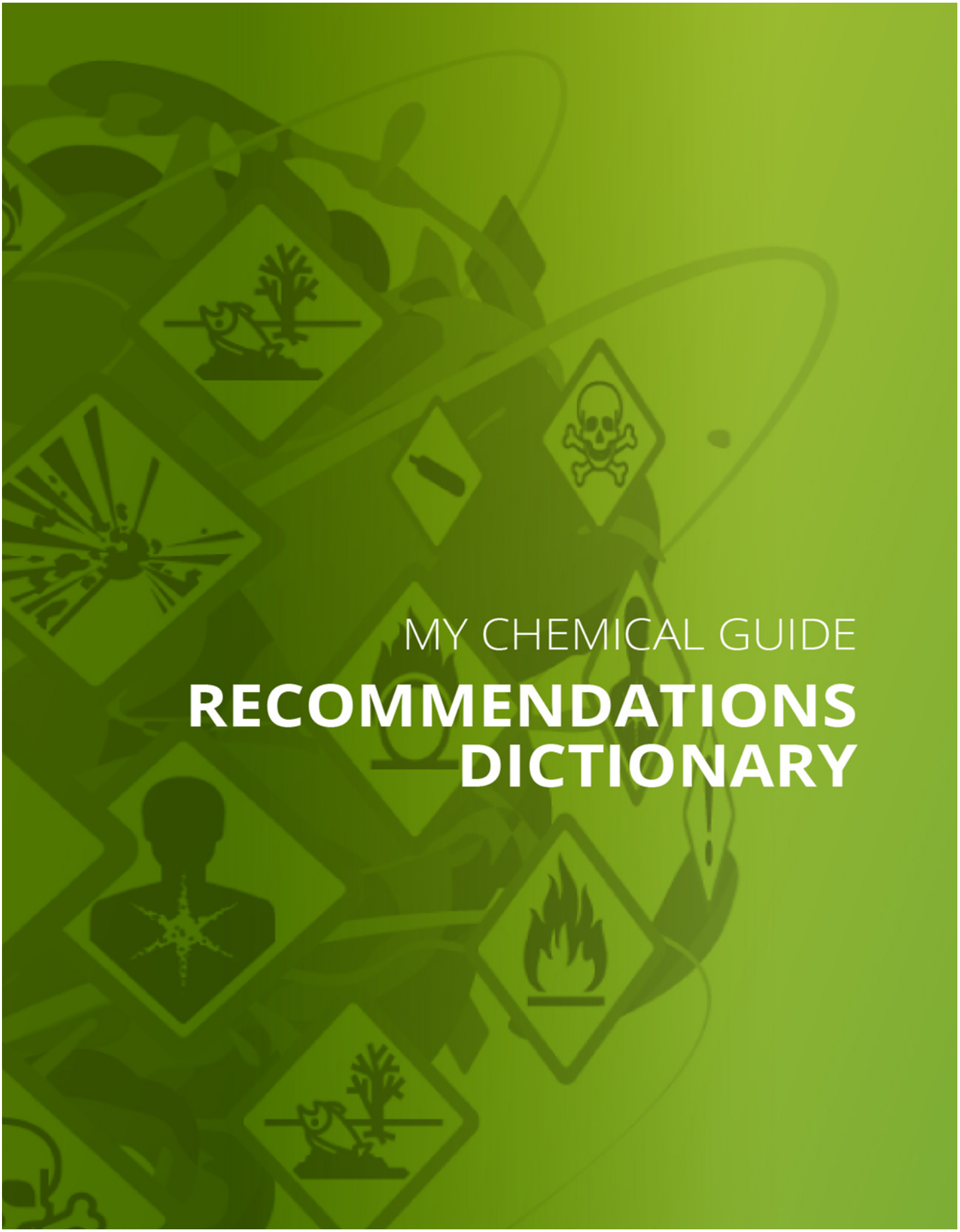


MY CHEMICAL GUIDE

RECOMMENDATIONS DICTIONARY

Good practices and guidance

Part I: Handling, use and exposure of dangerous substances

1.1

Special requirements for certain chemical products and substances

Introduction

Specific measures are often needed when working with certain chemical products or substances.

Applying good practice is often an easy, fast and effective way of complying with the general regulatory demands for the safe handling of chemicals. The good practice examples include tips and advice on measures that can reduce and control risks.

There are, of course, many more products and substances that may pose risks. For all chemical products, as well as for substances generated from different processes, the general regulations about risk assessment and measures to control risks apply. Read more about this in the Chapter ‘These routines must work’. The action to be taken depends on how the risk is assessed.

This guide provides information on different types of practical measures that reduce chemical risks. There is a comprehensive body of European and national legislation for chemical products and other substances that present specific risks.

> **EU directives and regulations**
> The basic directive is the directive 98/24/EG on protection of the health and safety of workers from the risks related to chemical agents at work, other directives can be found at EU OSHAs website
> **EU Guidance**
> Extensive guidance (tools and resurces) on different themes can be found at EU OSHAs website

1.2

Carcinogenic, mutagenic or reprotoxic substances (CMR)

Substances that are carcinogenic, mutagenic or reprotoxic, pose serious risks, which are usually not immediately noticeable upon contact with the substance, but may result in serious effects in the form of cancer several years later or may harm the next generation through their impact on reproductive performance or the fetus, or by causing genetic damage.

Carcinogenic, mutagenic or reprotoxic substances shall not be used, unless absolutely necessary
Where possible, it is compulsory to replace chemical products that are labelled with one or more of the following Hazard Statements (H = Hazard):

- **H340: May cause genetic defects**
- **H341: Suspected of causing genetic defects**
- **H350: May cause cancer**
- **H350i: May cause cancer by inhalation**
- **H351: Suspected of causing cancer**
- **H360: May damage fertility or the unborn child**
- **H360x: May cause fertility or the unborn child (x can be one of these letters F, D, FD, DF, Df or Fd)**
- **H361: Suspected of damaging fertility or the unborn child**
- **H361x: Suspected of damaging fertility or the unborn child (x can be one of these letters f, d or fd)**

Exception: This does not apply to fuels used in vehicles, engines or heating.

Is it possible to replace carcinogenic, mutagenic or reprotoxic products with safer alternatives?
In order to assess whether or not it is possible to replace a chemical product that contains carcinogenic or mutagenic or reprotoxic substances with a safer alternative, there is a need to examine the issue further. Use the method described in the e-tool to investigate this.

Measures
If carcinogenic, mutagenic or reprotoxic substances cannot be replaced, it is important to maintain documentation on the investigation that shows that it is not technically feasible to use other, less hazardous,

chemical products.
In the event that products containing carcinogenic, mutagenic or reprotoxic substances must be used, they shall (if technically possible) be handled in a closed system. Work, including the equipment and working methods, are designed so as to create as little air contaminants as possible and so that sprinkling and splashing are prevented.
The air contaminants generated, for example local exhausts, shall be captured as quickly and as effective as possible and as close as possible to the source using process ventilation.
If there is a risk of contact with skin, personal protective equipment in the form of protective clothing and protective gloves shall be used.
Spillages shall be collected and removed as quickly and as safely as possible.
Wastes that may contain such substances must be stored and transported in shock-resistant, sealed and labelled containers.
For work with carcinogenic, mutagenic or reprotoxic substances, it is important to provide written working and safety instructions in order to make it very clear what routines need to be followed.

EU directives and regulations

EU-Directive 2004/37/EC Protection of workers from the risks related to exposure to carcinogens or mutagens at work
Read also the explanations about carcinogens, mutagens or reprotoxic substances at work on EU-OSHA's website

1.3

Risk assessment

If carcinogenic, mutagenic or reprotoxic substances are present, it is necessary to assess the risks posed by them. The simplest solution, of course, is to replace the products with other, less dangerous, products, in which case there is no need for the type of extended risk assessment that must be carried out for such substances. If it is not possible to replace these substances, an assessment should be carried out, which shall:

- determine where the substances may occur;
- determine what measures are to be taken and how the work must be organised in order to ensure that only those working with these substances are present in

the premises and rooms where these substances are handled;
- assess the protective measures;
- identify where personal protection is needed, where it is intended to be used and the type of protective equipment to be used;
- determine how to ensure that everything, including technical measures, is working well, that work instructions are complied with and that changes or deviations that increase the risk of exposure to the substances are detected as early as possible;
- be documented and the documentation must include the points listed above

EU directives and regulations
EU-Directive 2004/37/EC Protection of workers from the risks related to exposure to carcinogens or mutagens at work
Read also the explanations about carcinogens, mutagens or reprotoxic substances at work on EU-OSHA's website

1.4

Register of workers exposed to carcinogenic and mutagenic substances

Carcinogenic and mutagenic substances can cause serious effects that may appear only after a long period of time. In order to facilitate later investigations into the cause of a cancer or a reproductive abnormality, a register of exposures is required (article 15 of the CMR-Dierctive). The employer is responsible for ensuring that there is such a register. The records shall be retained for a period of at least 40 years for carcinogenic and mutagenic substnces and for a period of at least five years for reprotoxic substances (from the date on which the exposure ceases).

The register shall cover work with substances that are labelled with the hazard statements or risk phrases:

- H340: May cause genetic defects
- H341: Suspected of causing genetic defects
- H350: May cause cancer
- H350i: May cause cancer by inhalation
- H351: Suspected of causing cancer
- H360: May damage fertility or the unborn child
- H360x: May cause fertility or the unborn child (x can be one of these letters F, D, FD, DF, Df or Fd)
- H361: Suspected of damaging fertility or the unborn child
- H361x: Suspected of damaging fertility or the unborn child (x can be one of these letters f, d or fd)

The register must also be kept for, among other things, work with:

- dust from hardwood
- coal soot, coal tar or coal pitch (containing carcinogenic poly-aromatic hydrocarbons (PAHs)
- diesel exhaust
- respirable crystalline silica dust (quartz dust)

The register shall include the following information:

- Name of the worker
- Work tasks.
- The worker’s exposure (involving any of the risks described above).
- How high the exposure was. This can be given as a meter reading (measured exposure) if the exposure has been measured. In the absence of measurements, the degree of exposure shall be estimated and described. It can be difficult to make reliable assessments of exposure. Consult a specialist if necessary.
- The frequency with which the worker was exposed.

EU directives and regulations

EU-Directive 2004/37/EC Protection of workers from the risks related to exposure to carcinogens or mutagens at work
Read also the explanations about carcinogens, mutagens or reprotoxic substances at work on EU-OSHA’s website

10.0

Fire or explosion risks

A fire and explosion hazard can harm workers and the public not only by causing burns but also by heat, fire gases, smoke and weakening structures and it may cause explosions if explosive atmospheres can develop.
Many substances and chemical products – whether gases, liquids or solids – entail a risk of fire and explosion. Typical at work places are e.g.:

- gases such as butane, propane, methane, carbon monoxide, hydrogen,
- liquids such as fuels, solvents, oils, greases, paints and thinners,
- solids such as wood, coal, plastics, metals, food.

Some are even self-igniting under certain circumstances, others burn or explode after ignition, a third group cannot burn by itself but can boost a fire substantially, e.g. by

providing oxygen.

Typical work situations
Fire and explosion risks have led to several major accidents and also to several fatalities. For example, serious risks may exist when working in:

- Tanks and tanks used for fire or explosive liquids, gases or powders, such as organic solvents or fuels.
- Enclosed spaces such as silos, cisterns and cargo spaces on boats, containers, etc. used for the storage or transport of such substances
- In gas welding in small and poorly ventilated areas. If the space is poorly ventilated, carbon monoxide may be generated which leads to nausea (feeling sick), headache, fainting and, in the worst case, death.
- Pits and pipes may be so deep and cramped to avoid mixing air with ambient air, the air becomes ‘standstill’. If there are dangerous gases, e.g. swamps or methane from the breakdown of waste, the air can be both explosive and oxygen poor.

