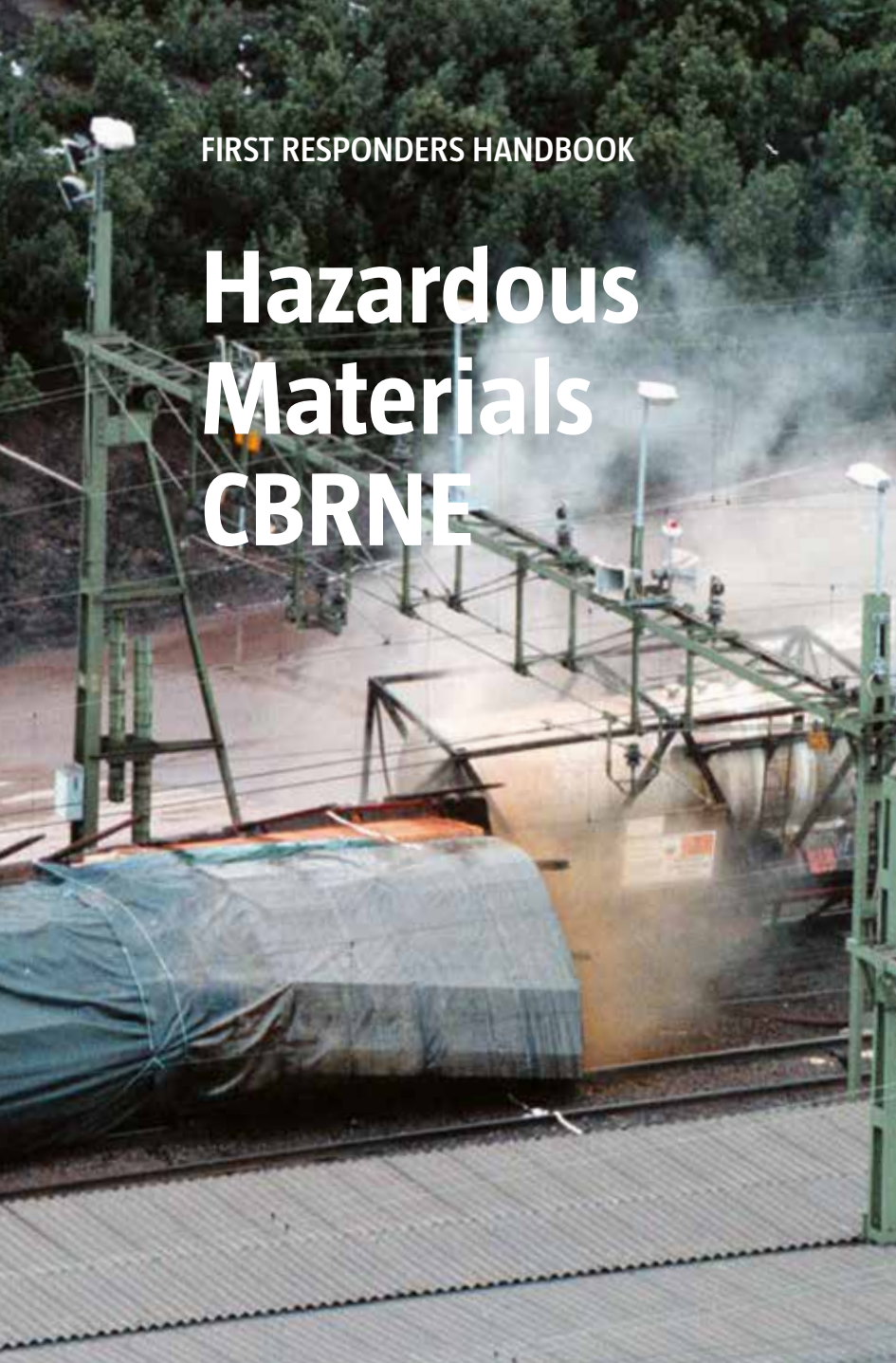
FIRST RESPONDERS HANDBOOK

Hazardous Materials CBRNE



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Introduction

This handbook for hazardous materials was produced by virtue of Nordic collaboration in accordance with the Haga Declaration. Local and national representatives from the fire & rescue service, emergency medical services (EMS), and the police in Sweden and Norway cooperated on producing the handbook.

The handbook is intended for use by the first responders of the emergency services from the moment they receive an alarm up to the first 30 minutes on scene at an incident.

The handbook is envisaged to function as a checklist and decision-support for personnel with existing knowledge of emergency response operations.

As no two incidents are alike it is impossible to set an exact order of work, the incident itself determines the order of work.

An app on the handbook may be downloaded free of charge from Google Play or App store.

Android:	HafireEN
iPad:	Hafire
iPhone:	HafireMOB

Using this handbook

This handbook is intended for use by the emergency response personnel of the emergency services who will be first on scene at an incident involving hazardous substances. To understand how the contents should be interpreted, it is important to know the meaning of the following terms:

Labelling

There are several different ways to categorize hazardous substances based on their properties. We have divided tab 5 based on the classification and labelling set out in the regulations for the Transport of Dangerous Goods.

Initial danger zone

In the initial stages of an incident involving hazardous substances the emergency response is characterized, as a rule, by deficient information and time pressure. Emergency response personnel can be forced to make decisions based on deficient facts.

The danger zone as it is initially determined can therefore be very roughly estimated and is called the initial danger zone.

The initial danger zones listed under tab 5 include both hot and warm zone. Dividing an incident site, during an ongoing emergency response, into hot, warm and cold zones is intended to make it clear where danger exists and what level of protective equipment is required. This is best done in collaboration between the fire and rescue, police and ambulance services.

Examples of measures during an emergency response

The examples mentioned under tab 5 cover the "initial measures" taken by the fire & rescue, police and ambulance services in the first 30 minutes of a response where hazardous substances are present.

It is important to as early as possible limit the environmental impact of an incident, which is another reason why such measures are proposed. It is of great importance that emergency response personnel are familiar with their own organisation's roles and responsibilities at the incident site.

