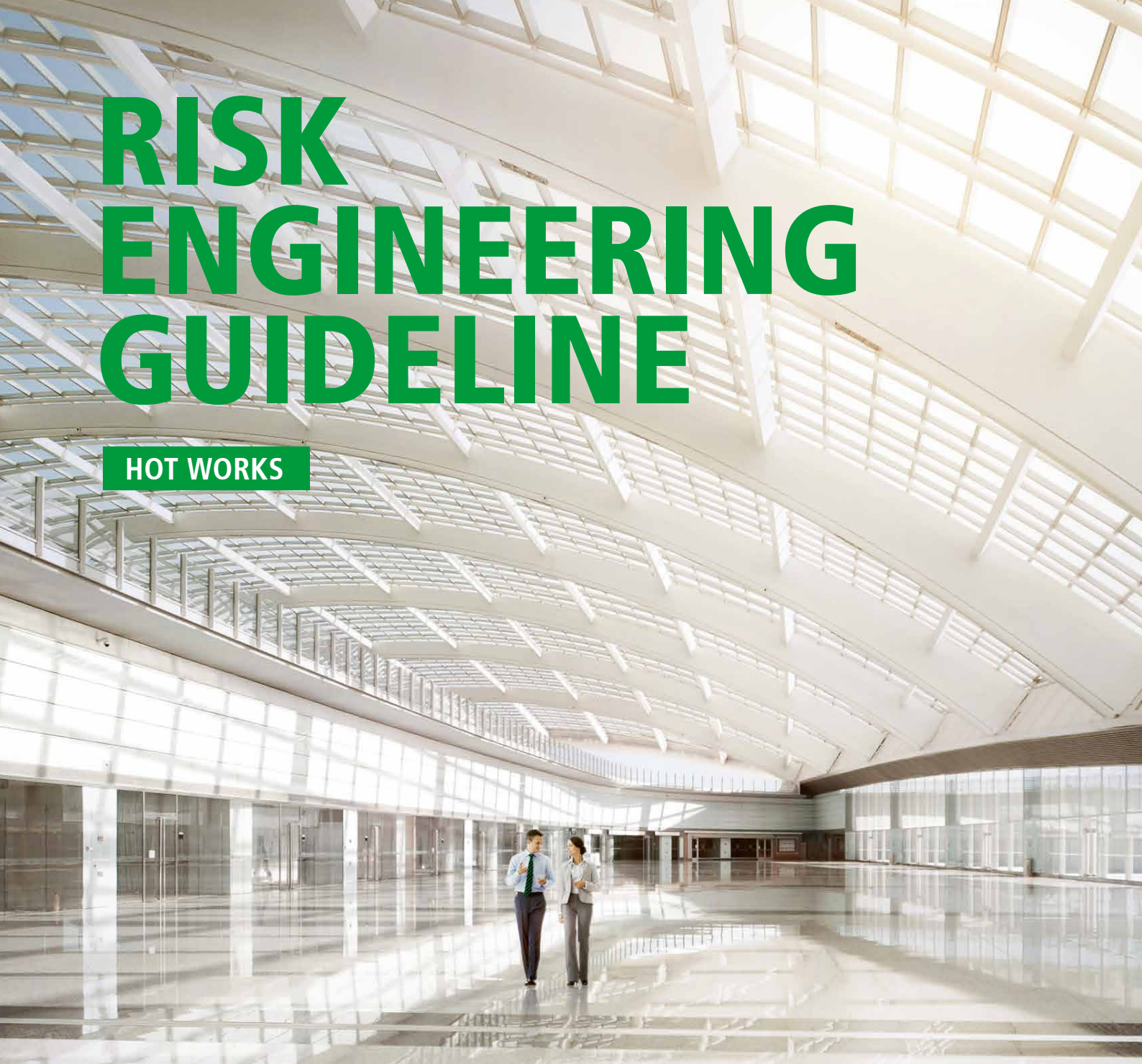
RISK ENGINEERING GUIDELINE

HOT WORKS



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Property

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The current statistics on causes of loss do not leave any doubt about the fact that hot work is a cause of large-scale fires.

General.

Time and again, hot work (welding, torch cutting, grinding, soldering, foil shrinking, heat bonding, etc.) have been the cause of enormous fire losses, in some cases involving tragic personal injury. In view of the high number of fires that are caused by hot work, it is even more important to point out the hazards as well as loss prevention measures that must be observed during these activities. This Risk Engineering Guideline lists and defines the requirements for the protection measures.