These are only very few examples of work tasks with fire and explosion risk.

Risk assessment
Of foremost importance regarding any fire and explosion risk assessment, is to identify related problematic substances in the company. These could be flammable liquids, gases, aerosols, solids, dusts, substances that can develop spontaneous ignition (e.g. textiles with decomposing greases and fats), substances that develop flammable gases on contact with water or other chemicals, explosives, oxidising substances (e.g. peroxides).
It has also to be established as to whether there are any working processes that may release any of the above mentioned substances (e.g. dusts, mixture of chemicals). It is also necessary to clarify, who is working with these substances, in which processes for how long. Not only the normal work procedures have to be analysed but also servicing, test runs, malfunctioning of machines and plants as well as unauthorized access. Often a special certificate, training, permit or authorisations is required for those workers which handle flammable and explosive materials.
Detailed rules on the use and handling of flammable and explosive substances, chemical products and goods are laid down in national regulations.
Ignition sources
Are there effective ignition sources like open flames and high temperatures available or may they develop during work processes? Such ignition sources can be:

- Thermal energy: combustion engines, open fire, hot surfaces, welding sputters, laser
- Electric energy: short circuits, electric arcs, electromagnetic radiation, lightning,

electrostatic, heat developed by currents
- Mechanical energy: friction, ultrasound, compression, sparks from tools, grinding
- Chemical energy: spontaneous heating or igniting, catalytic reactions, accelerating exothermal reactions

Explosion
If explosive substances are used, handled or are in any other way present in the company, the employer has to establish as to whether the development of an explosive atmosphere is possible. Such an atmosphere is defined as a mixture of oxygen with flammable substances, whereby this can include not only gases or aerosols from liquids but also particles from solid matter. For example a cloud of dust from flour or other biologic material, as well as from metal fines, can also explode and cause severe damage. In the next step it has to be established if this atmosphere can develop in such amounts that it would need special measures.

Detailed rules on the use and handling of flammable and explosive substances, chemical products and goods are laid down in national regulations.

Prevention measures

An overview table of effective prevention measures can be found in the OSHWiki article on ‘Prevention of fires and explosions’.

EU directives and regulations
Directive 98/24/EG on protection of the health and safety of workers from the risks related to chemical agents at work
EU guidance
OSHWiki article on ‘Prevention of fires and explosions’.

15.0

Good practice for sectors, processes and professions with particular chemical risks

Introduction

Certain activities and processes imply particular chemical risks that need to be dealt

with and controlled. Often, the risks associated with a sector, a process or a profession are similar and predictable and can be controlled through applying good practice in a similar manner, regardless of the individual workplace.
On this chapter about the different sectors, processes and professions, we provide tips and advice on measures to reduce the risks and how to understand and implement the relevant laws and rules. Applying good practice is a shortcut to controlling chemical risks, and reduces the need for elaborate risk assessments. Applying the good practice is often an easy, fast and effective way of complying with the general regulatory demands for the safe handling of chemicals. The good practice described here includes tips and advice on measures that can reduce and control risks.

Good practices are described for some common sectors, processes and professions in which chemical risks need to be controlled.

The good practices mainly correspond to EU Directive 98/24/EC on risks related to chemical agents at work, which demand risk identification, assessment and control. This directive is implemented and sometimes complemented by the national legislation of the Member States.
There are, of course, many more sectors, processes and professions that may pose risks. For all sectors, processes and professions, the general regulations about risk assessment and measures to control chemical risks apply. To read more about this, see the chapter ‘These routines must work’. The action to be taken depends on how the risk is assessed.

This guide provides information on different types of practical measures to reduce chemical risks. There is a comprehensive body of European and national legislation for the chemicals included here and other substances that pose specific risks for these, as well as other, sectors, processes and professions.

EU directives and regulations
Directive 98/24/EG on protection of the health and safety of workers from the risks related to chemical agents at work

16.0

Hairdressers

Many products used in hairdressing, such as hair dyes, products for permanent waving and fixatives, are irritating to the skin and respiratory tract. These products may also contain products that can cause eczema and allergies.

For products labelled with a hazard pictogram, the supplier needs to provide a safety data sheet, which should be kept, as it provides information on the risks as well as the protective measures needed. The protective measures described should be applied. There is no requirement to provide safety data sheets for cosmetic products; however, it is useful if the supplier can provide one.

Good practice when working with chemical products in hairdressing is described below:

Check that the general ventilation works well in the hairdressing salon. A very effective way of reducing exposure to air contaminants during permanent waving or dyeing is to use a transparent exhaust hood, placed above the customer’s head.

A fume cupboard (ventilated cabinet) can be used when mixing hair dyes. Alternatively, mixing can be carried out under an exhaust hood, as described above.

In order to avoid exposure to dust from bleaching products, the product can be bought in special packaging that does not need to be opened until the mixture is ready. An alternative is to leave the hydrogen peroxide to be absorbed in the bleaching powder.

Try to replace dangerous products (for information on risks, look at the labels’ hazard pictograms and the safety data sheets) with less dangerous products.

Use metal tools — such as metal clips — that do not release nickel (nickel may cause allergies). It is suitable to use scissors with plastic-coated handles.

Check that there is access to an emergency eye wash, in case dust or splashes of chemical products get into the eyes. The easiest way to ensure this is to connect the emergency eye wash to the tap of a wash basin. The eye wash may be complemented by an emergency eye-wash bottle.

Gloves should be worn at all times when dealing with chemical products. It is best to use disposable gloves made of plastic. The gloves must be clean and dry inside. A protective apron can also be used when appropriate.

Take care of your skin and hands. Use hand lotion extensively. Avoid wearing rings, and watches and other wrist-wear, since chemical products may get trapped and remain under them.

Evaluate the risks in hairdressing and take the precautions needed to control the risks. If such measures are not applied, the risks will be higher.

EU Guidance
EU-OSHA provides an online interactive risk assessment tool for hairdressers (OIRA). You can easily and online perform a risk assessment and get an immediate feedback.
The Commission published guidelines to give advice to employers in the hairdressing sector on occupational safety and health.

17.0

Electro plating, nickel-plating, chromating

Electroplating, as well as nickel plating and chromating, involves the use of toxic and corrosive chemicals in baths. Sometimes solvents are also used for degreasing. It is important to avoid inhalation of vapours and mists from the bath as well as from the degreasing of the metal products to be plated. Splashes and skin contact with the liquids should also be avoided. In addition, there is a risk that gases (such as hydrogen gas) and vapours from organic solvents will form explosive mixtures with air.

Good practice to reduce the risks is described below:

Risk assessment

Before assessing the risks, we recommend that you check the measures described below. They describe good practice, and applying good practice is often a good way of controlling or reducing the most common and severe risks.

Perform risk assessments for every step, including cleaning, degreasing, pickling, chromating, hard chromium plating, nickel plating and electroplating.

Knowledge of risks

Ensure that all staff have a good understanding of the chemical risks and know how to avoid and control risks. In addition, temporary workers, including cleaners, need to be aware of the risks and how to work safely and protect themselves.

It is important to follow safety instructions in order to avoid severe injuries, and it is important to provide written instructions on how to work and on what protective

equipment to use. Examples of severe risks and injuries are burns and the inhalation of vapours mist from baths, which can cause cancer in the long term. It is good practice to provide written safety instructions especially for processes with a low degree of automation and involving open baths and open handling, dosing and the mixing of chemicals.

Measures that apply to all types of electro-plating, nickel-plating and chromating

The premises

The premises with the baths should be separate from other activities. The general ventilation needs to be effective in order to remove air contaminants quickly and efficiently and to prevent them from spreading to adjacent premises. Regular maintenance of the ventilation equipment is needed to ensure that it continues to function well.
Emergency lighting is necessary, to avoid accidents, especially if baths are embedded in the floor.
Provide hand washing facilities close to where the work is carried out.

Baths

The encapsulation of the baths and the automation of the processes, as well as the dosage of chemicals, will reduce the emission of air contaminants from the baths.
Avoid manual handling of chemicals and goods if possible.
Effective process ventilation at each bath is a good way of reducing emissions of mist from the baths.
Investigate if it is possible to reduce the generation of mist by adding a wetting agent to the baths.
Make sure it is not possible to fall into the baths when working close to them. The baths may, for example, be equipped with protective devices such as covers or guard rails.
It is advantageous if hoists and other lifting equipment for goods (including for any dosage of chemicals) are operated at a distance from the baths, in order to reduce the risk of exposure to splashes and mist.
It is recommended that baths that are not in use are shielded or covered.

Safety routines

Ensure that there are good and functioning routines for the supervision and control of production equipment, lifting equipment, personal protective equipment, labelling and signposting. If the equipment does not function as intended, there is a risk that attempts to rectify the problem, by, for example, interfering with the baths, will increase the risk of accidents.

Ensure that there are good and functioning routines for cleaning, including:

- the cleaning of ventilation equipment;
- the cleaning of the edges of the baths;
- ensuring that spillages and leakages are taken care of.

If the work involves particular risks, if workers are not aware of the risks or if work and safety instructions are not followed, a written work permit may be appropriate in order to control who works in the highest risk operations. Written work permits can be individual or can be valid for a limited time. Work permits can be supplemented with work and safety instructions. Work permits may be appropriate for, for instance, work with equipment for electrolytic surface treatment, such as work involving the cleaning, repair, maintenance or changing of anodes; work in pipes or tanks for corrosive chemicals, such as the changing of gaskets or valves or changing the tubing; and ‘hot work’, for example welding, especially when working on or inside vessels that have contained flammable goods.
All electrical equipment should be explosion protected.

Labelling and signs
Are pipes and technical equipment for chemicals labelled with information about the content (name of the chemical and the risk it poses) and the direction of the flow? This applies, for example, to devices for draining, mixing or dosage of chemicals, as well as equipment for degreasing, pickling and coating.

For more information, see Signs and labelling.

Storage of chemicals
Store chemicals in well-ventilated storage areas. Chemicals that may react with each other should be stored separately.
It is important to limit the storage of chemicals in the production premises to, at the maximum, the daily ration of chemicals.
Tanks for chemicals should be placed on a drainage screen in a retaining dike.
Ensure that truck driving and the handling of cargo does not harm the packages of chemicals (as this would pose a risk of leakage).
Avoid packages that can be easily damaged when handled, such as glass demijohns and paper sacks.
For more information, see Storage of chemical products and substances.

Use of chemicals
Ensure that chemicals are not confused or mixed unintentionally or by accident. A

good solution is to have different types of joints for the pipes for different chemicals. Ensure that packages and equipment that are intended to be used for only certain chemicals are clearly labelled.
If possible, use chemicals in liquid form instead of powder form. Liquid chemicals may be dosed with a pump, which emits less air contaminants than pouring powdered chemicals. It is important to check and carry out maintenance on pumps regularly.
If powdered chemicals are used, the emission of air contaminants can be reduced through dissolving them in a vessel with a stirrer, a pump and local exhaust ventilation.

Personal protective equipment
The staff need to have access to respiratory protection, eye protection, safety boots, gloves and protective clothing. Soiled clothes and footwear need to be taken off immediately. Work clothes should be kept separate from personal clothes. For more information, see Personal protective equipment.

Emergency eye wash fountain and emergency shower
If there is a risk of splashes or of being flooded by chemicals, fast and easy access to an emergency eye-wash fountain and an emergency shower is needed. Fast and easy access to emergency showers is important to alleviate burns. Emergency showers may be connected to an alarm, in order to draw attention to someone who may need help. For more information, see Emergency eye-wash fountain and emergency shower.