Protection of emergency response personnel

Level of protection for personnel in the initial danger zone should be determined in relation to the substance's potential risk and the intended work. Different forms of decision support can be helpful to evaluate the necessary protection level.

A lifesaving operation can be performed without a chemical protection suit if the risks have been considered, and the operation is short, and that direct contact with the substance is avoided.

Note that a respirator provides no protection where there is a need for a supply of clean oxygen, in such cases breathing apparatus must be used. Personal chemical protection equipment protects against chemicals, infectious substances and radioactive dust but not against gamma radiation.

At incidents where there is a risk of being exposed to ionizing radiation the distance from the radiation source, duration of exposure and shielding are crucial for how large the radiation dose will be.

Mobilising and en-route

Mobilising and en-route

Prior to mobilising

Consider the protective equipment and resources needed

- Is any specific protective equipment needed?
- Is any specific materiel needed?

En-route to incident

Find out more information

- Is there any more information about the incident?
- Type of incident (C, B, RN or E incident – Is this known, confirmed or assumed?) and extent.
- Has an FCP been set-up? (forward control point)
- Are other resources on scene or en-route?
- Establish contact with the other emergency services on a joint communications channel.

Choose a safe response route

- If possible approach the incident site with the wind blowing towards the incident site not towards you.
- Never drive closer to an incident site than 50 m.

Set-up an FCP

- Ask for assistance from the command support staff or equivalent when choosing an FCP.
- Take wind direction into consideration.
- An FCP should be large enough for emergency services vehicles to turn around.
- An FCP should be obvious and preferably a well known place.

On scene – assessment and decision

On scene – assessment and decision

Initial visual report as you arrive on scene

- Describe what you see.
- Are the address or coordinates correct?
- Take photographs.

Carry out risk assessment

- Are there any people in need of rescue?
- Is it possible to identify the substances involved?
- Need for life saving/full or no decontamination.
- Detail the risk.
- Need for protective equipment.
- Need for more materiel and resources.
- Danger zone.

Provide a situation report

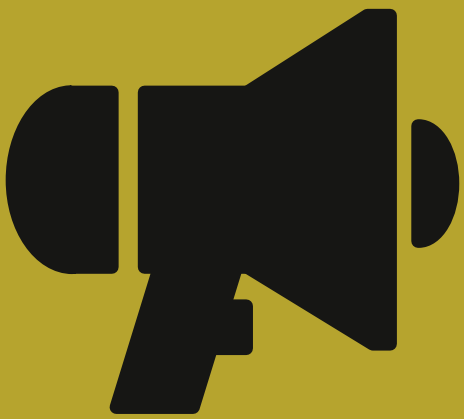
- Within 5 minutes of arrival.
- Describe the situation and your own situation assessment.
- Speak clearly
  - Substance and amount.
  - Number of casualties and status.
  - Need for antidotes (e.g. for cyanide, nerve gases and opiates).
  - Resource needs.
  - Expert support needs.

Establish cooperation with the other emergency services and experts

Evaluate the decisions in Mobilizing and en-route

Establish command structure

On scene – implementing the response



On scene – implementing the response

Evacuate

- Evacuate people from the danger zone / remove from source of exposure.
- Consider shelter-in-place as an alternative.

Lifesaving

- Lifesaving medical treatment.
- Lifesaving decontamination as and when needed.

Cordon off

- The initial danger zone, in accordance with tab 5.
- Warn.
- Warn people in the vicinity of the danger zone.
- Decontaminate personnel as and when needed.

Provide a new situation report

Other response measures

Implement any possible limitation measures

- Extinguish.
- Contain spilled substances.
- Clear up spilled substances.

Secure evidence

- If possible take film and photographs during and after the operation.

Lifesaving decontamination and symptoms

Lifesaving decontamination

Contamination by certain chemicals and toxins, bacterial spores (e.g. anthrax) or radioactive material presents a hazard for those affected and those assisting them, wherever they are, in or out of the danger zone. The aim is to, as quickly as possible, end exposure to the hazardous substance.

Lifesaving decontamination can be carried out in parallel to lifesaving medical treatment and antidote administration provided that helpers wear suitable personal protection equipment.

Lifesaving decontamination should if possible be performed on scene prior to transport to hospital.

Procedures

Chemicals (C)	- **Remove casualty from source of exposure.** - **Remove clothing without pulling over the head.** - **Rinse person with water, when needed*.** - **Wrap the casualty in blankets to avoid cooling.**
Infectious substances/ Biological (B)	- **Normally no need for lifesaving decontamination.** - **Anthrax anb botulinum toxin are the exceptions. Follow the recommendations for C.**
Radioactive substances (RN)	- **Remove casualty from source of exposure.** - **Remove clothing without pulling over the head.** - **Always wash the casualty's hands and face to minimize the risk of internal contamination.** - **Wrap the casualty in blankets to avoid cooling.**

* *See page 22*

The decision on lifesaving decontamination is taken by the medical incident officer or in his/her absence by the incident commander or crew commander.

Remember:

- Individuals that have been exposed to substances in gas form (e.g. chlorine or ammonia) do not require decontamination with water. Removal of clothing will however prevent spreading the smell of the gas further.
- When blistering and tissue-injuring agents (e.g. mustard gas) or nerve agents (e.g. sarin gas or similar) are suspected a complete decontamination of all individ–uals should be conducted as rapidly as possible.
- Individuals that have been exposed to radioactive substances need only be decontaminated if and when contamination by radioactive material is suspected.
- Take a radioactivty reading if measuring instruments are available.
- After lifesaving decontamination and wrapping in blankets the patient may be transported to hospital.

Symptoms during incidents where hazardous materials are present

- An emergency (seconds – minutes) illness/injury without any other visible cause has probably been caused by chemcials in gas/vapour form.
- If the substance is unknown, the patient's symptoms may provide guidance on the type of gas involved (see symptoms table on next page).
- Infectious substances present no symptoms during the first few hours.
- Low radiation doses from radioactive substances present no acute symptoms. Rapidly occurring (minutes-hours) symptoms (e.g. nausea, vomiting) only arise when the radiation is life-threatening.