1 Current Situation.

The current statistics on causes of loss do not leave any doubt about the fact that hot work is a cause of large-scale fires. These endanger human life, destroy considerable material assets, and result in potential business interruption disasters. Time and again, the media have reported on large fires that were caused by hot work. Analysing losses over the past few years, a continuous increase in loss frequency and loss amount can be seen, mainly caused by failure to observe necessary precautions before, during and after the hot work. The only way to increase awareness among the people entrusted with these activities is through regular targeted training to ensure that the principles of loss prevention that have proved successful are sufficiently observed.

2 Risk Situation.

In particular, the risk arises from the fact that the person who carries out the work, is often not familiar with the nature of the environment in which the work will be done and assesses the major hazard features incorrectly. The commissioning company or the commissioning department also often underestimate the incipient fire hazards present.

The following must be investigated:
- What kind of combustible materials are present and
- which surrounding areas are exposed?

Hot works always involves a potential ignition source. Approx. 80 % of all cases of fire losses caused by hot work are due to human error or incorrect organisation and approx. 20 % are due to technical causes, such as defective or unsuitable tools. It is thus evident that effective fire protection requires detailed knowledge of the process, operation and the plant. A lack of knowledge that might exist can be corrected by exchange of information or obtaining of information. There after, the most important hazards associated with hot work are evaluated and based on this, the various necessary protection measures are derived.

2.1 Thermal Energy

The execution of hot work always involves ignition sources due to the high temperatures generated during the process. The heat source (flame, arc) reaches temperatures of up to 4,500°C. Furthermore, thermal radiation that might ignite combustible materials must be considered within a radius of approx. 1 m around the workplace.

2.2 Thermal Conduction

Heat emanating from hot work can potentially travel (via conducting materials) a considerable distance from the point of the hot work. Build up of temperatures is possible leading to ignition in areas seemingly safe. For example, during the execution of welding, torch cutting and brazing work on pipes, hot fumes flow through the pipes in concentrated form instead of being cooled down by the ambient air, as it´s otherwise the case. The route of the pipework as well as the end of the pipe is particularly at risk due to ignition of dusts, flammable liquids and gases. Due to thermal conduction, combustible materials in adjoining rooms might ignite under unfavourable circumstances (e. g. heat conduction through heating pipes).

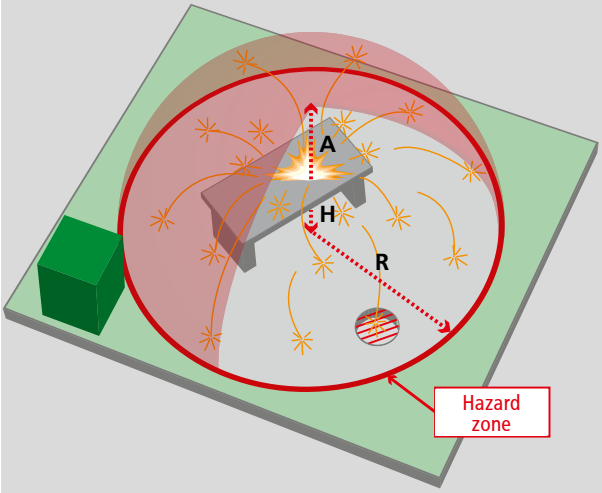
2.3 Sparks and Drops

Sparks, drops and red-hot parts are by-products generated during hot work. These red-hot particles diffuse according to the laws of ballistics and due to their frequently small particle size often escape through existing cracks and joints in the building, reaching targets that were not sufficiently considered as hazard areas when the safety measures were defined.

2.4 Hazard zone

For proper execution of the work a defined hazard zone around the workplace must be observed, depending on the process. The following details for determining the hazard zone take the total range and the ignition capacity of red-hot particles on combustible solid materials into

Figure 1 Dispersion of glowing particles and scheme of hazard zone



hot work	lateral radius $R_{ordinary}$ height of workplace (H) ≤ 2 m	distance upwards
brazing and soldering, heat bonding	2 m	2 m
welding	7,5 m	4 m
torch cutting	10 m	4 m
abrasive cutting	6 m	3,5 m

remark:
if height of workplace (H) ≥ 2 m, then $R_{large} = R_{ordinary} + ½ * (H - 2 m)$.

account. The information is based on proper execution of the work even under difficult circumstances, including normal process faults (e. g. torch backfire) This is not applicable to explosive atmospheres (gas, vapour, mist, dust or air mixtures) as the minimum ignition energies of these substances/systems are considerably smaller than that of solid materials. In such cases, it must be checked separately whether hot work may be executed at all!