Handling recently treated goods
Remove goods from hangers in a room different from the one in which electrolytic surface treatment takes place. Separate the rooms with, for example, a plastic or leather drape in the doorway through which the lifting and transport device can move the goods from the bath.
It is good practice to always use protective gloves when working with recently treated goods.

Emptying and cleaning of baths
Empty baths using pumps to avoid any contact with the electrolyte.
To clean baths, use of low pressure devices is recommended (high pressure devices emit mist, which may carry and spread dangerous substances).

Substitution of chromating involving hexavalent chromium with a less harmful alternative
Chromating with trivalent chromium (Cr(III)) poses less of a risk to health than

chromating with hexavalent chromium. Trivalent chromium works well for decorative plating but is not as good for hard chromium plating.

EU directives and regulations
Chromium (VI), see EU-Directive 2004/37/EC Protection of workers from the risks related to exposure to carcinogens or mutagens at work
Read also the explanations about carcinogens, mutagens or reprotoxic substances at work on EU-OSHA's website
Two other EU directives (ELV Directive and Directive on the type-approval of motor vehicles regarding their reusability, recyclability and recoverability) prohibit the use of hexavalent chromium in vehicles. Chromating works above a certain size are covered by the Industrial Emissions Directive (IED) and need to consider converting to the use of less hazardous chemicals.

18.0

Laboratory work

Chemical laboratory work entails working with chemical substances. The risks vary widely, depending on the type of laboratory work.

In general, the following good practices reduce the risks:

Always use a fume cupboard or similar when working with hazardous substances. Check the air velocity of the fume cup board at least once a year.

It may be appropriate to provide fume cupboards with a fixed measuring device that measures and shows the airflow, and indicates the normal operating mode.
If working with substances that pose a risk to life or serious injury (acute or chronic), a fume cupboard can be fitted with an alarm that provides an alert if the airflow falls below a set value. It is important to check the alarm and the alarm limits regularly. Results and dates of all checks carried out can be kept near the fume cupboard.

Consider the following recommendations and measures:

- Keep a negative pressure in the laboratory compared with adjacent premises, in order to prevent air contaminants from spreading to adjacent premises.
- Prepare written information, for example a placard with risk and safety information, if there is a risk of accidents or illness when working with reaction vessels, other apparatus or similar.
- Pipetting should not be carried out using the mouth.
- Limit the quantity of hazardous substances in the laboratory to what is needed for the job.
- Avoid using fume cupboards as storage areas for equipment or chemicals.

Mark all bottles, cans and barrels, etc., that are used for the storage of chemicals with the name of the chemical, the hazard pictogram and warnings.

Ensure that all containers of hazardous substances are properly closed.

Immediately remove spills with an appropriate absorbent.

Avoid keeping, cooking or consuming food or drink in the laboratory.

EU directives and regulations
Directive 98/24/EG on protection of the health and safety of workers from the risks related to chemical agents at work

19.0

Welding and thermal cutting

Welding and thermal cutting generate air contaminants which contain dangerous substances. These substances may cause discomfort and illnesses in the respiratory system. Welding and thermal cutting may also cause fire and explosion, if the safety precautions are not respected.

Good practice in welding and thermal cutting

Check that the welding and thermal cutting equipment, especially hoses, gaskets and valves, are in order and equipped to protect against back-fire. Welding burners should be equipped with a non-return valve between the welding pistol and the hose. Check that protective gloves and shut-off keys are available.

It is important to provide written instruction that make clear what safety routines should be applied, for example:

- Before welding and thermal cutting, clean the workplace and remove combustible material such as dust and waste material. If there are holes or cuts in the floor or walls, they can be watered or covered before starting to weld.
- Screen off the workplace with for example welding curtains or movable screens, if needed.
- Ensure easy access to firefighting equipment including anti-fire blankets and heat-insulated gloves.
- Return welding and thermal cutting equipment, including gas bottles, to its storage place after finishing the work.

Special safety instructions may be needed if welding or cutting painted materials. If the paint contains polyurethane (PU), isocyanates may be formed during welding and cutting. Isocyanates may cause harm to the respiratory tract as well as allergies. Measures are needed to remove the paint sufficiently in order to prevent it from being heated to over about 150 °C, which is the temperature at which isocyanates may be formed.

Use effective local exhaust ventilation to remove welding fumes from the breathing zone. For MIG welding, this can be achieved effectively using a welding pistol with an integrated local exhaust.
Follow the safety instructions for the handling of gas bottles.

Use the appropriate personal protective equipment including respiratory protective equipment, helmet and visor, protective clothes suited for welding and thermal cutting, and protective shoes.

Welding and cutting in vessels that have contained flammable liquids.

Welding in vessels that have contained flammable liquids is hazardous and many severe accidents have occurred when small amounts of remaining flammable liquid have started to burn or have exploded when starting to weld on the vessel.

It is good practice to ensure that only those well aware of the risks and of how to work safely are allowed to do this kind of welding and thermal cutting. One way of ensuring this is to require a written work permit for this kind of work. The work permit can be issued for a person and for a limited time.

Make sure that the vessel is cleaned before starting to work on it. Cleaning can be performed by for example blowing steam into the vessel for 15 minutes, or the vessel can be cleaned with water and it can be kept filled with water during the welding operation (with the necessary safety measures).
Ensure that the vessel is well ventilated before the work starts and until it the work is finished.

Welding and cutting in confined and poorly ventilated spaces
Respiratory protection is necessary to avoid breathing in high concentrations of welding fumes. In order to make it easy to breathe through a respirator, a respirator

with fan-assisted supply air or a compressed-air-supplied respirator is recommended. Arrange to supply fresh air into the confined space, if possible.
Warning! Do not use oxygen to improve the air quality. Oxygen can accumulate in clothes making them catch fire more easily.

EU directives and regulations
Directive 98/24/EG on protection of the health and safety of workers from the risks related to chemical agents at work
EU-Directive 2004/37/EC Protection of workers from the risks related to exposure to carcinogens or mutagens at work
Read also the explanations about carcinogens, mutagens or reprotoxic substances at work on EU-OSHA's website

2.0

Sensitising substances

Many chemical products contain sensitising substances. Allergies such as asthma or eczema may develop after contact with sensitising substances. Allergies are lifelong and those that have developed an allergy will, for the rest of their lives, react after contact with very small quantities of the sensitising substance. Therefore, it is important to apply the following good practice measures, in order to reduce the risk of developing allergies.

Good practice measures

It is good to have routines and rules describing:

- where to handle the sensitising product;
- what protective measures should be used in order to reduce the exposure as much as practically possible;
- whether or not personal protective equipment should be used and, if so, what kind of equipment should be used and when;
- how equipment and ventilation should be maintained and controlled so that workers are not exposed to sensitising substances;
- if sensitising products are handled openly, whether or not there are warning signs informing workers of the risks.

Information about the risks and protective measures

Those working with sensitising chemical products or supervising such work need to be informed about the risks and how to conduct the work, as well as about what protective measures to apply in order to avoid exposure to the sensitising substances.

EU directives and regulations

Directive 98/24/EG on protection of the health and safety of workers from the risks related to chemical agents at work

20.0

Spray painting

Spray painting can be performed using powder (powder spraying and electrostatic spraying), water-based paint or solvent-based paint. During powder-spray painting, the concentrations of airborne dust may get high. In addition, skin contact with certain paints and solvents may cause eczema and work with certain curing paints is associated with a risk of allergies. For some solvent-based paints, there is a risk of fire and even explosions. This is why measures to reduce exposure are needed in spray painting.

The following good practice can be applied to reduce the risks.

All kinds of paint

For spray painting associated with the highest risks, such as high-pressure spray painting, electrostatic spray painting and powder spraying, it is important to have written safety instructions that describe for example

- how paint and solvents should be handled;
- the measures to reduce the risk of fire and explosions;
- the use and maintenance of personal protective equipment;
- cleaning routines.

It is also good to have formalised and written routines for:

- cleaning the spray booth;
- changing the dry filter in the exhaust from the spray booth;
- checking and adjusting o the water level and the concentration of chemicals in the wet filter box;
- cleaning the ventilation ducts and fans;
- controlling the air flow in the local exhausts, as well as air velocity in the ducts and fall of pressure;
- controlling the ground connection (to prevent static electricity).

Spray paint in only specially designed spaces, for example spray booths, spraying rooms or tunnels. The space/room needs to be very well ventilated and the ventilation should continue a while after finishing the spray painting. The ventilation systems need to be cleaned, controlled and maintained regularly.

Cover surfaces in spray booths and similar with paper or plastics to facilitate

cleaning. The walls can for example be covered with a plastic film that is mounted on the clean surface. After spraying, the stained plastic film can be easily removed.

When spray booths cannot be used because of the size or shape of the object to be painted, it is important to plan the job to ensure a good working environment for the operator. Ensure that the ventilation in the premises is good and, if needed, improve the ventilation with mobile fans (with the necessary safety measures). Respiratory protection is needed. Check that fire extinguishers and other firefighting equipment are easily accessible near the work space. If possible, the spray painting should be the last task during the working day, to reduce the number of people exposed to the spray mist, as well as the time of exposure. After finishing the spray painting, ventilate the premises.

EU directives and regulations
Directive 98/24/EG on protection of the health and safety of workers from the risks related to chemical agents at work

21.0

Confined spaces

Examples of hazardous situations

Oxygen deficiency and risks of fire and explosion have led to several serious occupational accidents and also several deaths. Examples of serious risks are given below.

Examples of enclosed spaces are silos, tanks, cargo spaces on boats, and containers used for the storage or transport of fish, meat or other organic matter that can degrade or rot (when oxygen is consumed in the degradation process, the oxygen concentration in the enclosed space will be reduced and this could lead to a lack of oxygen).

Tanks and vessels used for inflammable or explosive liquids, gases or powders, for example organic solvents or fuels, pose potential hazards.

Pits and trenches may be so deep and narrow that the air is not mixed with ambient air and, therefore, the air becomes ‘stationary’. If there are dangerous gases, for example marsh gas or methane from the decomposition of waste, the air can become explosive, as well as deficient in oxygen.

If gas welding (oxyacetylene welding) is carried out in small and poorly ventilated areas, high concentrations of carbon monoxide may be formed, leading to nausea, headache, fainting and, in the worst cases, death.

For newly mounted district heating pipes that have been welded together, venting is often via a valve that ends in a closed space. If gas welding has been used, the pipes will contain carbon monoxide, which will be emitted to the closed space during venting. Deaths have occurred when the operator surveying the venting has fainted because of a lack of oxygen and has then been splashed by hot water from the district heating pipe.

Check the air before starting to work

Before starting to work in closed spaces, such as tanks, wells, silos, cargo spaces or similar, the risks need to be assessed. Such assessments and checks always need to be carried out before starting work in a closed space where there is a risk of exposure to dangerous gases. The work can start after it has been checked that the closed space is not oxygen deficient, that there are no harmful concentrations of gas and that there is no risk of explosion.

The risk assessment can include the following:

Measuring the oxygen concentration to check that it is not too low. If the oxygen level is too low, a worker would quickly become unconscious and several deaths have occurred in this way. If there is a risk of an oxygen deficit, the oxygen concentration needs to be measured before starting work.

If the closed space may contain flammable residues or vapours of fire and/or explosive substances, measurement of their concentration is needed in order to verify that there is no risk of fire or explosion (unless it is evident that the levels are very low and there is absolutely no risk).

Measuring the concentration of harmful gases, such as carbon monoxide and hydrogen sulphide, that may be present, is also needed.

A minimum requirement is to ventilate the space for several hours before starting to work in it. However, if this alternative is chosen it is necessary to ensure that the ventilation is efficient (typically, it will not be sufficient to only remove a cover or make an opening in the tank will).

Measurements of the risk of explosion

The risk of explosion is measured using an explosion detector. It is important to

verify that the explosion detector is intended for use in areas with risks of explosions (or else it could generate explosions itself).

