Fire Safety Permits

by Ir. Loo Chee Kin

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Many industrial and commercial premises have some form of safe work permits. Construction and project sites have various types of specific hazard permits. These are typically rolled into the safe work permit and perhaps attachment permits.

More specific hazard permits would involve confined space, working at height or scaffolding, lifting, lock-out tag-out and electrical works. Other permits could be for deep excavation or shoring, excessive noise, floor opening, heavy vehicle usage, fall protection, ladder, blasting and explosion, electrical tools in hazardous location, dust or chemical exposure, barricading, laser light and radiation sources, road/path detour, high pressure or hydrostatic testing, hot work, fire protection impairment, etc.

Major fires happen because two key permits are often overlooked – hot work and fire protection impairment permits.

Metal is used extensively in building construction and services. Arcs welding or oxyflame is often necessary for cutting or joining metal structure components or pipes. However, the people who use these cutting or joining methods frequently do not fully understand that improper use may result in loss of life and damage to property from fire/explosion.

Data from an insurance company shows that about 25% of industrial properties fires are due to insufficient precautions taken while doing hot work. Arcs welding or oxy-flame operations produce lots of sparks and hot slag. The hot molten metals and hot working pieces are potential ignition sources. Most fires are caused by hot slag. These globules of molten metal can splash or jump as far as 11 metres, setting ordinary combustible materials nearby on fire.

Some of these materials may be lying in concealed spaces or between combustible materials and can cause a smouldering fire which can break into flames. In some industrial fires, the content in the pipe line or tank could have been overlooked.

A worker performing hot work (such as welding, cutting, brazing, soldering, grinding) which may generate heat, arcs, sparks, open flames or other fire hazards, is exposing the work place to the risk of fires. However, hot work fires can be prevented if the work area is checked and an appropriate fire watch is in place.

For consistency in implementation, a hot work permit programme should be in place. Figure 1 (see Page 16) is a sample of a hot work permit. The permit should stipulate precautions to be taken and items to be inspected before the hot work is carried out. The precautions on the permit should include the following:

a) The hot work equipment is in good repair.

b) The fire protection system is in service.

c) Appropriate and sufficient numbers of portable fire extinguishers are available.

d) Smoke detectors should be covered with dust caps. Number of caps used to be noted on permit.

e) Fire doors are closed.

f) Combustible materials within a radius of 11 metres should be removed or covered with a listed welding blanket or pad.

g) Combustible floors should be kept wet or protected.

h) Pipe penetrations, openings or cracks in walls or floors within 11 metres are covered, filled or sealed with fire-rated or non-combustible material.

i) Ducts and conveyor systems are shut down and covered.

j) If hot work is done near combustible walls or partitions, protect the combustible construction with a welding curtain or welding blanket. Hot work should not be attempted on a wall that has combustible covering or insulation.

k) If hot work is to be performed on pipes or ducts with combustible insulation, remove at least 11 metres of the insulation and dispose of the insulation debris.

l) Purge and ventilate tanks and pipes containing flammable liquids. Clean and wash pits and trenches where there may be flammable liquids. Perform flammable vapour monitoring.

m) In addition to hot work permit, use confined entry permit for welding, cutting or brazing within a tank or any confined space. Continuously monitor work oxygen-deficient atmosphere in these cases.

As far as possible, hot work should be avoided. Where possible, work and equipment should be relocated off-site or brought to a designated hot work area. A designated hot work station should be of fire resistive construction or be located away from important areas, has proper ventilation and is equipped with fire protection systems.

A fire watch is required whenever welding or cutting is performed in locations where anything greater than a minor fire could develop. A simple decision tree is shown in Figure 2. The duty of the fire watch is to look out for fires in all exposed areas. He must also be trained to extinguish incipient fires. He should know how to raise the alarm if the fire is too large. The fire watch should stop hot work immediately if there are adverse changes to the working condition or danger to the surrounding.

It's a recipe for a bigger disaster when the active fire protection is out of service and hot work is being carried out. A fire protection impairment permit, or red tag permit as some insurance companies call it, is a system to monitor such impairment. Figure 3 shows a completed sample. Fire protection could be impaired due to:

- Routine servicing, like engine oil change in a diesel driven fire pump and the pump cannot be operated.
- Pipe leak and the sprinkler system riser valve are shut till they can be repaired.
- Faulty smoke detector and the gaseous protection system do not function automatically.
- Water supply disruption and hydrants are without water.