Common symptoms on exposure to CWA and some gases. Schematic overview:

Substance *(antidote)*	Time to symptoms	Eyes	Upper airway	Lungs
Nerve gas *(atropine/ oxime)*	Short	Blurred vision, small pupils	Saliva and nasal mucus, lots of mucus in the airway	Laboured breathing, coughing, mucus. Can be similar to pulmonary oedema
Blistering & tissue damaging agents				
Lewisite, Phosgene oxime	Short	Pain, redness, spasms in eyelids	Irritation, coughing, hoarseness	Coughing with mucus (serious exposure)
Mustard gas	Delayed	Pain, redness, spasms in eyelids	Irritation, coughing, hoarseness	Coughing with mucus (serious exposure)
Locally irritating gases Chlorine, Ammonia, Sulphur dioxide, etc.	Immediate	Irritation	Laboured breathing, dry coughing	Laboured breathing, dry coughing
Cyanide *(Cyanokit/ sodium thiosulfate)*	Short	Dilated pupils (serious poisoning)	–	Rapid breathing (progressing to loss of breathing)
Opiates Aerosoles *(Naloxone)*	Short	Small pupils	–	Slow breathing

Decontamination is particularly relevant for nerve gas and blistering and tissue damaging agents.

Skin	Brain	Stomach/ bowels	Other
–	Headache, reduced consciousness , possibly cramps	Nausea, vomiting, stomach pains, diarrhoea, incontinence	Muscle weakness, muscle spasms
Redness, blisters, lesions	–	Nausea, vomiting	Possible shock following serious incidents (as with burn injuries)
Redness, blisters, lesions		Nausea, vomiting	Possible shock following serious incidents (as with burn injuries)
(Possible irritation)	–	–	–
–	Anxiety, reduced consciousness , possibly cramps	–	–
–	Reduced consciousness	–	–

Source: National CBRNE Medical and Advisory Centre (Norway)

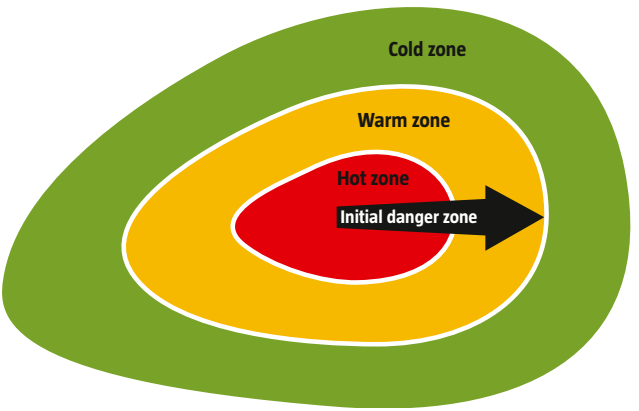
Risks, protective equipment, initial danger zone, initial action

Initial danger zone for incidents with an unknown substance

If the substance is unknown, for example, during the transport of mixed dangerous goods, the following initial danger zones are recommended:

- Solids: 50 m.
- Liquids: 100 m (from the pool edge).
- Gases: 300 m.

Wherever possible work with the wind blowing away from you, towards the substance.



Explosives (class 1)

Risks

- Shrapnel.
- Shock wave.
- Thermal radiation, fire.
- Toxic smoke/fumes.

Protective equipment

Breathing protection and protective clothing suitable for the assessed risks and the task in hand.

Initial danger zone for evacuation

	**For a fire:** - In open country (risk of shrapnel) - In shelter (risk of shock wave)	 1000 m 300 m
	**For a fire in commerical premises** **For a fire in a full container/ full storage premises:** - In open country (risk of shrapnel) - In shelter (risk of shock wave)	50 m 1000 m 300 m
	**During fire**	50 m

Examples of measures during an incident

- Begin observation at a distance with binoculars.
- Evacuate people in danger.
- Carry out lifesaving.
- Cordon off the danger zone.
- Warn.
- Remove ignition sources.
- Prevent spread of fire to the explosives.
- For a fire in a vehicle: Extinguish fire only if it is a
  - fire in the engine bay.
  - fire in the driver's area.
  - tyre fire.

Improvised explosive devices (IED) see Tab 7

If there is a fire in explosives or close to them, be defensive and wait in a sheltered place, until you have been informed that it is safe to extinguish e.g. a cargo fire.

Flammable gases (class 2)

Risks

- Fire, thermal radiation.
- Explosive gas-air mixture, shrapnel.
- Pressurized container in a fire: Pressurized container explosion, BLEVE.
- Frostbite (e.g. liquid methane, liquid hydrogen).
- Poisoning, chemical burns, asphyxiation.

Protective equipment

Breathing protection and protective clothing suitable for the assessed risks and the task in hand.

Initial danger zone for evacuation

	wind ≤2 m/s	wind >2 m/s
Small emission* (a leaking seal)	100 m radius	- 100 m in the direction of the wind - 50 m against the wind
Large emission (a broken connection hose or pipe)	300 m radius	- 300 m in the direction of the wind - 50 m against the wind
Tank/cistern at risk of splitting (BLEVE)		1000 m

Aerosols and disposable containers	50 m
Gas cylinders exposed to fire	300 m

** A gas emission counts as a small emission.*

Examples of measures during an incident

- Evacuate people in danger.
- Carry out lifesaving.
- Cordon off the danger zone.
- Warn.
- Remove ignition sources.
- Spray gas clouds with a wide water jet to direct or disperse the gas.
- Do not extinguish burning gas unless it is operationally necessary.
- Cool down heat-affected pressurized containers.

Water must not be allowed to come into contact with liquiefied gas e.g. liquid methane (because water adds heat and increases degassing).

Toxic gases (class 2)

Risks

- Poisoning, chemical burns, asphyxiation.
- Frostbite.
- Pressurized container in a fire: Pressurized container.
- Explosion, shrapnel.

Protective equipment

Breathing protection and protective clothing suitable for the assessed risks and the task in hand.