At the same time as measuring the risk of explosion, it is important to also measure the oxygen concentration. Often the risk of explosion is underestimated if the oxygen concentration is lower or higher than normal.

For work that is not hot and does not involve any source of ignition, good practice is to not exceed 25 % of the lower explosive limit (if the oxygen concentration is 21 %).

For hot work, good practice is to not exceed 5 % of the lower explosive limit (at an oxygen concentration of 21 %).

Use respiratory protection if the air is not safe

If it is not possible to ventilate a closed space to remove hazardous air contaminants and supply clean air and oxygen, respiratory protective equipment should be used. The respiratory protective equipment should protect against any air contaminants that may occur. For example, respiratory protective equipment with a compressed-air supply is the only type of equipment that offers protection if there is an oxygen deficiency in the closed space.

Never work alone

When working in tanks, wells, silos, cargo spaces or similar, it is important to be in contact with someone nearby who is able to observe the work in the closed space.

A number of severe accidents have occurred when people have fainted because of a lack of oxygen in a closed space. In some instances, this has been discovered by a colleague that entered the room to investigate, and then this second person has also fainted. Deaths have occurred in these circumstances. It is therefore important to make it possible to remove a person from such an area without any need to go into the confined space. Use of a safety harness with a rope with one end outside the confined space is good as a start, but needs to be complemented by a special lifting device.

Work permit

When working inside a tank, well, silo or cargo space where there are flammable liquids,

a written work permit is needed for ensuring that only those with the right competencies can conduct a particular kind of dangerous work task.
The written work permit can be complemented with a description of the work instructions and safety instructions, which must be followed in order to carry out the work in a safe manner.

EU directives and regulations
Directive 98/24/EG on protection of the health and safety of workers from the risks related to chemical agents at work

28.0

Workers with specific risks

Certain groups of workers may be at increased risk when working with dangerous substances.

- Pregnant and breastfeeding women
- Young workers
- Workers with medical conditions

For these three groups many EU Member States have issued national regulations combining EU-Directives and specific national obligations. Please check the situation at your work places based on these national regulations.
Due to their specific situation also other groups of workers are often at a higher risk. Such groups can be:

- Migrant workers
- Newly hired workers or workers from temporary work agencies
- Maintenance workers (including service workers who work a multiple sites) and other workers with constantly changing workplaces

EU guidance

EU OSHAs website about groups at risk and Dangerous substances and vulnerable groups

28.1

Workers with specific risks - Pregnant and breastfeeding women

Fetuses and infants are more sensitive to chemical substances than adults. Therefore, it is important that they are not exposed to hazardous chemical substances.

Substances that are especially dangerous for unborn children and infants

Substances that are particularly dangerous for unborn children and infants and pregnant and breastfeeding women and therefore should be avoided are:
lead
mercury; mercury compounds
some medicinal products (that is, certain cytostatics, which are used in the healthcare sector)
carbon monoxide (present in flue gases and exhaust gases)
chemical substances that can be absorbed through the skin.

Substances that are carcinogenic, mutagenic or reprotoxicare particularly dangerous to unborn children and infants. These chemical products are labelled with a hazard pictogram along with any of the hazard statements listed below (or alternatively orange symbols with risk phrases). Hazard statements outline the risks posed by chemical products. These are available on the packaging as well as in the safety data sheet under section 2 (Hazards identification) and section 11 (Toxicological information).

Hazard statements

- H351 Suspected of causing cancer.
- H350 May cause cancer.
- H340 May cause genetic defects.
- H372 Causes damage to organs through prolonged or repeated exposure.
- H373 May cause damage to organs through prolonged or repeated exposure.
- H350i May cause cancer by inhalation.
- H360F May damage fertility.
- H360FD May damage fertility. Suspected of damaging the unborn child.
- H360FD May damage fertility. May damage the unborn child.
- H360D May damage the unborn child.
- H360Df May damage the unborn child. Suspected of damaging fertility.
- H361f Suspected of damaging fertility.
- H361FD Suspected of damaging fertility. Suspected of damaging the unborn child.
- H361d Suspected of damaging the unborn child

- H362 May cause harm to breast-fed children.

Risk phrases (used together with the old orange hazard pictograms)

- R40: Limited evidence of carcinogenic effect.
- R45: May cause cancer
- R46 May cause inheritable damage.
- R48: Danger of serious damage to health by prolonged exposure.
- R49: May cause cancer by inhalation
- R60: May impair fertility.
- R61: May cause harm to the unborn child.
- R62 Possible risk of impaired fertility.
- R63: Possible risk of harm to the unborn child.
- R64: May cause harm to breastfed babies.

Assess risks and take measures

If someone who is pregnant or breastfeeding is working with carcinogenic, mutagenic or reprotoxic chemical products, it is necessary to assess the risks. Measures shall be taken to ensure that neither the women nor the unborn child/children are at risk of being harmed. The employer should consider that it might be preferable not to assign such persons for tasks in which they can have contact with carcinogenic, mutagenic or reprotoxicsubstances..

The risk assessment shall be carried out in collaboration with the woman as soon as the employer is informed that she is pregnant and/or breastfeeding.

Please note that if the risk assessment concludes that the risks are so great that action is needed, the woman may not perform her duties until the date on which measures have been taken to allow her to carry out the work safely.

EU directives and regulations
Directive 92/85/EEC Measures to encourage improvements in the safety and health at work of pregnant workers and workers who have recently given birth or are breastfeeding
EU guidance
New and expectant mothers - OSHwiki | European Agency for Safety and Health at Work (europa.eu)

28.2

Workers with specific risks - Young workers

Minors (under 18 years of age) are more sensitive to the effects of chemical substances than adults. Accordingly, minors may not work with chemical products that are labelled with any of the following currently used pictograms or previously used, orange, hazard pictograms:



Or some products labelled with:



Work with some substances is so dangerous that it is prohibited for minors. This applies to substances with the following hazard statements (formerly risk phrases):

Hazard statements

- H351 Suspected of causing cancer.
- H350 May cause cancer.
- H340 May cause genetic defects.
- H372 Causes damage to organs through prolonged or repeated exposure.
- H373 May cause damage to organs through prolonged or repeated exposure.
- H350i May cause cancer by inhalation.
- H360F May damage fertility.
- H360FD May damage fertility. Suspected of damaging the unborn child.
- H360FD May damage fertility. May damage the unborn child.
- H360D May damage the unborn child.
- H360Df May damage the unborn child. Suspected of damaging fertility.
- H361f Suspected of damaging fertility.
- H361FD Suspected of damaging fertility. Suspected of damaging the unborn child.
- H361d Suspected of damaging the unborn child
- H362 May cause harm to breast-fed children.

Risk phrases (used together with the old orange hazard pictograms)

- R40: Limited evidence of carcinogenic effect.
- R45: May cause cancerR46 May cause inheritable damage.
- R48: Danger of serious damage to health by prolonged exposure.
- R49: May cause cancer by inhalationR60: May impair fertility.

- R61: May cause harm to the unborn child.
- R62 Possible risk of impaired fertility.
- R63: Possible risk of harm to the unborn child.
- R64: May cause harm to breastfed babies.

EU directives and regulations
Directive 94/33/EC The protection of young people at work
EU guidance
Young workers - OSHwiki | European Agency for Safety and Health at Work (europa.eu)

3.1

Asbestos

This guide provides information on different types of practical measures to reduce risks for work with asbestos.

Introduction

The following applies to all work with asbestos:

Working with asbestos requires effective measures that reduce the exposure to asbestos, but notification, training, medical checks and measurements are also required.
If asbestos must be removed, the simplest option is to make use of the services of a contractor that is authorised for the removal of asbestos. In order to ensure that the contractor complies with the applicable laws and rules for the removal of asbestos, it is important to be clear about the requirements of the contractor. These requirements can be included in the procurement demands and in the agreement with the contractor.

Measures prior to the commencement of work:

Activities with exposure to asbestos dust are to be notified by the employer to the responsible authority of the Member State, and re-submitted if a change in working conditions result in higher asbestos exposure. Workers or their representatives are entitled to see the notification.

Prior to commencing work, check that you have made the necessary notification to the authorities, that the workers have the training and medical checks required, and

that the measurements needed for risk assessments have been carried out.

It is also important to examine which materials contain or are likely to contain asbestos.

For demolition, if there is the slightest doubt as to whether asbestos is present, request information on the presence of asbestos in the building to be demolished, the owner of the building or the owner of the technical device (such as machinery).

Specific arrangements and equipment are needed to work with asbestos safely. Work therefore needs to be planned carefully, so that all necessary arrangements are in place when work starts.

It is important to be prepared to protect staff if something unexpected occurs. Assess risks and describe how the work is to be carried out and the protective equipment to be used in safety instructions; the instructions shall be available at the workplace. For demolition processes, the instructions need to be adapted to the situation at the establishment concerned. The written working and safety instructions shall contain the following information on the measures:

- how to prevent dust dispersion
- the need for personal protective equipment
- cleaning up after demolition
- handling the waste
- personal hygiene.
- Organizing the work

Organize the work so that as few workers as possible are in contact with and exposed to asbestos.
Plan the work so that there is time to keep the facilities and equipment clean. Clean up dust containing asbestos fibres continuously. If equipment is to be transported to another location for cleaning — put it in sealed packaging before transport.
Smoking is forbidden within the defined area in which asbestos is present.

Labelling and signs

The place of work where asbestos is present and places where concentrations will probably exceed the occupational exposure limit value must be clearly delimited and clearly marked with warning signs, for example ‘Asbestos work — No access of non-authorised persons’ or, for demolition, ‘Caution — Demolition — Asbestos — Access

prohibited for unauthorised persons’.

Packaging and containers containing asbestos or materials containing asbestos, shall be clearly marked with warnings which must contain the word “asbestos” and the symbol with the letter “a”.

Respiratory protection

Breathing protection equipment shall be chosen so that it fits the user (the correct fit is important as it ensures a high level of protection).
The only type of respiratory protective equipment that provides protection against asbestos are powered and supplied-air respirators. In exceptional cases, filter masks may be used but only if the air does not contain high concentrations of asbestos and the work is not physically demanding. **In practice, the situation is almost always that a powered and supplied-air respirator is the only option that ensures good enough protection against asbestos.**

Workwear

Close-fitting protective clothing covering the whole body and incorporating a hood shall be used for all activities involving direct contact with asbestos, for instance in the event of demolition and when working with installations that contain asbestos.
The protective clothing needs to be dust repellent and designed in such a way that no dust is collected in the folds, pockets or similar.
Work clothing and personal clothing should not be kept together.
Work clothing contaminated by asbestos should not be allowed to be laundered with other, non-contaminated garments. (Studies show that asbestos workers’ families also have an increased incidence of diseases related to exposure to asbestos, which is considered to be due to exposure to asbestos on family members’ work clothes.)
Containers for the clothes used when working with asbestos must be clearly marked with the words ‘asbestos contaminated protective clothing’.

Waste

Waste, materials, empty packaging, filters and other materials containing asbestos shall be placed immediately in closed containers and stored until they can be disposed of.

On completion of the work

It is important to clean up carefully on completion of the work, so that no dust containing asbestos fibres is left on any surfaces.

Asbestos, the requirement for medical checks

Exposure to asbestos can cause severe pulmonary disorders and even cancer. Therefore, there is a need for special medical surveillance of workers exposed to asbestos.

An individual health record must be kept established and maintained in accordance with national laws and/or practices

Information and advice must be given to workers regarding any assessment of their health after the end of work involving asbestos exposure.

Control of exposure to asbestos

Work with asbestos can result in serious damage to health. To verify how high are levels of risks to workers, there are requirements for the assessment of risks, as well as, where appropriate, the measurement of asbestos pollution of the air at work. The EU occupational exposure limit value is 0.1 fibres per cm^3 or 100,000 fibres per m^3.