The hazard zone (torch cutting and welding) should be dimensioned as follows:

- The vertical area (safety distance A upwards, referring to Figure 1) should be at least 4 m.
- The horizontal area (lateral safety radius R, referring to Figure 1) should be at least 10 m. Strong wind influences which become more significant with increasing working height (outdoors), must be considered separately in this context.
- For working heights that exceed 2 m, the lateral safety radius R must be increased by 0.5 m for every additional working height metre.

Partitions and effective shields can restrict the hazard zone. However, the effect of partitioning walls and floors as presumed delimitations of and fire protection for the hazard zone may be nullified because joints, cracks, openings and sloping surfaces might facilitate expansion of a possible fire beyond this area and into lower floors and adjoining areas.

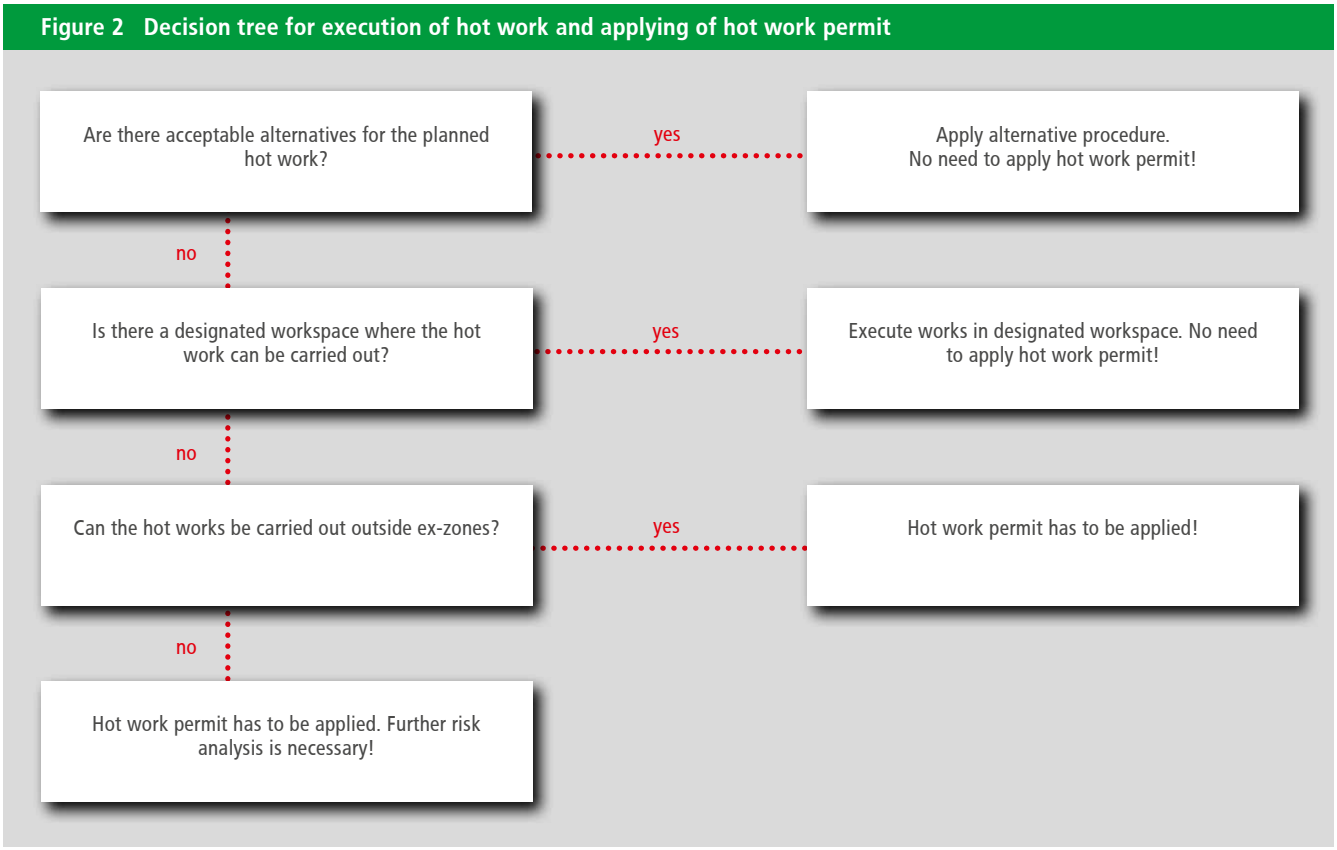
In view of ignition risks due to sparks and drops, it must be considered that the incipient fire hazard increases with increasing size and amount of these red-hot particles. Even a so-called "extinguished" weld bead represents an effective long-term ignition source, in particular in the event of sparks from autogenous and torch cutting. This becomes obvious when an "extinguished" weld bead hits an obstacle and bursts. The superficial red heat will then normally be visible again.