Initial danger zone for evacuation

	wind ≤2 m/s	wind >5 m/s
Small emission (a leaking seal)	2 km radius*	- 600 m downwind* - 50 m upwind
Large emission (a broken connection hose or pipe)	10 km radius*	- 3km downwind* - 50 m upwind

Aerosols and disposable containers	50 m
Gas cylinders exposed to fire	300 m

** The distances given depend on the following conditions:*
The distances are calculated for liquefied compressed chlorine and sulphur dioxide but are recommended initially also for other toxic substances with similar properties. Gas phase release should be considered as a small leak.

Examples of measures during an incident

- Evacuate people in danger or advise shelter-in-place.
- Carry out lifesaving.
- Cordon off the danger zone.
- Warn.
- Cool down heat-affected pressurized containers.
- Dilute gas concentration by spraying with water mist.
- Avoid spraying water on pools of liquefied gas or on leaking tanks of liquefied gas (because water adds heat and increases degassing).
- Spray gas clouds with a wide water jet to direct or disperse the gas.
- Consider reliquifying (for pressure liquefied toxic gases e.g. ammonia).

Chemical warfare agents, see Tab 6

- In urban environments heavy gases can spread in a circular fashion, which may mean spreading against the wind.
- Reliquifying is only effective if the leakage occurs from the liquid phase of the content.

Non-flammable, non-toxic gases (class 2)

Risks

- Frostbite.
- Pressurized container in a fire: Pressurized container explosion.
- Shrapnel.
- Fire support (oxygen).
- Oxygen deficiency at high concentrations of certain gases.

Protective equipment

Breathing protection and protective clothing suitable for the assessed risks and the task in hand.

Initial danger zone for evacuation

Aerosols and disposable containers	50 m
Gas cylinders not exposed to fire	100 m
Gas cylinders exposed to fire	300 m
Tank/cistern at risk of splitting	1000 m

Examples of measures during an incident

- Evacuate people in danger.
- Carry out lifesaving .
- Cordon off the danger zone.
- Warn.
- Cool down heat-affected pressurized containers.
- Be alert to the fact that leaking oxygen can intensify a fire.

Flammable liquids (class 3)


Risks

- Fire and explosion.
- Thermal radiation.
- Toxic smoke.
- Environmental hazard.

Protective equipment

Breathing protection and protective clothing suitable for the assessed risks and the task in hand.

Initial danger zone for evacuation

Initial danger zone	50 m

Examples of measures during an incident

- Evacuate people in danger.
- Carry out lifesaving.
- Cordon off the danger zone.
- Warn.
- Remove ignition sources.
- Cover liquid with foam.
- Contain or clear up substances to prevent spreading.
- In the event of fire: evaluate whether there are sufficient resources for extinguishing.

Flammable solids, self-reactive substances and solid desensitized explosives (class 4.1)

Risks

- Fire.
- Thermal radiation.
- Explosion.
- Flammable gases.
- Irritating and toxic smoke/fumes.
- Dust explosion.
- Environmental hazard.

Protective equipment

Breathing protection and protective clothing suitable for the assessed risks and the task in hand.

Initial danger zone for evacuation

Initial danger zone	50 m
During a fire, strong degassing or when there is a risk of a violent reaction	300 m

Examples of measures during an incident

- Evacuate people in danger.
- Carry out lifesaving.
- Cordon off the danger zone.
- Warn.
- Remove ignition sources.
- Move containers and cool down with large quantities of water.

- Increases in temperature can result in a violent explosive fire.
- Metal fires are very difficult to extinguish and have a very high temperature.
- There is a risk of explosion in suspected fires in desensitized explosives.
- Heated containers can explode from internal pressure.

Substances liable to spontaneous combustion (class 4.2)

Risks

- Fire.
- Thermal radiation.
- Dust explosion.
- Irritating and toxic smoke/fumes.
- Can ignite without an external ignition source.
- Environmental hazard.

Protective equipment

Breathing protection and protective clothing suitable for the assessed risks and the task in hand.

Initial danger zone for evacuation

Initial danger zone	50 m
During a fire, strong degassing or when there is a risk of a violent reaction	300 m

Examples of measures during an incident

- Evacuate people in danger.
- Carry out lifesaving.
- Cordon off the danger zone.
- Warn.
- Remove ignition sources.
- Move containers and cool down with large quantities of water.

The opening of containers may cause explosive fires.

Substances which in contact with water emit flammable gases (class 4.3)

Risks

- Fire.
- Thermal radiation.
- Irritating and toxic smoke/fumes.
- Produces flammable or toxic gases.
- Explosive gas-air mixture.
- Environmental hazard.

Protective equipment

Breathing protection and protective clothing suitable for the assessed risks and the task in hand.

Initial danger zone for evacuation

Initial danger zone	50 m
During a fire, strong degassing or when there is a risk of a violent reaction: e.g. on contact with water	300 m

Examples of measures during an incident

- Evacuate people in danger.
- Carry out lifesaving.
- Cordon off the danger zone.
- Warn.
- Remove ignition sources.
- Move containers and cool down with large quantities of water.
- Move containers exposed to fire.
- DO NOT use water as an extinguishing agent.

Oxidizing substances (class 5.1)

Risk

- Intensifies fire (fire support).
- During violent fires, there is a risk of explosion in large amounts of the substance or when the subtance is confined in connection with the fire.
- Toxic smoke/fumes.
- Corrosive smoke/fumes.

Protective equipment

Breathing protection and protective clothing suitable for the assessed risks and the task in hand.

Initial danger zone for evacuation

Initial danger zone	50 m
Risk of fire or explosion	≥ 300 m

Examples of measures during an incident

- Begin orientation at a distance with binoculars.
- Evacuate people in danger.
- Carry out lifesaving.
- Cordon off the danger zone.
- Warn.
- Remove ignition sources.
- Avoid contact with combustible material.
- Consider dilution to reduce fire and explosion risk.
- Do not use organic sorbents.
- Move containers and cool down with large quantities of water.
- Cool containers from a protected site.

A proactive response must not be carried out if there is a risk of explosion.

Organic peroxides (class 5.2)

Risks

- Intensive fire.
- Thermal radiation.
- Can already start to decompose at moderately elevated temperatures and produce flammable gases.
- May explode if heated.
- Toxic smoke/ fumes.
- Corrosive smoke/fumes.

Protective equipment

Breathing protection and protective clothing suitable for the assessed risks and the task in hand.