A rule of thumb is that there is a risk of exceeding the limit value if no action is taken, and if no breathing protection equipment is used. A qualified assessment of exposure can be made, for example, by prevention services.

If a measurement shows that the limit value for asbestos is exceeded, the work must be stopped immediately and may not continue until measures are taken to reduce concentrations to below the limit value.

EU directives and regulations
The good practices mainly correspond to *EU Directive 98/24/EC on risks related to chemical agents at work*, which demand risk identification, assessment and control.
This directive is complemented by the *EU Directive 2009/148/EC on exposure to asbestos at work*.
As asbestos is classified as carcinogenic, the general requirements in the CMR-directive (Directive 2004/37/EC - carcinogens, mutagens or reprotoxic substances at work) also applies.

3.8

Specific practices for demolition work

Preparation and organisation
As the demolition of buildings containing asbestos poses specific risks and requires that the working and any safety instructions are strictly adhered to it would be inappropriate to carry out such work on a piecework basis, as this may lead to demolition staff working under pressure.
If someone is working alone on a demolition inside an enclosure, readiness is required in the event of an accident.
During demolition, it has to be ensured that toilets and showers connected to hot and cold water are readily accessible at the workplace, so that it is possible to wash before meals and shower after work.
The demolition should start with the removal of the parts containing asbestos, then proceed with the removal of the rest.

Respiratory protection
For the demolition of asbestos in enclosed areas, breathing protection equipment fitted with powered and supplied-air respirators shall be used.
Breathing protection equipment shall be worn at all times during work in enclosed demolition areas, as well as when undressing and handling protective clothing.

Safeguard measures
It is an advantage if the demolition of loosely fitted asbestos can be carried out using a wet method. A wet process method will lead to a significantly lower exposure level than dry stripping.

The machinery used for the demolition must be either fitted with extraction equipment that is integrated into the machine or used in conjunction with local exhaust ventilation, placed as close to the place of processing as possible so that it effectively captures any dust that is disseminated.

The demolition area shall be enclosed. For larger demolition works, the demolition area may be encapsulated with walls of plastic sheeting. The room must be ventilated and have negative pressure in relation to its surroundings so that, if there is a leak, the outside air will flow into the work space from the environment and asbestos will not spread from the work area to the surroundings. It is important to monitor the difference in pressure. An airlock shall be provided for access to and exit from the enclosure. In the airlock, workers must be able to wash their hands when finishing work and removing protective clothing.

ATTENTION! During demolition work, many details have to be kept in mind to avoid the risk of inhaling asbestos.

Airlock.
The lock in which clothes are exchanged must be designed and used in such a way so that it cannot be open on both sides at the same time. Materials that are contaminated with asbestos must be packed before being transported out of the airlock.

When working on very **limited demolition tasks** or removals, it is important to use a technique involving glove-boxes. The area where the asbestos is to be removed from is encapsulated in box and in the encapsulation box two gloves are mounted. The worker is placed outside the encapsulation and performs the task using the gloves. In addition, glove-boxes need to be under low pressure, which can be measured with a differential pressure meter.

If a vacuum cleaner or local exhaust ventilation is used to capture and remove material or air contaminated with asbestos, the exhaust air should be emitted outside the premises. The equipment should be equipped with effective filters to capture the asbestos. The filters need to be exchanged periodically and treated as waste containing asbestos.

Workwear
Each time you leave an enclosed demolition area, any protective clothing needs to be vacuum cleaned and removed in the airlock. This shall be done before the removal of respiratory protective equipment. Other garments may not be taken into the airlock.
Work clothes to be reused are placed in a special bag.

Waste
All materials from the demolition designated asbestos waste shall be placed in closed containers. Such materials may not be reused. That is why it is important to place joists on the outside of the plastic enclosure, if used.

On completion of the work
After completion of demolition work, it is good practice to ventilate for at least 4-12 hours before the demolition of protective walls and the airlock.
During handling and transport of the ventilators, it is good practice to cover the air intake to the ventilators with plastic sheets, in order to prevent the spread of asbestos when the ventilators are handled and transported.
Dust containing asbestos fibres can often be left on the plastic sheets used for encapsulation. Vacuum cleaning and/or moistening of the plastic surfaces reduces the emission of asbestos when the encapsulation is demolished.

Cleaning tools or placing them in a plastic bag that is sealed before transportation is good practice, as it reduces the emission of asbestos from contaminated tools.

EU directives and regulations
The good practices mainly correspond to *EU Directive 98/24/EC on risks related to chemical agents at work*, which demand risk identification, assessment and control.
This directive is complemented by the *EU Directive 2009/148/EC on exposure to asbestos at work*.
As asbestos is classified as carcinogenic, the general requirements in the CMR-directive (Directive 2004/37/EC - carcinogens, mutagens or reprotoxic substances at work) also applies.

38.0

Repacking of chemical products and substances, the new packaging must be labelled

If a chemical product is repackaged in or poured into another container, the new packaging must be labelled. Sometimes accidents happen because, for example, bottles for soft drinks are used to store chemical products. It is important that packages are labelled with information about the contents.

The new packaging must be labelled with the product name, as well as the hazard pictograms and hazard and precautionary statements.

If the packaging is labelled with a hazard pictogram or pictograms, but not the additional hazard and precautionary statements (for example if the package is so small that they do not fit), hazard pictograms shall be supplemented by the words under the pictograms below.



If the product is for example inflammable, can cause cancer or allergy, is capable of causing damage to DNA or affects reproduction, the labelling has to include hazard statements indicating this.

In exceptional cases, marking of the new packaging is not required. If packaging is not labelled, there must be no risk at all that anyone working at the workplace or anyone temporarily visiting the workplace may be harmed by the content of the unmarked packaging. This may, for instance, be the case for short periods of handling or dosing a chemical product but only if it is clear that all those concerned know what the packaging contains.

It is important to ensure that the new packaging will not break or leak when filled with the product. For example, certain plastics cannot be used for solvents, as plastic will dissolve. In addition, there may be special requirements for the packaging if, for example, it contains flammable liquid.

EU directives and regulations
Regulation (EC) No 1272/2008 on classification, labelling and packaging (CLP) of substances and mixtures

3.9

Asbestos - special protective measures, medical checks, exposure control

When working in the cabin of a vehicle or machinery

When working in a vehicle or machinery cabin, the cabin needs to be fitted with a filter for cleaning asbestos-contaminated supply air. Select a prefilter together with a so-called ‘HEPA filter class H13’. The prefilter will reduce the load on the HEPA filter and, therefore, the HEPA filter will need changed less frequently. Used filters must be discarded as waste (see below).

If work is carried out from a vehicle, there needs to be an overpressure in the cabin. Overpressure means that if, for example, a window opens a little, the air will flow from the cabin into the environment. If there is an underpressure in the cabin, air will stream into the cabin, that is to say, the asbestos-polluted air will enter the cabin.

If the filters that are used to clean the supply air to the cabin become overloaded, the air flow through the filters will decrease and the risk of accidental leakages of asbestos-contaminated air into the cabin will increase. Therefore, it is important to change filters regularly.

If cabin doors or windows are opened, contaminated air may flow into the cabin. Personal protective equipment including for respiratory protection might also be required when working in a cabin, if such leakages of contaminated air cannot be avoided.

Asbestos, the requirement for medical checks

Exposure to asbestos can cause severe pulmonary disorders and even cancer. Therefore, there is a need for special medical surveillance of workers exposed to asbestos.

An individual health record must be kept established and maintained in accordance with national laws and/or practices

Information and advice must be given to workers regarding any assessment of their health after the end of work involving asbestos exposure.

Control of exposure to asbestos

Work with asbestos can result in serious damage to health. To verify how high are levels of risks to workers, there are requirements for the assessment of risks, as well as, where appropriate, the measurement of asbestos pollution of the air at work. The EU occupational exposure limit value is 0.1 fibres per cm^3 or 100,000 fibres per m^3.

A rule of thumb is that there is a risk of exceeding the limit value if no action is taken, and if no breathing protection equipment is used. A qualified assessment of exposure can be made, for example, by prevention services.

If a measurement shows that the limit value for asbestos is exceeded, the work must be stopped immediately and may not continue until measures are taken to reduce concentrations to below the limit value.

EU directives and regulations
EU Directive 2009/148/EC on exposure to asbestos at work.
As asbestos is classified as carcinogenic, the general requirements in the CMR-directive (Directive 2004/37/EC - carcinogens, mutagens or reprotoxic substances at workk) also applies.

39.0

Suppliers and dealers have to check labelling

Suppliers, importers and retailers, such as shops, shall verify that labelling is correct. One way of doing this is to verify that the manufacturer has the necessary expertise and the appropriate resources required for the labelling to be reasonably accurate. If the skills and resources are considered not good enough, a more thorough check is required. If such a thorough check is not possible, one option is to change to another manufacturer with the necessary expertise and resources. Contact the manufacturer or supplier if the labelling seems to be incorrect..

Requirements relating to tactile warning of danger labels for the visually impaired
If the retailer, manufacturer or importer sells chemical products with certain hazard

classifications to the general public (for private use), there is a requirement that the packaging must also be labelled with the tactile warning of danger label for visually impaired persons (tactile markings) in the form of a raised triangle.
This applies to products with the following labelling:



There are requirements for the packaging of certain chemical products to have child-resistant fastenings.

Certain products pose specific risks if the child swallows them or puts them into their mouth. Such products must therefore have a child-resistant fastening, so that children are unable to open the packaging.

EU directives and regulations

Regulation (EC) No 1272/2008 on classification, labelling and packaging (CLP) of substances and mixtures

4.0

Cytostatics

For work with cytostatic medicines and other toxic medicinal products that have a lasting effect, it is important to provide training in order to ensure that the work is carried out by only persons with sufficient knowledge of the risks and the preventive measures.

The employer may arrange for the required training. The specific training should, inter alia, address the potential health risks in handling cytostatic medicines and other hazardous products, safety practices, protective equipment, measures in the event of splashing and spills, waste management, and care and maintenance of the technical equipment.

It is important to provide training regularly in order to ensure that the knowledge of safe routines is not forgotten. Training is needed especially for new employees, when staff change their work tasks or workplace, for temporary employees, and when introducing new equipment, new drugs and new routines.

EU directives and regulations

Directive 98/24/EG on protection of the health and safety of workers from the risks related to chemical agents at work

40.0

Risk and safety information during manufacturing or mixing of chemical products and substances

If you manufacture, formulate or mix chemical products or substances, even if it is just for own use at work, you are responsible for drawing up or acquiring the necessary written risk and safety information. This information must include the health and safety information equivalent to what a supplier would have provided, that is to say, similar to the information in the safety data sheet.

The safety data sheets for the original components are an important input for risk information and appropriate safety advice for the mixture. In the safety data sheets, data are also available under section 10 (Stability and reactivity) as to what should not be mixed.

EU directives and regulations

Regulation (EC) No 1272/2008 on classification, labelling and packaging (CLP) of substances and mixtures

5.0

Curing plastics e.g. foam plastics, paint, adhesives - introduction

Chemical products may contain substances that are curing when mixed and applied to, for example, surfaces or joints. Many of these kinds of substances contain sensitising substances and, therefore, good practice in using such products is essential in order to prevent the development of allergies, such as asthma and eczema.
Read more about good practice when:

- curing adhesives and paint — epoxy and acid anhydrides
- using formaldehyde and its resins and acid-cured lacquers
- using epoxy products, such as curing adhesives and paint
- UV curing acrylate printing inks or lacquers.

