A photograph of an industrial site, possibly a power plant or refinery, featuring a large cylindrical tank emitting a thick plume of white steam. The scene is viewed from an elevated position, likely from a train or a walkway, with green metal railings and overhead power lines visible. The background is filled with dense green trees. The overall atmosphere is industrial and somewhat hazy due to the steam.

FIRST RESPONDERS HANDBOOK

# Hazardous Materials CBRNE

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Order No. MSB643 - February 2014

ISBN: 978-91-7383-412-4

Using the handbook .....	5
<b>1 Mobilising and en-route.....</b>	<b>9</b>
<b>2 On scene – assessment and decision.....</b>	<b>13</b>
<b>3 On scene – implementing the response .....</b>	<b>17</b>
<b>4 Lifesaving decontamination, symptoms .....</b>	<b>21</b>
<b>5 Risks, protective equipment, initial danger zone, examples of measures.....</b>	<b>31</b>
<b>6 Chemical warfare agents (CWA) .....</b>	<b>63</b>
<b>7 Improvised explosive devices (IED) .....</b>	<b>67</b>
<b>8 Marking and labelling .....</b>	<b>71</b>
<b>9 Regional alarm centre/ command support staff .....</b>	<b>81</b>
<b>10 Forensics .....</b>	<b>87</b>
<b>11 Checklist .....</b>	<b>93</b>

# 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.

# 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

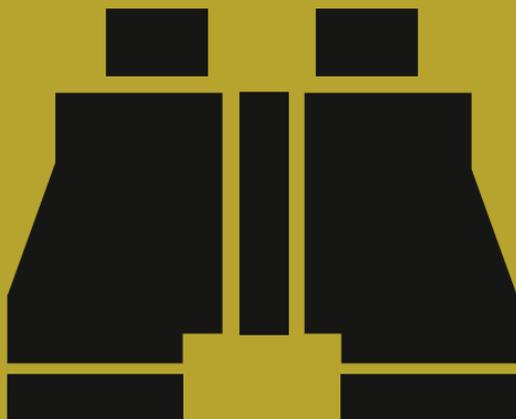
- If possible approach the incident site with the wind blowing towards the incident site not towards you.
- Never drive closer to an incident site than 50m.

### 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?
- 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



# On scene

## – implementing the response



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**

## **Further 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

<b>Chemicals (C)</b>	<ul style="list-style-type: none"><li>- Remove casualty from source of exposure.</li><li>- Remove clothing without pulling over the head.</li><li>- Rinse person with water, when needed*.</li><li>- Wrap the casualty in blankets to avoid cooling.</li></ul>
<b>Infectious substances/ Biological (B)</b>	<ul style="list-style-type: none"><li>- Normally no need for lifesaving decontamination.</li><li>- Anthrax and botulinum toxin are the exceptions. Follow the recommendations for C.</li></ul>
<b>Radioactive substances (RN)</b>	<ul style="list-style-type: none"><li>- Remove casualty from source of exposure.</li><li>- Remove clothing without pulling over the head.</li><li>- Always wash the casualty's hands and face to minimize the risk of internal contamination.</li><li>- Wrap the casualty in blankets to avoid cooling.</li></ul>

\* 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 individuals 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 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 chemicals 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
<b>Nerve gas</b> (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
<b>Blistering &amp; tissue damaging agents</b> - lewisite, phosgene oxime  mustard gas	Short  Delayed	Pain, redness, spasms in eyelids  Pain, redness, spasms in eyelids	Irritation, coughing, hoarseness  Irritation, coughing, hoarseness	Coughing with mucus (serious exposure)  Coughing with mucus (serious exposure)
<b>Locally irritating gases</b> -chlorine, ammonia, sulphur dioxide, etc.	Immediate	Irritation	Laboured breathing, dry coughing	Laboured breathing, dry coughing
<b>Cyanide</b> (Cyanokit/sodium thiosulfate)	Short	Dilated pupils (serious poisoning)	–	Rapid breathing (progressing to loss of breathing)
<b>Opiates Aerosoles</b> (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 chock following serious incidents (as with burn injuries)
Redness, blisters, lesions		Nausea, vomiting	Possible chock 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**



