Working in hazardous smoke

• *omtanke* • *solidaritet* • *samhold*

HANDBOOK

FAGFORBUNDET
Seksjon samferdsel og teknisk

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Introduction

Fire and rescue personnel working in a smoke-filled environment are exposed to a number of hazardous substances. Many of these are believed to be carcinogenic and the Labour Inspectorate considers fire and rescue personnel to have greater exposure to cancer than the population as a whole. With this background, Norsk Brannmannsforum [The Norwegian Fireman's Forum], the Norwegian Union of Municipal and General Employees and the Norwegian Confederation of Trade Unions have drawn up this booklet, with the aim of reducing the risk of exposure of fire and rescue personnel to carcinogenic substances. The health of employees must have decisive importance in how work is organised and exposure and risk must be reduced as much as possible. Norsk Brannmannsforum [The Norwegian Fireman's Forum], the Norwegian Union of Municipal and General Employees and the Norwegian Confederation of Trade Unions urge all fire and rescue authorities to take the risk of cancer seriously and to implement initiatives to reduce exposure.

Research

At the present time, in the Nordic countries and in Europe, limited research has been carried out in this field. However, some research has been carried out in the USA and Canada. This has revealed the type of long term consequences that the influence of smoke can have on fire and rescue personnel. A study from the University of Cincinnati from 2006 showed that as many as ten different types of cancer could be related to the occupation. In the USA, fire and rescue personnel are overrepresented in terms of testicular cancer, myelomatosis, non-Hodgkin lymphoma, skin cancer, brain cancer, prostate cancer, stomach cancer and colon cancer. Several of these have been accepted as occupational injuries in the USA and Canada.

The National Institute for Occupational Safety and Health (NIOSH) is now carrying out the most extensive research project thus far. This encompasses over 30,000 fire and rescue personnel. You can read more about this project at:

http://www.cdc.gov/niosh/updates/upd-10-17-13.html

At this present time, there is no research from Norway that can come to clear conclusions regarding the risk of cancer among fire and rescue personnel. Nevertheless, the stated research gives strong indications that the risk of cancer among fire and rescue personnel is high. Therefore, we know enough to implement initiatives that reduce both the exposure to hazardous substances and the risk of cancer.

Exposure via the lungs is a known factor and front-line personnel are generally good at protecting themselves with breathing apparatus in visible smoke. Protection against toxic substances in the form of visible gases and fibre/airborne particles in the fire area is however, still lacking. It is important that front-line personnel are aware of how easily toxic substances are absorbed via the skin and in the body. Strenuous work increases the body temperature and capillary vessels and the pores of the skin open to allow body heat to dissipate. This reduces the skin's ability to act as a barrier against the various toxic substances found in smoke.