5.2

Curing adhesives and paint - Epoxy and acid anhydrides

Epoxy is a component of many adhesives and varnishes. When working with epoxy, curing agents consisting of acid anhydride are often used. Working with such epoxy products is associated with a strong risk of developing allergies. When working with epoxy and acid anhydrides, it is important to apply good practice as regarding the aspects below in order to reduce workers' risk of developing allergies:

- Very detailed instruction, preferably a training
- Safeguard measures
- Safety signs
- Medical examination

In addition, it may be necessary to make measurements to verify that workers are not exposed to levels that exceed the occupational exposure limit values for the working environment.

Safety measures

Products containing epoxy components and labelled with the hazard statements H317 or H334 imply a severe risk of allergies. For these kinds of products, it is good practice to have a documented procedure and rules for:

- Where the products are handled
- What safety measures to apply to reduce exposure as much as practically possible.

Whether or not personal protective equipment has to be used and, if so, what kind of equipment should be used and when.

- The operating methods of the control and ventilation equipment so that workers are not exposed to dangerous levels.
- It is good practice to inform workers about the risk of allergies with warning signs, for example on the door of the room/space where epoxy is handled.

Information on risks and measures

Those working with or supervising work with such substances should be given information about the risks and how the work is to be carried out, and on the measures to be taken to avoid contact with allergenic substances.

Training

Education and training are required for all those working with or supervising work with epoxy components or acid anhydrides. Education and training needs to be relevant to the risks at work and include the protective measures that need to be applied to ensure that work can be carried out in a safe manner. Training should cover:
basic knowledge of the risks associated with the substances used;
knowledge of the chemical products handled;
an examination of high- risk operations;
the risks associated with processing the chemical products and whether or not there are any risks associated with thermal decomposition;
the protective measures necessary for safe work;
the type of ventilation needed;
the situations in which personal protective equipment is needed and the type of protective equipment that is adequate;
technologies for cleaning and decontamination.
Good practice is to ensure that training is provided periodically, as planned and whenever is required. After training, it is a good idea to issue a certificate attesting to the successful completion of training and describing what was included in the training.

Medical examination
People with, for example, previous allergies or asthma are especially vulnerable and should avoid working with chemical products that may cause allergies. One way of monitoring this, as well as monitoring someone developing an allergy, is to perform regular medical check-ups, both before starting work with acid anhydrides and then regularly after starting work, for example once every other year. For epoxy, workers can also be offered health examinations.

Are measurements needed?
Measurements of exposure to epoxy during different operations may be needed in order to conduct risk assessments. The measured concentrations are compared with the existing occupational exposure limit values. In order to reduce the need for measurements, it is important to ensure that safety measures are as effective and efficient as possible.
Occupational health services or other skilled consultants can help with the necessary measurements.

Tips and advice on safety measures in open and manual handling
In the case of open and manual work with epoxy, there is a high risk of skin contact, which increases the risk of developing an allergy to epoxy. Good practice measures that reduce the risks involved in manual handling of epoxy products are:
Use epoxy in temporary workplaces only if adequate safeguards can be organised.

Mix epoxy components carefully and in the proportions set out on the

packaging/instructions leaflet.

Mix the components in a well-ventilated space. Use local exhaust ventilation and personal protective equipment during mixing.

Preferably use disposable packaging and mix in a closed system in order to reduce the risk of contact with skin.

If packaging is used repeatedly, follow the instructions on the packaging and use equipment mounted on the packaging to ensure correct dosing. This reduces the risk of having to work with contaminated packaging.

If you are working with large quantities of epoxy, avoid working on other operations and work tasks in the same room.

Cover the area where the work is carried out, so that any spillage can quickly and easily be removed.

Discard waste contaminated with epoxy in movable waste bins with lids, which open with a foot pedal. Mark the waste bins with ‘Hazardous waste. Contains epoxy. May cause sensitisation by skin contact’.

When grinding or cutting epoxy products, use local exhaust ventilation or, if that is not possible, use respiratory protective equipment

Ensure that epoxy dust does not come into contact with hot surfaces. Hot surfaces may decompose epoxy and spread the dust into the air, which may cause severe allergic reactions. If tools are burned to clean them, make sure that this is done only where the ventilation is good, for example under local exhaust ventilation, so that the gases are not inhaled.

Avoid spraying epoxy in temporary workplaces that lack protective measures. If spraying liquid epoxy products, use full body protective clothing and compressed air breathing apparatus.

EU directives and regulations
Directive 98/24/EG on protection of the health and safety of workers from the risks related to chemical agents at work

5.4

Curing adhesives - Isocyanates and polyurethane
Isocyanates are used in the manufacture of polyurethane foam and are also included in polyurethane or polyurethane glue. Work with isocyanates poses a risk of allergy. Such products are labelled with the hazard statements ‘H334: may cause allergy or asthma symptoms or breathing difficulties if inhaled’ or ‘H317: may cause allergic skin reaction(s)’.

There are effective safety measures to reduce the risks associated with working with isocyanates. These include:

- training
- signs if necessary
- taking measurements to verify that workers are not exposed to levels that exceed the occupational exposure limit values in force.

Training requirements
Information about risks and preventive measures is required for all those working with or supervising work with isocyanates (diisocyanates). Such training might cover:

- basic knowledge of the risks associated with the substances used;
- knowledge of the chemical products handled;
- a review of risky operations;
- what happens during processing including any thermal decomposition;
- the protective measures that are necessary for safe work;
- what type of ventilation is needed;
- the situations in which the personal protective equipment is needed and the type of protective equipment that is adequate;
- technologies for cleaning and decontamination.

Safety measures that reduce the risks of working with isocyanates
For work with isocyanates and polyurethane that are labelled with the hazard statements H317 or H334, there shall be a documented procedure and rules for the following aspects:

- the room and workplace where the products are handled;
- the means of protection to be used to reduce exposure as far as practicable; the personal protective equipment required and how it shall be used; the control and ventilation equipment needed so that workers are not exposed to dangerous levels;
- warning signs: if these substances are handled in open work spaces, there shall be warning signs; the signs shall be located on the door of the room/work space.

- When working with isocyanates, the risks can be reduced, for example, in the following ways:
- Purchase: select, in the first place, products containing prepolymerised isocyanates with less than 1 % MDI (methylene diphenyl diisocyanate) and IPDI (isophorone diisocyanate). In addition, blocked isocyanates pose a lower risk (they contain an additive that prevents them from reacting- blocks them - until they are exposed to a deblocking temperature. In the case of products containing free isocyanates, avoid products containing TDI (toluene diisocyanate- 2,4-TDI, 2,6-TDI or TDI) or HDI (hexamethylene diisocyanate). These isocyanates are volatile and may generate concentrations in ambient air that may exceed levels that cause allergies.
- Ensure that the curing (e.g. of the foam) takes place in, for example, hardening chambers that are supplied with ventilation and are under pressure, or in a fume hood or equivalent device. If it is not possible to arrange this, powered and supplied-air respirators need to be used.
- When working with isocyanates in poorly ventilated areas, wear a powered and supplied-air respirator. If exposure to isocyanates is low, a full mask with combined gas and particulate filters shall be used.
- Store the isocyanates in a temperate room (15 to 25°C), separated from the production space.
- Isocyanates should not be exposed to direct sunlight or humidity during storage. If isocyanates are stored in casks or drums, they shall be closed. Barrels that have been opened need to be resealed properly. If the liquid in the barrel has already solidified, contact the supplier. Attempting to remove solidified content with heat, etc., is very risky and should be avoided.
- When relatively large quantities of isocyanates are stored in storage tanks, these tanks should be placed in a retaining dike that is equipped with a detection and alarm system to detect any leakage of isocyanates.
- Place waste in, for example, movable waste bins with lids that can be opened with foot pedals. Mark waste bins with the text ‘Hazardous waste’, together with a short text about the content and related safety measures. Provide waste bins with local exhaust ventilation if necessary. Do not mix unhardened waste of different types. It may cause chemical reactions.Establish an agreement with the supplier with regard to the return of used isocyanate containers. Remember that it is inappropriate to use containers containing isocyanates for other purposes. Use the decontamination agents recommended in the safety data sheet to clean up and neutralise any spillage. Decontamination agents that contain solvents such as ethanol are very effective.

Are measurements needed?

The measurement of the exposure of workers to isocyanates may be needed in order to conduct risk assessments. The measured concentrations are compared with the existing occupational exposure limit values. In order to reduce exposure, it is important to ensure that safety measures are as effective and efficient as possible.

EU directives and regulations
Directive 98/24/EG on protection of the health and safety of workers from the risks related to chemical agents at work

6.0

Quartz (respirable crystalline silica, RCS)

Quartz is a natural part of many rocks and stones. Exposure to quartz dust occurs when exposed to road dust or stone dust, or during the working with material that contains rocks and stones, such as concrete. Exposure to quartz-containing dust may cause the serious lung disease silicosis and even cancer.

Risk assessment
The risks associated with quartz need to be assessed and measures need to be taken to ensure that the risks are under control. Risk assessment needs to be carried out before the work starts. In the risk assessment, it is good practice to consider the following:

- activities: the operations likely to present a risk of exposure to quartz-containing dust;
- sources of the emission and spreading of the quartz-containing dusts;
- work process conditions;
- assessment of exposure (in relation to the national occupational exposure limit value);
- assessment of the risk and of the need for action, what measures should be in place and applied;

Are measurements needed?

In order to assess the risks, measurements of the exposure to quartz may be needed. The exposure should be compared with the occupational exposure limit value for quartz.
Examples of situations where activities may be associated with low concentrations of quartz dust in the air are (under normal conditions):

- in dental laboratories, where only small amounts (grams) of quartz-containing materials are used in each case;
- in industries where the handling of quartz-containing material is undertaken in an encapsulated space with local exhaust ventilation;
- where quartz-containing materials are used for water purification and the filter material is emptied from the packaging by flushing with water in closed systems;

For assistance with measurements, please contact an occupational health service (authorised for this) or other competent persons (for information).

Measures to reduce exposure to quartz

Those working with quartz or the supervisors of such work need to be aware of the risks involved and of how to work to avoid exposure to quartz dust.
If any measures are necessary (such as special ways of working or the use of personal protective equipment), it is important to provide written instructions describing these measures.
Work and workplaces shall be designed in such a way so that workers' exposure to quartz is avoided or as low as possible.

Where possible, switch from using quartz-containing materials to using non-dangerous or less dangerous materials. For example, quartz sand can be replaced by olivine sand for moulding materials in foundries, and silica powder as a filter aid or fillers in industry products can be replaced by perlite. If this is not possible, the material can be washed, or treated with a dust-binding material, so that it does not contain or emits less of the fine and most dangerous respirable quartz dust.

Choose work equipment that does not disperse dust, for example use machines with local exhaust ventilation that capture quartz dust as close as possible to where it is generated and emitted.

Machines and dust-generating processes can be enclosed, preferably with local exhaust ventilation attached. It important to check regularly that the encapsulation is sufficiently tight and depressurized.

In the case of hand-held machines it is good to use those machines that generate dust with built-in dust extraction equipment. An alternative is to use water spraying or water flushing where possible

It is good practice to check regularly that enclosures, ventilation and other measures are operating as intended, for example every 6 months.

Dust suppression techniques can be made more effective by dust binding humidification or the addition of dust-binding substances.

Work can be carried out from a cabin; in such a case, the cabin needs to be

equipped with ventilation filters that remove dust from the supply air (such as filter class F8).

Define cleaning routines and check that they are respected. Dust is best removed by vacuum cleaners or central vacuum cleaning. Cleaning by flushing with water is an option if it is possible and safe. Don’t sweep! Sweeping creates a lot of dust.