**RISKS, PROTECTIVE EQUIPMENT,  
INITIAL DANGER ZONE, INITIAL ACTION**



Explosives.....	page 32
Flammable gases .....	page 34
Toxic gases .....	page 36
Non-flammable, non-toxic gases.....	page 38
Flammable liquids .....	page 39
Flammable solids.....	page 40
Spontaneous combustion .....	page 42
Substances which in contact with water emit flammable gases .....	page 44
Oxidizing substances .....	page 46
Organic peroxides .....	page 48
Toxic substances .....	page 50
Infectious substances .....	page 52
Radioactive substances.....	page 54
Corrosive substances .....	page 56
Miscellaneous dangerous substances .....	page 58

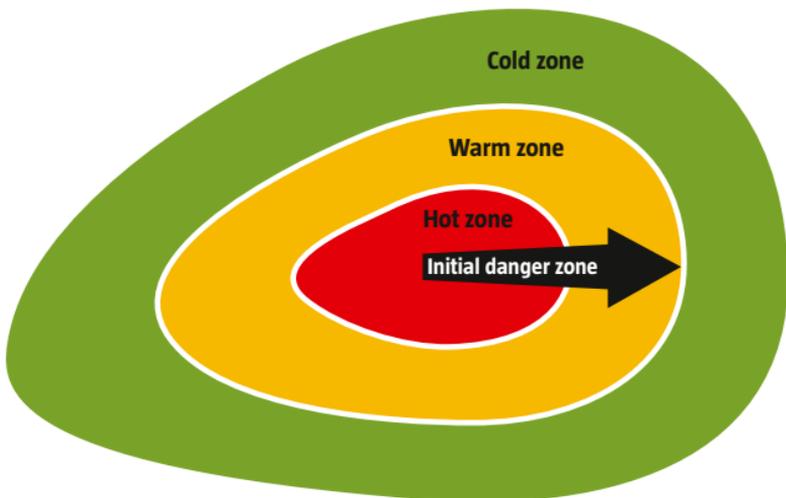


## Initial danger zone for incidents with an unknown substance

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

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

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

	<p><b>For a fire:</b></p> <ul style="list-style-type: none"> <li>- In open country (risk of shrapnel)</li> <li>- In shelter (risk of shock wave)</li> </ul>	<p>1000m 300m</p>
	<p><b>For a fire in commercial premises</b></p> <p><b>For a fire in a full container/ full storage premises:</b></p> <ul style="list-style-type: none"> <li>- In open country (risk of shrapnel)</li> <li>- In shelter (risk of shock wave)</li> </ul>	<p>50m 1000m 300m</p>
	<p><b>During fire</b></p>	<p>50m</p>

## **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 $\leq 2$ m/s	wind $> 2$ m/s
	Small emission* (a leaking seal)	300m radius
Large emission (a broken connection hose or pipe)	300m radius	- 300m in the direction of the wind - 50m against the wind
Tank/cistern at risk of splitting (BLEVE)		1000m
Aerosols and disposable containers		50m
Gas cylinders exposed to fire		300m

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

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

\* 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	50m
	Gas cylinders not exposed to fire	100m
	Gas cylinders exposed to fire	300m
	Tank/cistern at risk of splitting	1000m

### 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)



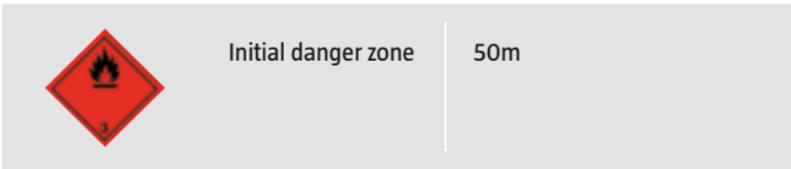
### Risks

- 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



### 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

50m

During a fire, strong degassing or when there is a risk of a violent reaction

300m

## **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	50m
During a fire, strong degassing or when there is a risk of a violent reaction	300m

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

## **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 substance 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	50m
	Risk of fire or explosion	≥ 300m