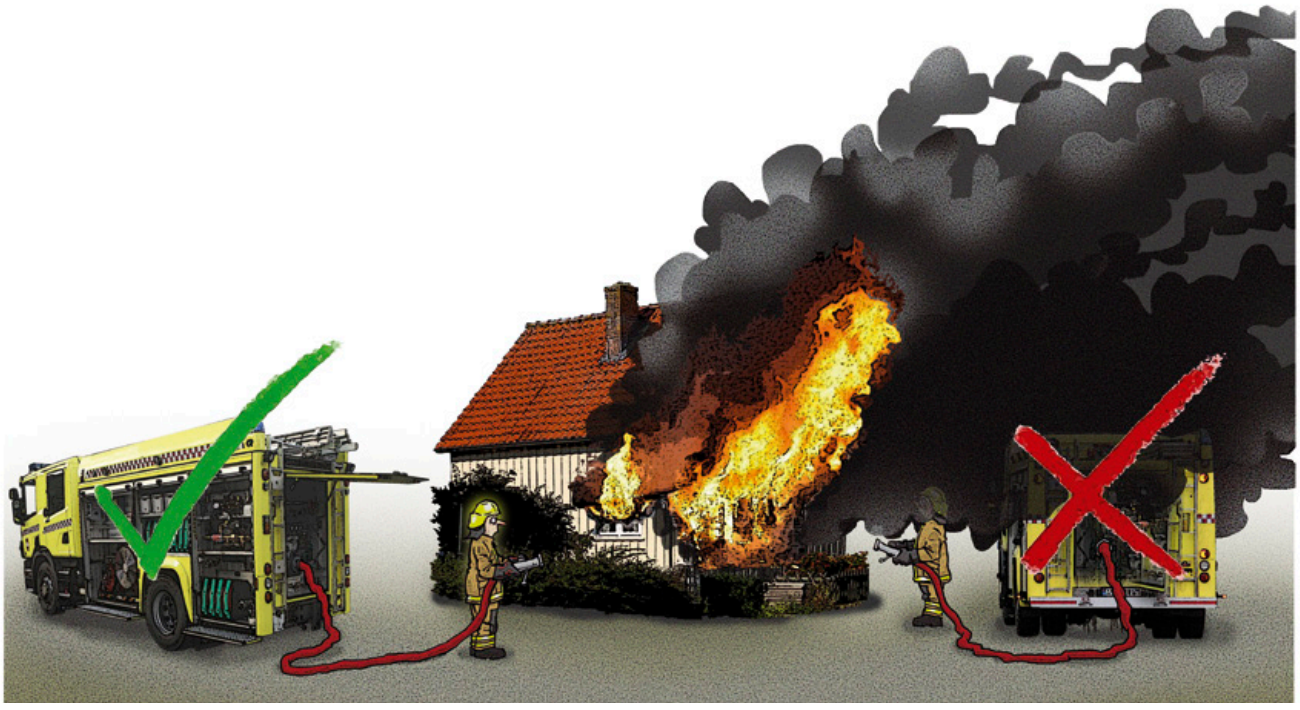
Preventive measures at the fire station and scene of an incident

Reduction of risk must be done locally. Certain risk-reducing initiatives will require financial investment; others will require changes in both method and culture. There are several examples of fire and rescue authorities that have implemented positive changes by introducing simple initiatives.

Scene of an incident

The degree of risk is dependent, among other things, on decisions made at the scene of the incident. It is possible to make evaluations that will lead to a reduction in risk. The following should be considered:

- Tactical initiatives
- Parking of vehicles in a smoke-free zone
- Working upwind
- Evaluation of firefighting methods, for example:
  - Is the primary intention to save lives?
  - Is there any need for smoke diving in the initial phase?
  - Can we extinguish the fire from the outside?
  - Use of fog spike, cutting extinguisher or CAFS?
  - Positive pressure ventilation with fan?



All personnel that do not carry breathing apparatus must have a filter mask attached to their emergency clothing. The mask must always be used when present in practically smoke-free zones, for example during post-fire damping, and in particular by the leader during OODA. The mask must always be accessible, otherwise it will not be used.

Throughout the entire firefighting process, it is important that the risk of smoke is continually monitored and taken into consideration. Personnel must be conscious of the way that toxic substances act upon the skin. Be aware when you sweat, have an itch, etc., that you do not wipe your bare skin with dirty materials, gloves, etc.

Take the time to remove your gloves, ensure that you have wet wipes/paper towels available at the scene of the incident, for example on the fire truck, alongside other equipment we have ready (e.g.chainsaws, axes, etc.). In the container for soft drinks, water or energy drinks, wet wipes and paper towels should be included as a matter of course. Make it a routine to always have these accessible.

It is important that these routines are also followed during minor incidents, such a container fires, waste fires and car fires. Toxic substances can be just as hazardous during these types of fire; however, there is often less focus on safety and consideration of the effects. Also in these incidents one should consider location and position and preferably use a fan if personnel are standing downwind.

Invisible smoke?

In many cases we are called out and are notified of suspicious odours, minor smoke emissions, etc. What do we do? Should we sniff around like a dog to find the source of the smoke? Remember that even at this stage, the smoke can contain a lot of extremely unhealthy elements. Use a filter mask with a gas filter as an alternative to a full breathing apparatus; however, make sure that you have a CO meter to be safe. Nowadays, these involve minor expense and should be standard on all units.