3 In-House Organisation.

Prior to execution hot works, the use of alternative methods, so-called cold processes (e. g. sawing, screwing, cold bonding etc.), should be examined. If possible the peaces should be taken; a designated safe area such as a maintenance workshop. Where it is not possible to dismantle components, or if there are any other reasons why the work cannot be executed at the designated workplaces, the hot work permit procedure must be followed.

If work has to be executed in areas with a potentially explosive atmosphere (gases, vapours, mist, dust), a separate risk analysis must be carried out (also refering to Check List Point 2.2 in the appendix). The general procedure to be followed is shown in the diagram in figure 2.

Figure 2 Decision tree for execution of hot work and applying of hot work permit



It must be ensured through organisational measures that, if hot work must be executed outside a designated place in the plant, explicit authorisation in every case must be obtained from the company or a designated person. It must be ensured that no unauthorised hot work at the plant is permitted at any time. Adoption of robust procedures in respect of hot work is advised. The definition of suitable rules in the respective "Fire Protection" section of the Plant Fire Regulations (for example in accordance with DIN 14 096) has proven worthwhile in this regard. In addition, the execution of hot work must be defined in detail by creating a separate standard for operating procedure adapted by the individual plant, especially for recurring work. Corporate management must ensure that suitable rules are implemented.

4 Loss Prevention Measures.

Consistent loss prevention measures are needed. Loss prevention measures should be carefully defined and applied to own employees as well as any contractors carrying out hot work on site.

4.1 Measures to be taken prior to beginning with the work

Prior to executing any hot work, complete the "Hot Work Permit". The "authorising supervisor of the plant" must have sufficient knowledge of the site, must be competent and capable of assessing the risk situation and must have the authority to give any necessary further instructions.

- Remove any combustible objects, materials, oil and dust deposits from the hazard zone. Remove large combustible covers and insulations from the area.
- Cover permanently installed objects and components with non-combustible panels or non-combustible mats.
- Seal close joints, cracks, pipe lead-ins and the like with non-combustible materials (e. g. gypsum, clay or mortar).
- Cool components that are exposed to a thermal conduction risk (e. g. copper pipes) with water.
- Check for any combustible materials in wall cavities (e. g. foam insulation) or behind a wall, in particular when working on or close to continuous metal profiles, pipes etc.
- Empty, degas and, if necessary, purge with inert gas any containers and pipework with combustible contents. Measures to ensure ventilation might be required.
- Safely exclude the existence of a dangerous explosive atmosphere due to inflammable gases, mists, vapours or dusts, or fire-accelerating atmosphere (e. g. oxygen enrichment) in the hazard zone.
- Close off the workplace (torch cutting and welding, at least 10 metres around and up to 4 metres above the workplace.
- Hot work may only be carried out by reliable people 18 years and older who are familiar with the devices and the processes. Untrained and underage people may only carry out such work under supervision.
- Inform external staff in detail on the fire and explosion hazards at the plant.
- Employ a trained fireguard at a place from where the entire hazard and hazard zone, in particular the diffusion of sparks and drops into adjoining and lower plant areas, can be monitored. Under no circumstances should the fireguard be responsible for simultaneously monitoring several fire workplaces that are situated apart or that are not within the direct influencing range (operating range) of the fireguard.
- Suitable and functional fire extinguishers should be available one portable fire extinguisher is not always sufficient. An unreeled pressurised water hose with connected nozzle pipe (e. g. from a wall hydrant) might be additionally required for specific work (e. g. work on the roof).
- The person carrying out the work and the fireguard must know the location of the closest fire alarm and/ or telephone and the necessary telephone numbers.
- Set up an alarm plan. Radio alarm to a permanently staffed office might be required to ensure that the fire department will be alarmed without delay.
- Inform control departments like the plant security, fire alarm center and plant fire brigade.
- Automatic fire alarms and sprinkler systems may not be put out of service completely. Where faulty activation can be anticipated due to deceptive variables, switch off only the area where the work is to be executed. Define alternative measures in the event of any shortcomings in the monitoring. Always discuss such measures with the fire department and the fire insurance beforehand.
- Keep the workplace clean and tidy.
- All tools must be operational.
- Disconnect power supply to the work zone/installation, if necessary.