If necessary, respiratory protective equipment, such as a half mask with a P3-filter, usually provides sufficient protection. If the work is heavy or lasts for more than 2 hours, it is important to use powered and supplied-air respiratory protective equipment. Working while wearing respiratory protective equipment makes it harder to breathe. Supply air makes it easier to breathe and therefore possible to use respiratory protection for longer duration of the work.

Please note that the use of quartz-containing materials is not recommended in the case of manual abrasive blasting; if quartz-containing materials are used in abrasive applications, it needs to be done under closed containment or with water added to the sandblasting sand, so-called ‘hydroblasting’.
It is important to review the measures at least once a year in order to check that they are operating as intended.

Medical examination
Quartz can cause silicosis and if someone starts developing silicosis it is important to identify that as early as possible. The best way of monitoring this is through medical examinations. Therefore, it is a good idea for workers that may be exposed to quartz to have regular medical check-ups, both before starting to work with quartz and then regularly after starting work, for example once every other year, or as recommended by the occupational physician. The medical check before starting work can show if the worker has any physical characteristics that imply that they are likely to be at a particularly high risk of developing lung diseases if exposed to quartz.

EU directives and regulations

Directive 98/24/EG on protection of the health and safety of workers from the risks related to chemical agents at work
EU-Directive 2004/37/EC Protection of workers from the risks related to exposure to carcinogens or mutagens at work
Read also the explanations about carcinogens, mutagens or reprotoxic substances at work on EU-OSHA’s website

7.0

Mineral wool

There are several different kinds of mineral wool, for example glass wool, stone wool, slag wool, refractory mineral wool and glass fibres.

Mineral wool may damage the lungs and can often cause irritation if in contact with the skin. In order to reduce exposure to dust containing mineral wool, it is important to:

Choose products that release the least dust and particularly the least fine fibres, namely those fibres that are so small that they reach far into the lungs (respirable fibres).

Have cleaning routines and comply with them. Dust is best removed by vacuum cleaners or central vacuum cleaning. Cleaning by flushing of water is an option if it is possible and safe. Do not sweep and do not use compressed air! Sweeping creates a lot of dust. Compressed air is not good for cleaning, as it disperses dust into the air; it only moves the dust, it does not remove it. Always use respiratory protection if the work creates a lot of dust, for example during the demolition or insulation of furnaces. Suitable respiratory protective equipment consists of at least a half mask with a P2-filter.
Use protective clothing if the work creates a lot of dust. Protective clothing should be kept separate from other work clothes and personal clothing. Since the fibres can be trapped in clothing, it must be washed.

If clothes are heavily contaminated, it is important to vacuum them before washing. It is also important to label clothing contaminated by fibres when it is sent for washing so that those handling the clothes can take the necessary precautions to avoid exposure to the fibres.

Clearly, the risks associated with working with crystalline fibres, refractory fibres and speciality fibres are greater that the risks associated with glass wool and stone wool. To find out more about these more dangerous fibres, see the chapter 'Refractory fibres'.

EU directives and regulations
Directive 98/24/EG on protection of the health and safety of workers from the risks related to chemical agents at work

8.0

Refractory fibres, speciality fibres and crystalline fibres

Refractory fibres, speciality fibres and crystalline fibres (not standard mineral wool) are likely to cause cancer.

Therefore, there are special requirements for the control of and to reduce exposure to these fibres.

Measures to reduce risks

Good practices for the control of and to reduce exposure to these fibres are outlined below:

Select refractory mineral wool (for example AES-fibres) instead of refractory fibres, crystalline fibres or speciality fibres in all cases where this is possible. Refractory mineral wool is not as dangerous as these other fibres.

Select products that emit as little dust as possible.

Have cleaning routines and follow them. Remove dust with a vacuum cleaner equipped with an effective filter, such as a HEPA-filter, or by central vacuum cleaning. Cleaning by flushing water is an option if it is possible and safe. Do not sweep and do not use compressed air! Sweeping creates a lot of dust. Compressed air is not good for cleaning, as it disperses dust into the air; it only moves dust, it does not remove it. Use protective clothing if the work creates a lot of dust. Protective clothing must be kept separate from other work clothes and personal clothing.

Since the fibres can be trapped in clothing, it needs to be cleaned. It is important to label clothing contaminated by fibres when it is sent for washing so that those handling the clothes can take the necessary precautions to avoid exposure to the fibres.

If respiratory protective equipment is needed, it should be equipped with a P3-filter in order to provide adequate protection against the fibres.

It is good practice to carry out production processes involving these fibres in such a way that dust is emitted in only designated areas, as it is important to reduce the number of people exposed to this carcinogenic dust as far as possible. It is important to post signs with the words ‘WARNING. Dust containing fibres’ at the entrance to such sites.

It is also good practice to label machinery and other equipment containing refractory fibres, crystalline fibres and speciality fibres, so that it is clearly apparent

that they contain these kinds of dangerous fibres.

EU directives and regulations
Directive 98/24/EG on protection of the health and safety of workers from the risks related to chemical agents at work

9.0

Contaminants in the work place air

Contaminants in workplace air can be generated by many work processes. Some typical examples are given below.

All **combustion processes** will result in the production of a complex mixture of gases, vapours and solids/ solid particles depending on the fuel (the material that burns), depending on the fuel, the combustion conditions (for example temperature and level of oxygen) and control measures adopted to reduce emissions of hazardous materials.

One commonly encountered example are the **diesel exhaust fumes** arising from the combustion of diesel fuel in compression ignition engines. Emissions from diesel engines are complex mixtures of gases, liquids and solids. Many of the individual components have their own specific toxicity, and some have occupational exposure limit values assigned to them. Diesel engine exhaust is classified as a human carcinogen by the International Agency for Research on Cancer (IARC).

Many processes or activities that involve heating/heat for cutting, or soldering or welding metal will produce a fume that, again, will contain a mixture of gases and particulate materials.

The chemical composition of welding fumes depends on the type of welding process, the composition of the welding rod and the material being welded. The majority of fumes from metal welding are generated by the consumable (i.e. the welding rod) rather than the substrate being welded. Information on the chemical composition of the fumes should be given on the safety data sheet provided with the consumable. Stainless steel, and other specialist alloys containing high levels of chromium, nickel and manganese carry a particularly high risk. Manual metal arc (stick) welding generates more fumes than other techniques, such as MIG (metal inert gas) and TIG (tungsten inert gas) welding. Although welding is most commonly used to join metals, other materials, such as plastics, are also welded and these processes can also generate toxic fumes which must be controlled.

The physical properties and chemical compositions of aerosols generated from **metal cutting** depend on the composition of the metal and any products applied to

the surface of the metal. High levels of exposure to welding and other metal fumes can cause metal fume fever, which can present itself as non-specific flu-like symptoms such as fever, chills, etc.

Other processes involving heating materials can lead to the generation of process-generated contaminants. One example is rubber fumes. There is a wide range of different base rubbers, both natural and synthetic, each with a unique chemical structure. In addition, during the production of rubber products, a wide range of chemical agents are used as fillers, vulcanising agents, accelerators and inhibitors, antidegradants and antioxidants, plasticisers, etc.

Chemical agents present in rubber fumes may include various volatile agents (such as benzene, toluene, xylenes, ethylbenzene, dimethylbenzenes and diisopropylbenzenes), polyaromatic hydrocarbons and other agents. As is generally the case for process-generated fumes, many of the individual components have their own specific toxicity, and some have occupational exposure limit values assigned to them.

Many activities within the construction sector, as well as in the mining and quarrying sector, produce **dusts** that are released into the air. The exact composition of the dust will depend on factors such as the types of activities; the materials/products that are being used; the materials used in the buildings that are being built, repaired or demolished; and the composition of the ore that is being mined or quarried. Dust generated by these activities often includes some amount of respirable crystalline silica (RCS). Similarly, asbestos exposure in Europe now mainly occurs during the repair, maintenance or demolition of buildings, and hence could be considered a process-generated contaminant.

Organic dusts may also be considered process-generated contaminants, as they are emitted from organic materials that have undergone some degradation, resulting in the release of a complex mixture that can include a range of viable microorganisms (such as fungal spores, bacteria and viruses) and their by-products, including toxins, and constituents of their cell walls (such as endotoxins and glucans), and parts of living organisms. Exposure to organic dusts can occur in occupations and industry sectors that involve working with animals, plants and organic materials, including farming and the collection and processing (for example composting) of household and other waste. Other organic contaminants may be released as aerosols, for example during the slaughtering and butchering of animals.

An example of an organic dust is **wood dust**, which is generated from sawing, sanding and other woodworking processes and carries a variety of health risks. This includes the dust from hard and soft woods, and also composite materials such as

medium density fibreboard (MDF) and chipboard, wood chippings used for animal litter or in the paper and pulp industry, or mulch made of wood chippings. Wood dust can cause asthma and is also classified by the International Agency for Research on Cancer (IARC) as a carcinogen.

The IARC has classified several process-generated substances as Group 1 — Carcinogenic to humans (for example diesel engine exhaust, coal combustion, soot, welding fumes and wood dust) or Group 2a — probably carcinogenic to humans (for example bitumen, biomass fuel emissions, combustion of coal and gasoline engine exhaust). In addition, several occupations and industries are classified as Group 1 (for example the rubber industry and painter) or Group 2b (for example firefighter and the petroleum industry) where the causal agent has not been established, but where the process-generated emissions are likely to play an important role.

EU directives and regulations

Directive 98/24/EG on protection of the health and safety of workers from the risks related to chemical agents at work
EU-Directive 2004/37/EC on carcinogenic, mutagenic or reprotoxic substances (CMR-directive, AnnexIII).
Read also the explanations about carcinogens, mutagens or reprotoxic substances at work on EU-OSHA’s website

Part II: Practices and routines

36.0

Start by sorting out chemical products not needed/used

Managing chemical products and the risks associated with them will be easier if there are fewer products. Avoid buying different products for the same purpose (for example by reducing the number of different oils or cutting liquids or detergents). It often also makes economic sense to reduce the number of products used.

Cleaning chemical products which are not used, will presumably not be needed.

Identify chemicals that are not used and will probably not be needed. Have you got chemical products in stock that have not been used for several years? Are there chemical products intended for a specific purpose that are no longer needed?

When disposing of chemical products, do not forget to also discard the safety data sheets. If you have an inventory, do not forget to also remove the products from this inventory.

There are no regulations stipulating that you have to reduce the number of chemical products. However, such a reduction simplifies the management of chemicals products and the associated risks.

41.0

Safety data sheets

When is a safety data sheet needed?

Safety data sheets (previously often known as material safety data sheets) shall be provided for all chemical products and substances used or kept at a place of work that are labelled with the current hazard pictograms or the older, orange, hazard pictograms.

A safety data sheet is not required for chemical substances and chemical products handled in small quantities and cannot reasonably be dangerous, for example:

- small glue bottles for office purposes;
- cosmetic products;
- vehicle fuels and fuel oil used for heating;
- chemical products and substances that are only transported (check instead the rules for the transport of dangerous goods);
- samples to be analysed in chemical laboratories;
- substances produced in a laboratory or that are directly imported for own use on a small scale;
- sulphuric acid contained in batteries.

When you are purchasing chemical products, ask for a safety data sheet before you order the product.

Read and understand safety data sheets

Safety data sheets contain information on the risks to human health, of fire and explosions, and to the environment. To know how to read and interpret the safety data sheet is a prerequisite for obtaining good-quality information on risks.
The safety data sheet is divided into 16 numbered sections, and all 16 sections have to be provided. In each section, there are usually subheadings. Some of the information is primarily addressed to experts, but much of the information has to be known by everyone working with the chemical product at the workplace.

This page gives guidance on reading safety data sheets for anyone who is not an expert, but must read the safety data sheet in order to work safely with the chemical product or substance.