Initial danger zone for evacuation

Initial danger zone	50 m
Risk of fire or explosion	≥ 300 m

Examples of measures during an incident

- Begin orientation at a distance with binoculars.
- Evacuate people in danger.
- Carry out lifesaving.
- Cordon off the danger zone.
- Warn.
- Remove ignition sources.
- Avoid contact with metals and with other chemicals.
- Consider dilution to reduce fire and explosion risk.
- Move containers and cool down with large quantities of water.
- Cool containers from a protected site.
- Be extra careful with class 5.2 substances that are transported under an elevated temperature.

- Increases in temperature can result in a violent explosive fire.
- Heated containers can explode from internal pressure.
- A proactive response must not be carried out if there is a risk of explosion.

Toxic substances (class 6.1)

Risks

- Serious injuries (either via the respiratory system, mouth, eyes or skin).
- Long-term effects (cancer, fetal damage, genetic damage.
- Environmental damage.

Protective equipment

Breathing protection and protective clothing suitable for the assessed risks and the task in hand.

Initial danger zone for evacuation

Solids	50 m
Liquids	100 m
During a fire, strong degassing or when there is a risk of a violent reaction	300 m

Examples of measures during an incident

- Evacuate people in danger or advise shelter-in-place.
- Carry out lifesaving.
- Cordon off the danger zone.
- Warn.
- Limit water use on the fire.
- Contain or clear up to prevent spreading.

Chemical warfare agents, see Tab 6

Infectious substances (class 6.2) and biological toxins

Risks

- Infectious substances can cause disease in humans or animals, but do not produce any symptoms during the early hours/days after exposure.
- Biological toxins don't induce acute symptoms; the disease may occur or become manifest within hours.

Protective equipment

Breathing protection and protective clothing suitable for the assessed risks and the task in hand.

Initial danger zone for evacuation

Initial danger zone	50 m

Examples of measures during an incident

- Evacuate people in danger.
- Carry out lifesaving (individuals contaminated with anthrax spores or botulinum toxin must be decontaminated).
- Cordon off the danger zone.
- Warn.
- Inform people that they should not eat, drink or smoke until they have washed their hands.
- If the incident occurred in a building:
  - Seal off the building.
  - Close windows and doors.
  - Close/turn off ventilation.
- The duty infectious diseases doctor is responsible for the medical risk assessment.

Radioactive substances (class 7)

Risks

- Direct radiation damage, at high doses.
- Long-term effects (e.g. cancer, fetal damage, genetic damage).
- Internal contamination through inhalation or swallowing.
- Gamma (and neutron) radiation has a long reach and penetrates all types of protective clothing.

Suggested protective equipment

Breathing protection and protective clothing suitable for the assessed risks and the task in hand.

Initial danger zone for evacuation

Initial danger zone	50 m radius
Liquid or fumes	300 m

Examples of measures during an incident

- Evacuate people in danger.
- Carry out lifesaving
  - Move people away from the danger zone.
  - If individuals are suspected of having radioactive substances on their person – stop exposure by removing clothing. *See tab 4, Lifesaving decontamination.*
- Cordon off the danger zone.
- Warn.
- Spend as little time as possible in the radiation-contaminated area.
- Maintain the greatest possible distance from the radiation source.
- No more personnel than necessary in the danger zone (no women of childbearing age).
- Touch no objects in the danger zone.
- Rotate personnel so that each person spends as short a time as possible in the danger zone.
- Record time in danger zone and calculated dose for each person.
- When there is access to measuring instruments, the cordon is set at a dose rate of 100 µSv/h*.

**At a dose rate of 100 µSv/h it is possible to work for 200 hours before reaching the occupational dose limit of 20 mSv per year.*

Corrosive substances (class 8)

Risks

- Chemical burns on skin, eyes and the respiratory canal.
- Can in contact with other substances cause a violent chemical reaction.
- Can in contact with metals produce flammable and toxic gases.
- Fire.
- Environmental damage.

Protective equipment

Breathing protection and protective clothing suitable for the assessed risks and the task in hand.

Initial danger zone for evacuation

Initial danger zone	50 m
During heavy degassing or risk of violent reaction	100 m

Examples of measures during an incident

- Evacuate people in danger.
- Carry out lifesaving
  - Rinse eyes and contaminated skin with water.
- Cordon off the danger zone.
- Warn.
- Wash down any gases with a water-mist jet.
- Neutralize acid residues with lime.
- Dilute alkalis using large amounts of water.
- Contain or clear up to prevent spreading.
- Remember that acids can react with common sorbents.

Miscellaneous dangerous substances and articles (class 9)

Risks

- Health hazard.
- Toxic smoke/fumes.
- Explosion.
- Many substances in this class are harmful to the environment.
- Contact with water can lead to violent reactions for certain substances.

Protective equipment

Breathing protection and protective clothing suitable for the assessed risks and the task in hand.

Initial danger zone for evacuation

Initial danger zone	50 m
During fire	100 m

Examples of measures during an incident

- Evacuate people in danger.
- Carry out lifesaving.
- Cordon off the danger zone.
- Warn.
- During fire, move or cool down containers.
- Contain or clear up substances to prevent spreading.

Certain substances (With hazard identification number 99) can cause violent reactions if water is applied.

Chemical Warfare Agents

Chemical warfare agents

Chemical warfare agents (CWA) are extremely dangerous chemical agents that are made to injure or kill. Nerve agents and blister agents are considered the most likely to be used in terrorist actions *(for symptoms see pages 24-25)*.

Nerve agents (such as sarin) are liquids that release moderate to small concentrations of extremely toxic vapour. In liquid form they are quickly absorbed through unprotected (or poorly protected) skin. Both vapour inhalation and skin contact with liquid/droplets can result in death within minutes. The first symptoms of nerve gas poisoning are usually small pupils and increased saliva/mucus production.

Blister agents (such as mustard gas) are liquids that release moderate concentrations of vapour. In liquid form, but also in gas form, they damage skin, mucus membranes and eyes within minutes, but are rarely fatal in the immediate aftermath. Symptoms may be delayed for several hours (mustard gas) or occur immediately (lewisite).