A sample checklist has been attached as Annex to this Risk Engineering Guideline. The list facilitates easy checking of the safety relevant requirements for determining loss prevention measures. If necessary, these must be more detailed than any company requirements.

4.2 Measures to be taken during the work

- Continuously check whether the loss prevention measures defined prior to beginning of the work are observed.
- Continuously check the adjoining areas as well.
- In plant areas with dust exposure where extensive removal of dust or lint is not feasible completely or sustainably prior to beginning of the work, thoroughly wet a large area of the floor.
- In the event of a fire, immediately stop the work and alarm the fire brigade. After that, start immediately with fire fighting.
- Ensure that the work area is continuously monitored also during work breaks (e. g. lunch break). Before breaks, switch off or put out of service all production facilities in the correct manner.

4.3 Measures to be taken after execution of the work

- Once the work has been completed, immediately remove welding equipment, gas cylinders etc. from the work area.

- After completion of the work, also carefully remove all covers.
- Due to the smouldering fire risk, the fireguard must continuously check the entire environment of the workplace (hazard zone) for a period of 30 minutes. After that, half-hourly inspections must be ensured for another four hours. In addition, mobile fire alarms may be used.
- In order to be able to extinguish any detected incipient fires immediately, a fire extinguisher has to be in the area for least the next four hours.
- If any fire protection systems were placed out of operation these must be activated immediately after the end of the works and the involved fire brigade or insurance company must be notified.
- The permit must be returned to the issuing person/ department for "signing off". Any incidents that might have occurred during execution of the work must be logged.

5 Special Hazards.

5.1 Propane Burners

The use of propane burners represents a special hazard. When these are used, additional loss prevention measures must be taken:

- Place liquid gas cylinders in an upright position and secure them against toppling over.
- Do not store more than half of the daily requirement at the workplace.
- Remove empty gas cylinders immediately from the work area.
- Provide gas hoses with leakage or hose breakage security devices to prevent escaping of gas and thus gas accumulation at lower places around the workplace.

5.2 Hot Work on Roofs

When executing hot work on roofs, keep in mind that there are often combustible components in the form of lattices, heat insulations, foamed plastics, vapour barriers, bituminous and high-polymer (synthetic) roof sheeting.

Roof sealing and roofing material must adapt to the shapes of roof structures. They are formed or joined using heat by soldering, bonding or welding. These processes also fall under the term "Hot works".

In-house fire protection installations, such as sprinkler systems, are bypassed in the event of a fire in the roof area and are thus ineffective.

Therefore, hot work on roofs requires particularly careful checks and preparation. The workplace must also be equipped with suitable fire extinguishers.

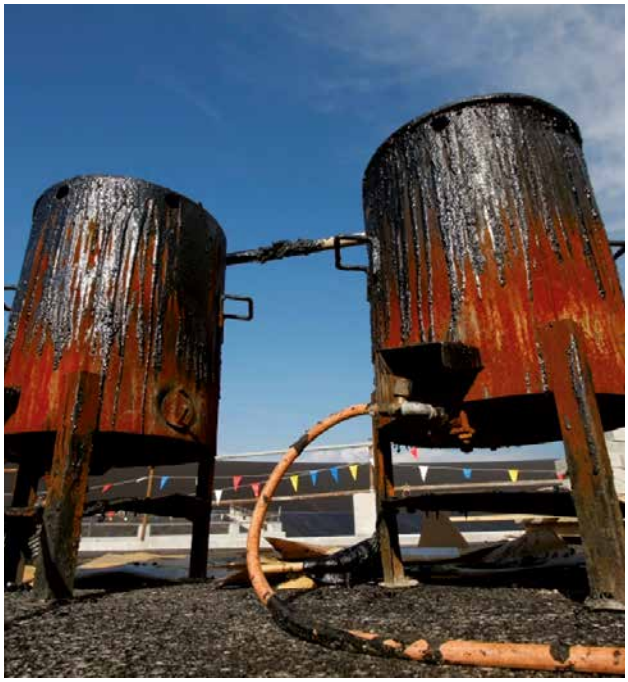
Any existing risers must always be included in the protective measures to be taken when carrying out hot work on roofs. For this, a pressure hose and nozzle pipe must be connected to the risers in the work area prior to beginning with the hot work. Unreel the hose and keep it under pressure and ready for use at all time until the work has been completely finished.

The mobile fire control equipment may only be removed once the necessary inspections have been completed.