## **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	50m
	Risk of fire or explosion	≥ 300m

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

### **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



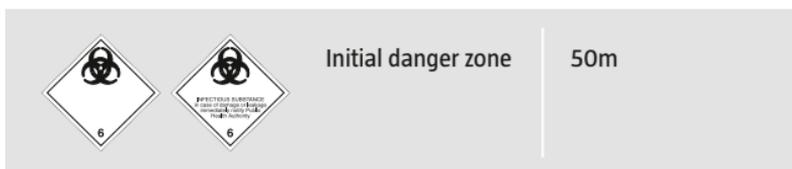
### Risks

- 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



## **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	50m radius
	Liquid or fumes	300m

## 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  $100 \mu\text{Sv/h}^*$

---

*\*At a dose rate of  $100 \mu\text{Sv/h}$  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	50m
	During heavy degassing or risk of violent reaction	100m

## **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	50m
During fire	100m

## **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 (CWA)





## Chemical Warfare Agents

Chemical warfare agents (CWA) are very dangerous chemicals that are made specifically to cause injury or kill. Nerve gases and tissue-damaging gases especially, can be expected to be used for terrorist purposes (*see page 24-25 for symptoms*).

Nerve gases such as Sarin are liquids with low volatility; inhalation of their vapours is highly toxic, absorption of the liquid through unprotected (or poorly protected) skin can also be fatal within minutes. There are antidotes (atropine or atropine-oxime) that should be given quickly, if possible with an autoinjector at the scene.

Tissue-damaging gases, such as mustard gas, are liquids with low volatility. The liquid form but also the gas destroys skin, mucous membranes and eyes within minutes / hours but rarely kills. The effect may be delayed for several hours (mustard gas). There is no effective antidote.

Things to consider:

- Do not touch casualties without protective equipment.
- The first symptoms after exposure to nerve agents are usually small pupils and increased mucus production.
- Wet clothes, shoes and possibly even hair or beard should be removed from seriously injured casualties as soon as possible after evacuation.
- A complete personal decontamination is mandatory if nerve gases or tissue-damaging gases are suspected:
  - First absorb the liquid on the skin.
  - Then decontaminate by showering and using soap.



# Improvised Explosive Devices (IED)



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	150m unobstructed view
Bag	200m unobstructed view
Vehicle	500m 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.

# 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)



Miscellaneous dangerous substances  
(page 58)



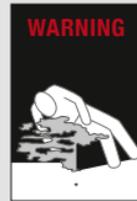
Environmental hazard



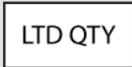
Substances being transported at an elevated temperature



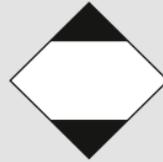
Fumigated cargo carriers, e.g. containers



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 spontaneous 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	Spontaneously 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 cargo*



*Plate with hazard identification number and 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





## **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 chemical incident officer can help in the event of an incident involving toxic liquefied 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**

- Norwegian Centre for NBC Medicine
- 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**

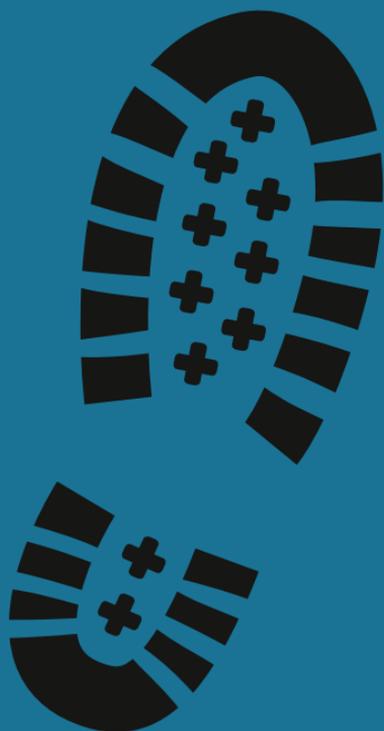
- Police bomb technicians

### **Norway**

- Police bomb group

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

# Forensics





## Forensics advice

- Note that an incident site can also simultaneously be a crime scene.
- Remember that water can destroy evidence more so than any other extinguishing agent.
- Document! If you can, take photos of or film vital parts of the progress of events and describe what you see while filming.
- Watch where you are walking and limit the number of personnel on scene. Tracks and other things could be important evidence.
- Do not move objects unless it is absolutely necessary.
- Record who has seen what, for example, tracks or unusual behaviour.











# 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

## 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





RÄDDNINGSTJÄNSTEN  
STORGÖTEBORG



Räddningstjänsten  
Östra Skaraborg



Storstockholms  
brandförsvär

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Order No. MSB643 - February 2014 ISBN: 978-91-7383-412-4