Important treatment information

- There are antidotes (atropine or atropine-oxime) for nerve agents (must be given as quickly as possible, preferably using an autoinjector at the scene). There are no effective antidotes for blister agents.
- Do not touch casualties without adequate protective equipment (ordinary rubber gloves provide poor protection against nerve agents).
- Mouth to mouth resuscitation can injure responders and must not be given.

- Wet clothes and shoes, and possibly even wet hair and beard growth, should be removed from seriously injured casualties as soon as possible after evacuation.
- Complete decontamination must be carried out as quickly as possible if exposure to nerve agents or blister agents is suspected:
  - Absorb any liquid on the skin (e.g. using Fuller's earth, flour, absorbents or nappies/diapers) without rubbing.
  - Next shower, wash with soap and shower again.

Tear gas

Risks and symptoms

Tear gas can cause irritation to eyes and airways very quickly. Wet or injured skin may become painful. Heavy exposure can also cause nausea.
Typical symptoms include:

- stinging, burning sensation in nose, mouth and throat
- very watery eyes
- excessive salivation
- coughing

The toxicity is low, i.e. much higher concentrations than those that produce violent symptoms are necessary to do direct harm. However, very high concentrations (which can only be achieved in closed rooms) can cause serious injury.

Important treatment information

- Tear gas has almost immediate effects, but symptoms disappear 15–30 minutes after exposure stops.
- Treatment involves evacuation to an area with fresh air, removing outer clothing and droplets/ particles

on skin/clothes. In the case of heavy exposure, the eyes should be flushed (water or saline solution). Affected people should avoid rubbing their eyes (cornea damage).

- Flushing with water may initially increase irritation and pain in areas of thin skin.

Pepper spray

Risks and symptoms

Pepper spray is a liquid that is dispersed as an aerosol. It irritates the mucus membranes and primarily causes symptoms in the mouth, nose and eyes. It incapacitates those affected by causing painful irritation of the eyes. This can result in impaired vision, hypersensitivity to light or temporary blindness. It can also cause serious respiratory problems, allergic reactions and rashes in some people.

Typical symptoms include:

- running eyes and nose
- pain in the eyes and face
- red skin
- rapid pulse and raised blood pressure
- rapid breathing

Important treatment information

- The effects of pepper spray last longer than those of tear gas (approx. 30–50 minutes).
- The aerosol drops from the spray may contaminate everything the affected person touches. Avoid rubbing eyes and wash hands, change clothes and shower as soon as possible.

- Wear gloves when handling or treating people with pepper spray on skin/clothes.
- Move affected people to an area with fresh air, flush the affected areas with cold water.
- Carefully dry away (absorb) any particles with a wet towel or compress without rubbing. This is especially important around the eyes.

Chlorine gas and ammonia

CHLORINE GAS (Cl_2) is a yellowish green gas, it is 2.5 times heavier than air, and has an easily recognisable pungent odour. It is transported in liquid form. Its low boiling point (–34°C) means the liquid quickly evaporates into a gas. In low concentrations it causes local irritation; high concentrations cause tissue damage, respiratory problems and lung failure, which can be fatal. Contact with skin and mucus membranes can cause corrosive damage.

AMMONIA (NH_3) is a colourless gas, it is lighter than air, and has a pungent odour (household ammonia odour). It is used in industry, farming and larger cooling facilities. Its low boiling point (–33°C) means the liquid quickly evaporates into a gas (which is heavier than air as long as it is cold). In low concentrations it causes local irritation; high concentrations cause tissue damage, respiratory problems and lung failure, which can be fatal. Contact with skin and mucus membranes can cause deep corrosive damage.

Risk and symptoms (both gases)

Typical symptoms for both gases (low/medium concentrations) include:

- burning sensation in nose, mouth and throat
- hoarseness and coughing
- headache
- chest pains

High concentrations can result in:

- swelling of the throat, pulmonary oedema, and life-threatening lack of oxygen
- in its liquid form it can cause frostbite injuries when it evaporates

Important treatment information

- Gas mask filters protects against low/medium concentrations.
- There are no antidotes. Provide oxygen and respiratory support/start resuscitation if necessary.
- People exposed to the gas only can be treated without decontamination after evacuation from the danger zone. However, removal of clothes prevents patients from continuing to smell of gas and cause anxiety among personnel further down the treatment chain.
- It is especially important to flush the eyes (water or saline solution) if they have been splashed with ammonia.
- People with symptoms should be sent to hospital as soon as possible.

Hydrogen sulphide and carbon monoxide

Hydrogen sulphide (H_2S) is a colourless, combustible gas; it is slightly heavier than air, and smells like rotten eggs (the odour may disappear at high concentrations). It can be formed by, for example, putrefaction (sewage manholes, fertiliser cellars, purification facilities, etc.) but it can also be formed if acid is mixed with liquids

containing sulphur (e.g. toilet cleaning agent, insecticides, etc.). In low concentrations it causes local irritation; high concentrations block oxygen uptake in cells (similar to cyanide) and can cause respiratory failure and death after just a few inhalations ('knockdown').

Risks and symptoms

Typical symptoms (low/medium concentrations) include:

- burning sensation in nose, mouth and throat
- hoarseness and coughing, headache
- nausea

High concentrations:

- unconsciousness and death within seconds/minutes

Carbon monoxide (CO) is a colourless, odourless, combustible gas; it is slightly lighter than air, and is formed by the incomplete combustion of materials containing carbon. It binds to the haemoglobin and blocks the blood's oxygen carrying capacity. Carbon monoxide is often involved in suicide attempts (exhaust fumes). Disposable barbecues can produce high concentrations of carbon monoxide. Deadly concentrations usually only occur in closed rooms.

Risks and symptoms

Typical symptoms include:

- headache, nausea dizziness and confusion
- hyperventilation

High concentrations:

- coma, skin and mucus membranes can turn cherry red despite a life-threatening lack of oxygen

Both hydrogen sulphide and carbon monoxide are highly combustible and can become explosive when mixed with air.