Searching: Use preferably a small LED light with a white light, hold it 90 degrees across the front of you and search. This is almost as effective as your nose and much less unhealthy.

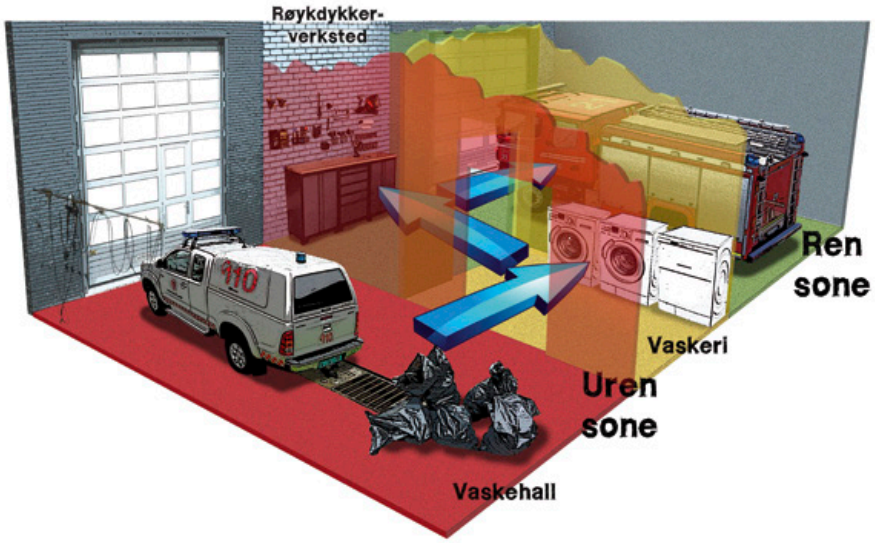
When firefighting is concluded

Concluding a firefighting action requires good routines to prevent exposure to toxic substances. Always have a packed bag ready alongside your emergency clothing and take it with you every time you are on the fire truck or are called out. Take underwear and a tracksuit, etc. – remember to also take warm clothing with you in the winter months. Your rescue suit is a good alternative as outer clothing after an action.

Disposable gloves, protective gloves, disposable masks and plastic sacks must be readily available. New trucks should be planned to include a separate ½» Gardena connector or a 1½" pipe with a regular tap on the end along with a garden hose and nozzle. It is much easier to wash off the worst of the dirt, etc. with a garden hose than a fire hose. Be consistent in using disposable gloves and a mask when handling equipment.

The following routines should be established when changing clothes at the site of an incident:

- Use disposable gloves and a dust mask whilst removing articles of clothing and placing them in plastic sacks
- Have wet wipes and paper towels available
- Rinse off loose dirt
- Place clothing in a plastic sack and tie firmly
- Other equipment can be stored on the truck or another suitable vehicle
- Take a change of clothing with you



At the station

As a minimum requirement, all fire stations, regardless of the size or extent of crews, should have adequate shower and changing facilities.

Begin the process by removing contaminated equipment. Continue with personal cleaning. The station must have proper facilities for handling contaminated clothing, both washing and drying. The station should have an industrial-type washing machine, tumble dryer/ cupboard for washing a minimum of 3 sets of emergency clothing and cleaning facilities for smoke diver and extinguishing tools. The station should immediately be divided into clean and contaminated zones, if this is possible. New buildings must have planned and clearly defined clean and contaminated zones.

Good routines must be established for the following:

- All dirty clothing and equipment must be taken to the contaminated zone
- Turn out the sacks of clothing directly into the washing machine
- Wash the clothing at the correct temperature
- Use a mask and disposable gloves during this process
- Well-organised systems for personal cleaning/showering

As a minimum, a reserve set of clothing must be available per shift crew. The optimal solution is for each crew member to have their own reserve set. This ensures that there is enough equipment and that it is custom fitted to individual users. The overall economy will be the same, as the wear and tear will be extended correspondingly. A good solution is to invest in a new set «just» before the old one is due for replacement. Keep this as a reserve set for use only whilst the newest is being washed.