5.3 Tar boilers

The following must additionally be observed when tar boilers are used:

- Do not install and operate old and worn boilers that require repair.
- Do not install boilers on an combustible base but rather on a non-combustible floor plate (possibly with drip pan).
- Monitor the boiler also during work breaks.
- Do not extinguish a burning tar boiler with water. Only use powder or foam extinguishing agents or smother the flames with the lid.



5.4 Burning metals

When using highly combustible metals/metal dusts, provide special fire extinguishing agents, so-called D powder extinguishers, prior to beginning with the hot work.

6 References.

Local Standards should be complied with.

VdS 2038	General Safety Regulations of the Fire Insurance Companies (ASF)
VdS 2047	Safety Regulations for Hot Work
VdS 2008	Hot Work
VdS 2036	Hot Work Permit
VdS 3450	DVD Training Video „Welding, Cutting, Grinding“
VdS 2894	DVD Training Video„Working on Roofs with a Naked Flame“
DGUV Regel 100-500 Kap. 2.26	Welding, Cutting and Related Processes
DGUV Information 205-002	Fire Protection during Welding and Cutting **Work**
CFPA-E Guideline No 12	Fire safety basics for hot work operatives
NFPA 51B	Standard for Fire Prevention During Welding, Cutting, and Other Hot Work

Checklist for execution of hot work

The check list below is to enable the person granting the permit to define the safety precautions necessary for hot work, using safety-relevant questions and observations. This check list does not claim to be complete.
In the text below, the person carrying out hot work will shortly be referred to as the"welder", even when other hot work are carried out.

Preconditions

To grant the hot work permit including the definition of the necessary safety precautions, the following preconditions are absolutely necessary:

- The person granting hot work permit must be precisely informed about the working sequence, i. e. the execution of the job in work steps, under particular consideration of fire and explosion protection.
- A preliminary examination must have shown that the works cannot be substituted by other methods involving a smaller hazard, e. g. sawing, chiselling, drilling, flanging, bolting, gluing or removing.
- A preliminary examination must also have shown that the hot work cannot be executed at specifically set-up welder's workplaces or workshops.
- If hot work must nevertheless be executed, as a basic rule all mobile combustible materials must be removed from the hazard area before starting hot work. Immobile combustible objects shall be covered up with non-combustible materials so that no gaps are left uncovered. Gaps, holes, breakthroughs and other openings in ceilings, floors and walls separating adjoining rooms shall be thoroughly sealed with non-combustible materials.
- The definition of the safety-relevant requirements in connection with specific hot work shall be made under consideration of the points below, before granting a written hot work permit (preparation of permit) and/ or before preparing operating instructions in each case.

1 Preparatory and accompanying work organisation

No.	Requirement	Yes	No	Remarks
1	Is a reliable and qualified expert in charge of the execution?			
2	Does the person executing the work have comprehensive information about the local conditions?			
3	Has a (or have several) trained firewatch(es) ("welding guards") been appointed?			
4	Following the safety check, have the resulting measures been considered in the permit procedure and have the relevant safety precautions been defined?			
5	Has the permit including the list of safety precautions for hot work been filled in completely and legibly and signed at least by the following persons: Supervisor granting the permit, executing "welder", firewatch?			
6	Has the supervisor granting the permit ensured that all executing "welders" and firewatches have understood all safety information regarding both content and language?			
7	Does the executing "welder" permanently carry a copy of the valid permit with him?			
8	Does the firewatch have sufficient competence for stopping the hot work if necessary when safety precautions are disregarded or when unforeseeable hazardous situations occur?			
9	Have the "welder" and the firewatch coordinated with one another about the sequence of work/hazard area and checks?			
10	Are permanent checks by the firewatch regarding the observation of the safety precautions made prior to starting the work necessary?			

11	Are the welding flame and the flying sparks as well as other processes important from a fire protection point of view permanently observed by the executing "welder(s)" and firewatch(es)?			
12	Are safety precautions once made corrected in good time when the situation during the hot work requires such a step?			
13	Is the open flame of ignited and temporarily put down "welding and cutting torches" permanently observed by the firewatch?			
14	During the welding breaks, is the electric welding wire holder of electric welding units put down on an insulated support or suspended so that it will touch neither the workpiece nor its support connected to the power supply?			
15	Is the electric welding unit shut down on the power supply side during extended interruptions of the work?			
16	In other work interruptions, is the gas supply to the "welding torch" properly shut off and is the unit put down safely?			
17	Are the hot work planned so that they can be completed by the end of the shift or of the working hours, including the checks?			
18	If hot work continue after one shift ends, is the work transferred to the following shift in a way adequate to the risk and without gaps?			
19	Have the firewatch and the "welder" agreed between them when the hot work are actually completed?			
20	Is the execution of the 1st check including a check of all adjoining rooms directly after the end of the work a fixed part of the hot work order?			
21	Are the subsequent checks carried out about every 30 minutes after the end of the working hours? (all-around observation of workplace, no more overtemperature can be detected; no glowing spots/fire pockets; no fire smell)			
22	Is a final check carried out around 4 hours after the end of the works?			
23	Are further checks carried out if the situation calls for them?			
24	Are the checks stopped only after the last check has shown that generation of a fire is not probable any more?			
25	Is the respect of all safety precautions up to the final check of the workplace ensured?			
26	Is the completed permit kept in a central place after the work is finished?			