Important treatment information

- There are no antidotes; provide oxygen and respiratory support/resuscitation if necessary.
- Mouth to mouth resuscitation is not regarded as dangerous once the patient has been evacuated from the danger zone.
- Hydrogen sulphide is toxic at even very low concentrations. High concentrations can result in death after just a few inhalations.
- Gas mask filters provide no protection against carbon monoxide.
- Affected people should avoid exertion – should preferably be kept sitting upright and still.

Hydrogen fluoride (hydrofluoric acid)

Hydrogen fluoride (HF) is a colourless liquid with a boiling point of 20°C, i.e. in high concentrations it evaporates into a gas at room temperature. It is normally used for treating metal surfaces and etching glass. The gas is lighter than air and high concentrations therefore only occur indoors.

Risks and symptoms

Highly corrosive, both in liquid and gas form, and causes deep wounds in all tissue with which it comes into contact. It binds the calcium in tissue; if large areas are affected the calcium level in blood may become fatally low. Diluted solutions (under 7%) may not produce symptoms until one to several hours later.
Typical symptoms include:

- intense pain on contact with tissue (skin, eyes, etc.)
- burning sensation in nose, mouth and throat

- sneezing, coughing
- breathing difficulties
- chest pains

Important treatment information

- Start treatment immediately.
- Flush the skin/mucus membranes with copious amounts of water.
- A Ca++ Gluconate salve can be applied to damaged skin (Ca++ Gluconate infusion can be given if large areas of skin are affected).
- Concentrated solution on an area of skin larger than the palm of a hand can be life-threatening.
- Casualties should receive medical treatment (emergency unit/hospital) as soon as possible.

Improvised Explosive Devices (IED)

Measures at incidents with IEDs

If an IED has exploded

- Move or touch nothing or no one, that is a job the for Police bomb technicians.
- Consult with experts as soon as possible.
- Lifesaving operations only when and if they become possible.
- Site the command post or other assembly point, e.g. Forward Control Point (FCP) away from areas where further IEDs may be present.

Undetonated IEDs

- Move or touch nothing, that is a job the for Police bomb technicians.
- Consult with experts as soon as possible.
- Identify, if possible, the type of explosive device, from a distance using binoculars.
- Evacuate the danger zone and cordon off in accordance with the IEDs estimated size. See table below.
- Site the command post or other assembly point, e.g. Forward Control Point (FCP) away from areas where further IEDs may be present.

Cordon distance for IEDs

IED	Cordon distance
Packet/letter	150 m unobstructed view
Bag	200 m unobstructed view
Vehicle	500 m unobstructed view

Considerations

- Choose a protected assembly point.
- Make use of buildings or natural barriers for protection.
- Keep away from buildings with large amounts of glass.

Blast injuries, grouped according to damage mechanisms:

- **Primary injuries** are caused by the blast (shock) wave; they are typically *internal injuries* (e.g. ear drums, lungs, intestines, circulation, brain, eyes) which can be serious or lethal *despite minimal visible* body damage. Most dangerous at short distances/within confined spaces.
- **Secondary injuries** are caused by objects or fragments ejected by the explosion, typically causing *cuts, penetrating wounds and blunt injuries.*
- **Tertiary injuries** are a result of victims being thrown against buildings or objects by the blast, typically causing *fractures, contusions and traumatic amputations* (also injury of *internal organs*).
- **Quatenary injuries** are other injuries like *burns, toxic gas* inhalation, injuries caused by *collapsing buildings etc.*

Marking and labelling

Transport marking and labelling

Explosive (pages 32)

Flammable gases *(page 34)*

Toxic gases *(page 36)*

Non-flammable, non-toxic gases *(page 38)*

Flammable liquids *(page 39)*

Flammable solids *(page 40)*

Substances liable to spontaneous combustion *(page 42)*

Substances which in contact with water emit flammable gases *(page 44)*

Transport labelling

Oxidizing substances *(page 46)*

Organic peroxides *(page 48)*

Toxic substances *(page 50)*

Infectious substances *(page 52)*

Radioactive substances *(page 54)*

Radioactive substances *(page 54)*

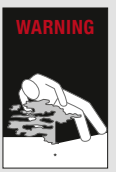
Corrosive substances *(page 56)*

Miscel-laneous dangerous substances *(page 58)*

Environmental hazard

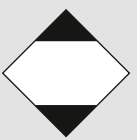
Substances being transported at an elevated temperature

Fumigated cargo carriers, e.g. containers



Carriers that contain agents for cooling or conditioning and which pose a risk of suffocation

Limited Quantity



Limited Quantity

Shift carefully (railway waggon)

Must not be subjected to impact and must be protected against impact from other waggons (railway)

Marking

An orange plate on a lorry or railway waggon signifies that it is transporting dangerous goods. Orange plates with numbers are only used for tanker transportation or battery vehicles and for bulk transport. The upper number is the hazard identification number, which generally signifies one of the following hazards:

Hazard identification numbers

0	Of no significance
2	Gas
3	Flammable liquid or gas
4	Flammable solid
5	Oxidizing
6	Toxic
7	Radioactive
8	Corrosive
9	Risk of a sontaneous violent reaction
x	Reacts dangerously with

The first digit represents the primary hazard, digits 2 and 3 signify the secondary hazard. The same number twice signifies an intensification of that particular hazard. When the first number is followed by a zero it signifies that there is no secondary hazard.

Examples of hazard identification numbers

20	Asphyxiant gas without secondary risk
22	Refrigerated liquefied gas
23	Flammable gas
268	Toxic corrosive gas
30	Flammable liquid
33	Highly flammable liquid
333	Spontaneous combustible liquids
606	Infectious substance
80	Corrosive or slightly corrosive substance
99	Miscellaneous dangerous substance carried at an elevated temperature

The lower number is the UN number, which states the hazardous substance or substance type that is being transported.