The waste water from the washing machine can be contaminated and should be directed to a closed system. Contact the appropriate municipal office if necessary for guidance. Vapour emitted from washing machines when opening is simply steam according to the manufacturer and does not contain toxic substances.

Working Environment Committee (WEC)

WEC is an important body and the task of reducing risk should be firmly founded here. WEC should set up a plan for how this is to be carried out, along with a basis and cost analysis. It is important that this requirement is given priority.

Do we carry out exercises in the way we wish to resolve the task?

Traditionally, smoke diving training involves setting a fire in a training building, flashover container, or by burning down a real house. For many smoke divers, this represents a significant proportion of the time they are exposed to a smoke-filled environment. Exercises should also be subjected to a risk assessment, in relation to the level of exposure.

How should we carry out exercises correctly? Legislation stipulates clear requirements as to whether employees can be required to carry out work that is dangerous or hazardous to health. At the same time, there are requirements for necessary training/exercises in the type of operations that will actually be carried out. In other words, we have to find the happy medium.

Flashover container

Most fire services use the 'home-made' type, which is comprised of just a room where crews train in dealing with flashover. If pure propane is used, good combustion is achieved with low toxin levels. Avoid the use of materials or similar, as this increases the exposure to toxic substances unnecessarily.

Remember that training in flashover containers is training in handling incidents. You should not go in and extinguish flashover fires. Flashover is an incident that fire crews must be able to handle.

There are prefabricated container solutions on the market, complete with inventory (e.g living room, kitchen, etc.) where everything is made from steel and all flames are from propane via a water bath in the sofa seat, oven, etc., or from jets in the roof to simulate flashover. The smoke is artificial and everything is controlled and monitored via IR cameras from a separate control room. This of course involves expense in terms of investment; however, this can be resolved by increasing cooperation across municipalities. HSE requirements during exercises should steer the solutions selected for exercise facilities for flashover.

Concrete fire exercise buildings

In concrete fire exercise buildings, materials are often burned that contain significant amounts of contaminants, and for many this represents a major part of the exposure to toxins.

This is a type of exercise that we should increasingly avoid; however if it must be used, the fire should be set with clean, whole timber. Avoid fibreboard/chipboard, etc. The alternative is to set the fire with propane and use artificial smoke.

The objective of this type of exercise is mainly to practice searching in smoke-filled environments. We should therefore place emphasis on the least possible exposure to toxic smoke. After the exercise is completed, the same routines apply as for a real fire.

Burning down houses

Burning an actual house is among the exercise activities that involves the greatest exposure of crews to toxic substances. Nevertheless, it is a unique opportunity to train in using new and better firefighting techniques. This is like an actual site of an incident – evaluate the location in relation to wind direction, intended approach, etc.

Before starting smoke diving procedures, find out which direction smoke will come from by creating an opening and by using overpressure ventilation. After the exercise is completed, the same routines apply as for a real fire.

Pregnancy

It is important that the employer has good routines and plans for safeguarding pregnant employees. Pregnant employees must be given alternative duties to smoke and chemical diving along with other less physically demanding tasks. Plans and routines should be drawn up beforehand.

For the pregnant employee, it is important to notify the employer at an early stage. Remember that the employer should also be given the opportunity to introduce initiatives. The relevant person must be replaced in their daily job and a new, temporary position arranged.

You can read more about this in the Norwegian Union of Municipal and General Employees' information booklet on pregnancy in the fire and rescue services.

Conclusion

It is both exciting and challenging to carry out 'serious' smoke diving; however, it is more important to focus on how we should work as safely as possible and at the same time safe-guard our health.
Extreme sports and adrenalin rushes belong to our free time – not at work.

The time when a soot-covered, dirty fireman was seen as a 'tough guy', has passed. The fire and rescue personnel of the future have sound attitudes and are concerned about their safety and health. If you notice changes in your health, see your doctor.

Take the opportunity, think 'development' and how you can resolve tasks just as safely and effectively with a minimum amount of exposure to smoke.

Everything is about attitudes.

Learn more

If you wish to find out more about working in hazardous smoke, you can find a number of links at **www.fagforbundet.no/sst/brann-og-redningspersonell/**

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