2 Preparation of workplace and measures to be taken during the work
2.1 General

No.	Requirement	Yes	No	Remarks
27	Is the workplace cordoned off and marked?			
28	Have all mobile combustible objects and substances been removed from the entire safety area? (dust deposits, oil films, waste, packing materials etc.)			
29	Have all combustible components (e. g. wooden flooring) and equipment been cleaned and/or covered up with non-combustible materials or moistened if necessary?			
30	Are any further measures required, e. g. continued moistening of floor and of surrounding components which conduct heat and which are flammable etc.?			
31	Have joints, gaps, pipe breakthroughs and other openings in ceilings/floors, walls etc. been perfectly sealed with loam, mineral fibres, fire protection pads, fire-resisting putty etc.? (adjoining false floors/rooms/hollow spaces in walls as well as those hidden under covering panels as well as duct areas with difficult access deserve particular attention. Here dust sheets mostly will not be sufficient for protecting these areas against glowing particles!)			
32	Is it secured that no work is carried out in the rooms directly adjoining the workplace which endanger safe execution of the "welding work"? (e. g. in case of insufficient/non-tight room sealing; penetration of flammable gases and vapours through joints and gaps into the hot work area; by handling flammable liquids; during flooring laying work etc.)			
33	Have the nearby fire stoppings (doors, gates, flaps, louvers etc.) been closed?			
34	Is the nearest delay-free local fire alarm point for fire-fighters known? (place, route, operation)			
35	Is it ensured that in the area in question automatic fire alarm systems have been shut off where false alarms must be expected in the work area?			
36	Is at least one fire extinguisher or, even better, one rolled-out pressurised water hose with a nozzle (e. g. from a hose reel) available directly at the workplace?			
37	Is there any further suitable fire-fighting equipment in the supervision area of the firewatch which can be operated by these persons?			
38	Are the persons involved locally familiar with the operation of the fire extinguishing equipment?			

2.2 Additional measures when working in tight space conditions, in explosion-hazardous areas and when working on pipes and vessels

No.	Requirement	Yes	No	Remarks
39	Has a risk analysis been carried out prior to starting the work?			
40	Are the rooms subject to sufficient ventilation during the work?			
41	Are preliminary concentration measurements necessary (O_2/explosion tests)?			
42	Are further concentration measurements necessary also while executing the work?			
43	Is it secured that when an explosion warning device responds, the hot work are stopped immediately?			
44	Have combustible jackets, coatings as well as pipe, apparatus and wall insulations etc. been removed on a large surface?			
45	Have the contents of vessels and pipes been checked?			
46	Have vessels and pipes been drained/degassed, cleaned and secured with water or inert gas?			

3 Measures following the work

No.	Requirement	Yes	No	Remarks
47	Have the works been completely terminated?			
48	Has the workplace been properly cleaned?			
49	Have all equipment items been removed from the working area?			
50	Is it ensured that the firewatch remains at the location for at least 30 minutes after the work is completed?			
51	Is it ensured that the workplace is checked at least once every 30 minutes during four hours after the work is completed?			
52	Have all fire protection systems been completely put back into operation?			
53	Has the workplace been accepted by the company management or its responsible representatives after the work was completed?			

4 Unit safety and accident prevention

No.	Requirement	Yes	No	Remarks
54	Is the equipment item safe to operate for hot work?			
55	Are all parts of a gas torch which may be in contact with oxygen absolutely free of oil and grease?			
56	Are the gas bottles sufficiently secured against falling over?			
57	Are the equipment items removed directly after the end of the work?			
58	Has a visual inspection of gas-carrying hoses and lines been carried out as a minimum requirement?			