Plate for packaged dangerous goods

Plate with hazard identification number an UN number

Product labelling

Hazard pictograms, mandatory from 1 July 2015

Explosive

Flammable

Gas under pressure

Oxidizing

Toxic

Serious long-term health hazard

Harmful, less serious health hazard

Corrosive

Environmental hazard

Current (older) product labels - Hazard symbols

Explosive

Extremely/Highly flammable

Oxidizing

Very toxic

Harmful/irritant

Corrosive

Dangerous for the environment

Regional alarm centre/command support staff

Regional alarm centre / command support staff

Find out more information

- Who is calling? Name, age, phone number, address.
- Where is the caller calling from?
- Where did the incident happen e.g. industrial area, agricultural site, transport incident (buildings, topography)?
- What type of vehicles? Are there any visible UN numbers, shipping labels, names of hauliers?
- Obtain an overview of the extent of the damage and injuries: number of casualties, emissions, type of substance. Is there an unpleasant smell? Are there any people nearby or resident?
- Visible leak or gas cloud? Colour?
- What are the wind conditions at the incident site?
- Tell the caller not to approach the incident site, to pay attention to cordons, and possibly to block off approach roads with his/her own vehicle.

Transport incident

- Is the driver contactable?
- Does the driver know the name and properties of the goods?
- What type of vehicle? Are there any visible UN numbers, shipping labels, names of hauliers?

Industrial area / establishment

- Are there any experts for the specific industry/ establishment at the incident site?
- Is there an industrial fire brigade?
- Has the industrial fire brigade been alerted?

Alerting of resources /additional units

- State the type of incident, exact location and resources needed, using standard procedures.
- Notify units about additional information on the extent of the incident, as well as the name and properties of the substance involved.
- Also provide meteorological details (wind direction, wind speed, temperature, and type of weather).
- Relate where the caller is and the current situation where s/he is.
- Provide an approach route based on topography and/or wind direction.

Overview of resources

- Assist with obtaining an overview of resources. This applies, for example, to resources in the affected municipality, the region, industries or in other organisations.
- Obtain expert assistance.

Prepare for treatment of casualties

- Keep hospitals in the area updated with regards to:
  - Type of hazardous material.
  - Number of casualties (preliminary) and their condition.
  - Decontamination status (i.e decontaminated or not) of the patients arriving.
  - Need for antidote.

Chemical experts

Sweden

- RIB Resurs (The incident resources service on the MSB's software programme and web based integrated decision support tool).
- Chemical Expertise Network – can answer questions about chemicals based on product name alone.
- Swedish Poisons Information Centre
- Swedish Board of Health & Welfare C-MEG (Chemicals – Medical Expert Group) – contacted via the Duty Officer at the relevant local health authority.
- A company's chemcial incident officer can help in the event of an incident involving toxic liquiefied gases, acids and alkalis – contacted via SOS Alarm (regional alarm centre).

Norway

- Resource centres
- National CBRNE Medical and Advisory Centre
- Poisons Information (info on the effects of poisons)
- Norwegian Coastal Administration – Advice for Chemical Incidents.
- DSB (Norwegian Directorate for Civil Protection)

Experts on infectious diseases and biological toxins

Sweden

- On-call infectious diseases doctor – contacted via the Duty Officer at the relevant local health authority.
- On-call county vet – contacted via the Duty Officer at the relevant local health authority.

Norway

- National CBRNE Medical and Advisory Centre
- Infectious diseases doctor at the nearest hospital
- Norwegian Institute of Public Health
- Norwegian Food Safety Authority

Experts on radioactive substances

Sweden

- Duty Officer at the SRSA (Swedish Radiation Safety Authority) – contacted via SOS Alarm.
- Swedish Board of Health & Welfare RN-MEG (RN – Medical Expert Group) – contacted via the Duty Officer at the relevant local health authority.
- Duty Officers at county councils can contact their local medical physicist.

Norway

- National CBRNE Medical and Advisory Centre
- Norwegian Radiation Protection Agency

Explosives experts

Sweden

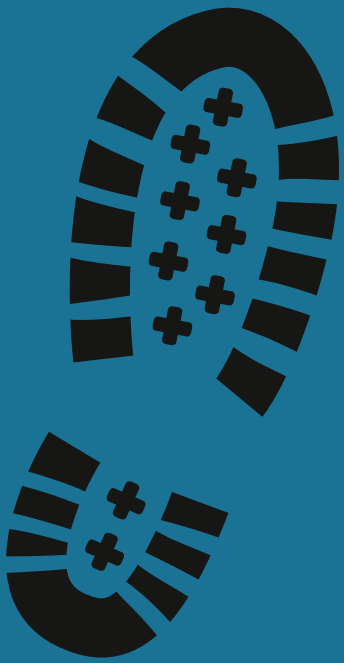
- Police bomb technicians

Norway

- Police bomb group

Every regional alarm centre is presumed to have access to current phone numbers for experts and institutions.

Forensics



A CBRNE incident may be caused by criminal actions!

If possible, note and document

- Observed objects and actions, e.g. footprints, strange behavior?
- Take pictures/video of the incident scene; describe what you see and what actions you observe.

To consider (if possible) during the response

- Look where you are going, limit the number of responders in the scene.
- Footprints, fragments, other signs may be important evidence and should be protected.
- Do not move anything unless vital to the tasks at hand.
- Dead persons should, if possible, be left as found. Are there signs indicating whether the person is a victim or a perpetrator?
- Clothing, shoes etc. removed from injured or exposed persons prior to decontamination may contain material important for subsequent criminal investigation. Store in plastic bags, separately for each person.

Remember

- Water damages evidence more than other fire extinguishing agents.
- Securing material for analysis early increases the possibility for determining which agent(s) victims and first responders have been exposed to.

NOTES

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Checklist

Prior to turnout

- [ ] Consider the protective equipment and resources needed

En route to incident

- [ ] Find out more information
- [ ] Choose a safe response route
- [ ] Set an FCP (Forward Control Point)

On scene – assessment & decision

- [ ] Initial visual report
- [ ] Carry out risk assessment
- [ ] Provide a situation report
- [ ] Establish cooperation
- [ ] Evaluate previous decisions
- [ ] Establish Command Structure

On scene – operational measures

- [ ] Evacuate
- [ ] Lifesaving
- [ ] Cordon off
- [ ] Warn
- [ ] Decontamination of personnel
- [ ] Provide a new situation report

Further operational measures

- [ ] Take any possible limitation measures
- [ ] Secure evidence



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