Figure 3: Sample of a fire protection impairment permit. On the left is the front with the impairment data and right is the back with the warning details

The fire protection impairment permit should be used to indicate that a system has been removed from service. The extent and expected duration of the impairment should be indicated on the permit. The areas or buildings involved must be inspected and the increased risks determined. When a permit is issued, the insurance company, the alarm company and property owner should be notified. Even the local fire brigade must be notified if the impairment is extensive or prolonged. The fire system owner should do a risk assessment and make recommendations to the management or the property owner on how the current

occupancy risk is managed and the measures needed to address the impairment, such as asking the local fire brigade to send a fire truck to the site on standby.

Most large industrial fires can be avoided if these two permits are in hand. In the four case studies presented here, the hazards were not understood or identified, so precautions were not taken. These had resulted in large fires, explosions and loss of lives. Permits are tools which will only be effective if used accordingly. Those involved with the permit systems should be trained appropriately. They should be prepared for delays if a permit could not be issued because the precautions were not met. It is better to delay a project than run the risk of fire.

Case Study 1

A renovation contractor was carrying outwork in a transportation terminal. This was in a tenant outlet that was closed off. The work area was a tight space. They were in the finishing stages and lacquer paint was being used. Unknown to them, the sprinkler system had been impaired at the request of another contractor. Some old utility brackets were causing obstruction, so a powered grinding wheel was used. The sparks fell on the paint cans and a fire started. The contactor was not trained in incipient fire fighting and so, left the work area. The sprinklers fused but water was not delivered to douse the fire. A member of the public called the fire department and the fire was extinguished quickly. However, the terminal had to be evacuated and operations were disrupted for half a day.

If there had been an impairment plan in place, the hot work would not have been permitted. The area would have been cleared and the paint cans removed.

Case Study 2

A salvage contractor was new to the pharmaceutical plant. The task was to remove some old tanks and pipes. As the tanks were made of steel, it was proposed to use an oxy-acetylene torch. A permit to work was issued for the task. However, the contractor did not know the tanks previously contained a type of alcohol. There was residual alcohol at the bottom of the tank and because it was a hot day, flammable vapours had built up inside the tank. When the contractor applied the torch on the first pipe, it exploded with a resulting force so huge it lifted the tank from its foundation. There was loss of life in this incident.

Had a hot work permit been used and, if the precautions included purging the tanks, the one with flammable vapours would have been flagged up.

Case Study 3

A cold store was having problems with a cooling unit. The facilities team felt it was time to replace the evaporator unit. To connect the new refrigerant pipes, brazing was done on the copper pipes. The hot work was too close to the cold room panel and the foam insulating material between the panels was ignited. As the fire was within the panel, a fire extinguisher could not be used to extinguish the flames. The thick smoke from the burning plastic insulation soon overwhelmed the workers. Fire fighters with full turn-out gear and self-contained breathing apparatus (SCBA) had to break open the panels to get to the core of the fire to extinguish it. All the food inside the cold store was contaminated and had to be thrown out.

Had a hot work permit included combustible construction identification, extra precaution would have been taken. A facilities team should be aware of combustible construction present. Instead of brazing, a safer method, such as compression fitting for the copper tubes, could have been used.

Case Study 4

There was a large bee hive in a school compound. The school building was made of wood. Standard operating procedure at the time was to light a bundle of dried coconut leaves and smoke the bees out. During the smoking process, amber dropped every where but there was no fire. After they got rid of the bees, the workers packed up and left. Half an hour later, a villager saw flames and called the fire department. But when the firemen arrived 10 min later, the whole block had been razed.

As this was common practice, no hot work precaution was taken. No fire watch was posted after the hot work, and the smouldering ambers lighted the fire minutes later. ■

IEM DIARY OF EVENTS

Title: One-Day Course on HAZOP Training For Team Members - A Practical Approach

13 August 2015

Organised by : Technical Division - Oil, Gas and Mining Engineering Technical Division
Time : 9.00 a.m. – 5.30 p.m.
CPD/PDP : 7

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