5 Additional organisational and fire protection-related measures for hot work on roofs

No.	Requirement	Yes	No	Remarks
59	Has the roof structure been thoroughly explored before starting the hot work (is there any combustible roof insulation or are there any other combustible building materials)?			
60	Have all workmen been informed about the fire hazards?			
61	Are all gas bottles in an upright position and secured against falling over?			
62	Has it been agreed that empty containers are removed from the roof without delay?			
63	Are gas hoses with a leakage gas or a hose break safeguard used exclusively?			
64	Has a pressure reducer been installed between the gas vessel and the consuming device?			
65	Is only the gas quantity absolutely required (half the daily consumption max.) stored on the roof?			
66	Are tar boilers set up on a non-combustible bottom plate in a collecting tray?			
67	Are functional tar boilers used exclusively?			
68	Are filling and temperature limits of the boilers reliably respected?			
69	Is it ensured that the boilers are observed during work breaks?			
70	Are suitable fire-fighting agents available (no water in the tar boiler area; use only powder and foam fire extinguishers!) and has a pressurised hose with a nozzle been laid out to protect the roof area (e. g. from a hose reel)?			

Hot work permit

No.:

Contractor (company or department):.....

Location (company, building, storey, room):.....

❑ Blowtorch Cutting/Welding ❑ Grinding ❑ Brazing ❑ Shrinking/Hot-bonding ❑ Roof work ❑ .....

Work order:..... to be carried out by:.....

Beginning of work:..... Permit expiry:..... Actual end:.....

Maximum validity: 1 shift

Emergency number: **Nearest phone/push-button alarm:**

Measures to be taken prior to beginning with the work

Topic	Action	Req.*	Compl.**
Work area and within 15 m/50 feet	Define the hazardous area, cordon off the area (radius at least 15 m, secure steel grating floors below)	❑	❑
	Safety instructions by the supervisor	❑	❑
	Remove any combustible substances (gases, liquids, solids)	❑	❑
	or cover with non-combustible panels, mats	❑	❑
	Wash/clean pipes/containers/appliances	❑	❑
	Cover/close openings, cracks, joints	❑	❑
	Inspect safety of work equipment	❑	❑
Provision of extinguishing agents	❑ CO_2 ❑ Dry powder ❑ Foam ❑ Water extinguisher	❑	❑
	❑ Wall hydrant, pressurised hose in work area ❑ Inergen/FM 200	❑	❑
Plant technology	If fire alarm systems are shut down, inform/coordinate with fire brigade Specify alternative measures!	❑	❑
Fire watch	Instructions for fire watch	❑	❑
Other		❑	❑

Measures to be taken during the work

Topic	Action	Req.*	Compl.**
Fire watch	Continuous inspection of the hazardous area (also during work breaks)	❑	❑
Interruption	Person who carries out the work must secure the work equipment (close valves on gas cylinders, isolate electrical equipment)	❑	❑

Measures to be taken after completion of the work

Topic	Action	Req.*	Compl.**
Work area	Remove all work equipment from the area	❑	❑
	Remove all covers with due care and attention	❑	❑
Fire alarm system	Reconnect automatic fire alarm system	❑	❑
	Inform fire brigade	❑	❑
Supervision of the work area	Inspection for a minimum of 30 minutes after completion of the work (fire extinguishers at the workplace)	❑	❑
	Checks every ½ hour for up to 4 hours (fire extinguishers at the workplace)	❑	❑
	Mobile fire alarm system	❑	❑
Completion (after the supervision)	Remove barricade	❑	❑
	Remove fire extinguishers and take them back to their correct location	❑	❑
	Record any incidents, if applicable	❑	❑

Release of the work

Parties involved	Action	Name (in print)	Date/time	Signature
Supervisor	Above listed measures are appropriate to cover any hazards that might occur			
Executing contractor	The work may only be started once all required fire protection measures have been implemented and the fire watch is present			
	Knowledge of the listed measures			
Fire watch	Has taken note of the listed measures			

Transfer of the workplace following completion of the work

Parties involved	Action	Name (in print)	Date/time	Signature
Executing contractor	Execution of the listed measures			
Fire watch	Execution of the listed measures			
Supervisor	Execution of the listed measures and reconnection of fire alarm system			

*Required ** Completed

About HDI Risk Consulting.

HDI Risk Consulting GmbH supports major corporations, industrial and mid-size companies with loss prevention and in establishing risk management systems.

HDI Risk Consulting offers its' customers access to some 180 engineers and experts from a wide range of technical disciplines. We aim to support companies with the management of risks and the development of individual risk-based concepts for insurance cover.

HDI Risk Consulting operates globally in the Property, Motor, Engineering and Marine markets, with particular focus on the identification and assessment of risks and the development of appropriate, individual protection concepts.

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