The supplier is obliged to provide the safety data sheets in official national language(s)

The supplier is required to provide safety data sheets for all products to be used for commercial purposes and that contain dangerous substances. The employer is responsible for ensuring that the safety data sheets are available for all staff who deal with the products. The staff must be informed on how to read the safety data sheet..

EU directives and regulations
Regulation (EC) No 1907/2006 Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals Agency

43.0

Verification of correctness of information in the safety data sheets (SDS)

If there is a suspicion that the safety data sheet is not correct, the following checks can be made:

Check that the marking on the packaging and safety data sheets are consistent.

If a safety data sheet is dated prior to 2015, it is not acceptable, as requirements are now more extensive.

The substances in the product shall be clearly defined in section 3 (Composition/information on ingredients). If it says only ‘oil’, ‘biodegradable’, ‘preservatives’, ‘resin’, ‘curing agents’, ‘glycol ether’, ‘aromatic hydrocarbons’, ‘aliphatic amines’ or ‘polymer’, it is not possible to assess the risks, as these are names of entire groups of substances. Some of the substances in these groups are dangerous while others are harmless. If there are CAS numbers (a kind of identification number for chemicals) for each ingredient, this indicates that the substances are strictly defined.

Aqueous solutions with a pH of less than 2.5 or more than 11 may be corrosive to the skin. Check the pH in section 9 (Physical and chemical properties) of the safety data sheet. Any warning that a component is corrosive shall be under section 11 (Toxicological information).

Is the information on toxicology provided in section 11 adequate? It is not sufficient to write ‘harmful by inhalation’, as this does not explain what happens if the product is inhaled. In what way is it hazardous?

Compare the information in section 11 (Toxicological information) with the control measures described in section 8 (Exposure controls/personal protection). Do they match? Is there, for example, nothing about the potential risks associated with inhalation but there is a requirement to wear respiratory protective equipment?

EU directives and regulations
Regulation (EC) No 1907/2006 Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals Agency

44.0

Awareness and knowledge of chemical risks

When working with chemical products, it is important know what the are risks in order to apply the necessary safety precautions. Often there is a lack of knowledge about the risks associated with dangerous substances at work. It is therefore important that all workers who have to handle or use or are exposed to chemical products are aware of the risks and know how to apply the necessary safety measures. Safety measures also have to be applied by those not involved directly in the same task but working in the same room, temporary staff, trainees, staff from agencies or cleaners, maintenance workers or any others that may be exposed.

The information or training provided to those who work with a chemical product or substance is supported by safety data sheets. Workers need to get informed about the risks and they also need to have access to safety data sheets and be able to find the information about the risks associated with the chemicals they work with.

The different sections in the safety data sheets provide important information, such as:

- the risks at workplaces (section 2: Hazard identification);
- how workers can protect themselves from exposure and how to work with the product (section 8: Exposure controls/personal protection);
- Handling and storage of the chemical product (section 7 Handling and storage);

A very good way to learn more about the risks posed by chemical products is to carry out risk assessments. For more information, see also the section on risk assessment. In a risk assessment, it is especially important to consider how the chemical product is handled and the exposure.

For substances generated by different operations and processes, such as dust from grinding or smoke from welding, there are no safety data sheets available. In these cases, the employer is responsible for finding out about the associated risks and informing workers.

Check that everyone has the required knowledge about the risks associated with the chemicals they are exposed to

It is particularly important that those working with chemical products are aware of the associated risks. At the same time, it can be difficult to know, at all times, who comes into contact with chemical products and who should have such knowledge
If you want to check that everyone has the knowledge they need, you may check the following points:
Does everyone who needs to have the necessary knowledge on chemical products

have it? Please note, in particular:

- those who work with chemicals or those who are present in the room where chemical products are used;
- those occasionally working with chemical products;
- substitutes for the usual staff, for example during holidays;
- temporary staff;
- trainees;
- agency staff;
- repair people, cleaners and others occasionally working on the premises; a common type of accident is due to repair people working on process equipment, tanks, etc., without first being aware of the risks and carrying out the required checks.

To receive training is one thing — but to have learnt what is necessary and to apply it is entirely different. Check that persons dealing with chemical products have really understood what they need to know:

- Does everyone know what the hazard pictograms on packaging mean?
- Does everyone know how to find the relevant information in the safety data sheets?
- Can everyone easily find a safety data sheet when needed?
- Does everyone know what risks are associated with the chemical products they work with?
- Does everyone know what risks are the most severe?
- Do you use new products? In this case, do all those involved in work with these products know what the risks are and how to protect themselves?
- Are the safety instructions known and followed?

EU directives and regulations
Directive 98/24/EG on protection of the health and safety of workers from the risks related to chemical agents at work

45.0

Safety instructions

When working with chemical products, there may be a risk of injury if the right safety precautions and protective equipment are not used. Safety instructions are a way of making it clear how to work and what kind of equipment, including protective equipment, to use in order to avoid getting injured.

Safety instructions describe in detail, for example:

- how the work is to be carried out in order to be safe, for example what preparations are needed to work safely, such as switching on exhaust ventilation, what equipment to use and what to do when the work is finished;
- what protective equipment to use;
- when and where the protective equipment should be used;
- how the equipment should be maintained;
- what to do in the event of an accident (for example in the event of a temporary spillage or if first aid is needed).

If the instructions are simple, oral information is sufficient. If the instructions are extensive or if many workers or others need to have the same information, it is needed to provide written instructions in the workplace. It is also important to instruct temporary workers.

A good basis for such safety instructions is the safety data sheet which includes protective measures to be followed when working with the product. Safety data sheets, specifically section 8, provide general information on protection. Sections 7, 10 and 13 also contain information on how to work with products or substances.

If one or more members of staff have to develop their own safety instructions, time should be allocated to the risk assessment and planning of how to work safely. Furthermore, the staff members who will apply the instructions must be able to discuss measures to be taken with their manager.

The employer remains responsible at all times for ensuring safety regardless of who is doing the risk assessment and developing safety measures.

Written safety instructions

If it is important to follow the safety instructions to avoid injury by chemicals and if it is important that several people are aware of the safety instructions, written safety instructions are recommended.

It is important to ensure that written safety instructions are easily visible and accessible to those concerned, for example they can be placed on the machine or a wall and written in the language understood by the relevant workers
In addition to written instructions, safety instructions should also be given orally.

For certain activities that require a work permit, written work and safety instructions are required.

EU directives and regulations
Directive 98/24/EG on protection of the health and safety of workers from the risks related to chemical agents at work

47.0

Determine the presence of chemical products and generated substances

As a basis for chemical risk management, it is important to determine whether any hazardous agents are present at the workplace. A good way of doing this is to have a register of chemical products and generated substances. This register serves as a basis for deciding what chemical risks may be present in the business and need to be assessed.
All chemical products that are marked with a hazard pictogram should be included in this register. In addition, substances generated by work processes, for example dust from grinding and drilling, or smoke from processes such as welding, should be included in the register, to have a complete overview of the chemical risks at the workplace.

The register serves as input to the risk assessment and may be compiled as part of the risk assessment.

It may be useful to have one or more lists of all the chemical products used within the company or within certain parts of the company. One way of starting to make such a list is to collect all safety data sheets in a binder. Just remember to organise the binder in a way that makes it easy to find a safety data sheet when needed. A binder usually works well if there are not too many different chemical products, so that all safety data sheets can be stored in one or two binders. Enterprises that handle many chemical products and substances can instead list the chemicals in a document. An electronic list, often also allowing access to safety data sheets, is useful in companies where all the users of the products and substances have access to a computer.

Register in the form of a binder

A register in the form of a binder is often easy, especially for companies with a limited number of chemical products. The safety data sheets are ordered in this binder in a systematic manner. What suits you best?
A single binder for the entire company or one for, for example, each department or different types of operations. A rule of thumb for making this decision is that all safety data sheets must fit into one binder per entity, i.e. one per enterprise, or if they are too many, one per each compartment, etc.

Do you need to have two copies of the register? One for the office and one for the

workplace? In that case, do not forget that updates need to be made in both.

In the binder, it shall be easy to find the safety data sheets. To arrange the safety data sheets in alphabetical order of their names is usually a good way of organising the binder.

If other substances are generated during work, for example smoke, dust or mist, the register may include a list of those substances and the associated risks.

Keep the register up to date and remove safety data sheets for products and substances that are no longer used in the company. It can be updated continuously or, for example, once a year. If you buy new products or substances, it is important to immediately insert the accompanying safety data sheets into the binder.

Register in the form of an electronic list

An electronic list is particularly good for businesses with large numbers of chemical products or substances. A well-designed list provides quick and easy access to information about the chemical products or substances used within the company, provided that all staff who may need the information have access to a computer. In that case, staff may at any time obtain information on a product.
An electronic list can be made for the entire company or parts of it. The register can include information about the products, such as:

- the use
- the product name
- the supplier
- the place of storage/use
- labelling and hazard statements
- special regulations that apply such as occupational exposure limit values
- the annual quantities consumed (approximately)
- links to suppliers' websites
- electronic safety data sheets or links to such sheets (paper versions of safety data sheets may be scanned in)
- if the products contain any substances that may become prohibited
- safety instructions
- information on products that contain substances on restricted substances lists; see for example the European Chemicals Agency (ECHA) website. In the restrictions list provided by ECHA is easier to search a substance when using its CAS and/or EC number.

If substances such as dust, mist or smoke are generated by the processes or from the activities in the company, these may also be listed in the electronic register.

EU directives and regulations
Directive 98/24/EG on protection of the health and safety of workers from the risks related to chemical agents at work

48.0

Purchases of chemical products and substances

It is difficult to get the procedures for chemical products to work if anyone can buy whatever he/she wants. Each company has to find its way to manage purchases. Think about:

- What are your suppliers? Are they serious and do provide safety data sheets and technical product information plus oral information about the products?
- Who should be allowed to purchase chemical products?
- Do you purchase products from non-EU suppliers? For labelled products, there must also be a safety data sheet or equivalent information. If the product is only used internally, the product can be labelled according to EU rules or with product name, hazard pictograms (or symbols) and text containing information on the risks. A notification may also be required for ECHA’s registers.

Before a new chemical product is purchased, who controls

- that there are no new risks associated with the new product (see the Safety Data Sheet – SDS - Sections 3, 11 and 12)?
- that all specific provisions are in place for the product (s) (see SDS section 15)?
- that your planned use of the product is identified/described by the manufacturer/ supplier? Identified uses are listed in the safety data sheet or exposure scenario (s) under heading 1 or in an annex of the SDS. Products containing the substances listed may only be used for identified uses. If your use has not been identified, contact the supplier/ manufacturer.
- that a risk assessment is carried out?
- that the measures needed to work safely also take place (see SDS sections 7, 8, 10 and 13 on how to work with the product or the substance and 4, 5 and 6 on preparedness for different types of accidents and your own risk assessment)?
- that the new chemical product purchased added to the register of substances and chemical products in your company

If you find a good way of purchasing less dangerous substances and chemical products this is an important contribution to all your prevention efforts. It makes prevention easier.

EU directives and regulations

Regulation (EC) No 1272/2008 on classification, labelling and packaging (CLP) of substances and mixtures
Regulation (EC) 1907/2006 Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals Agency

49.0

Storage of chemical products and substances

Some basic rules for the storage of chemicals are;

- Where packaging is able to release gases or vapours which are harmful to health, the space in which they are stored shall be provided with forced ventilation, which effectively vents the vapours and gases.
- Where there is a risk of a hazardous chemical reaction where spillage from leakages from different chemical products and substances can occur at the same time, packaging of these substances shall be stored separately.
- Where there is a risk of leakage from packaging and other containers, procedures and procedures shall be in place to detect and correct any leakage.
- Substances posing high risks, such as very toxic or hazardous health hazards, shall be stored out of access to unauthorised persons.

For all chemical products and substances coming with a Safety Data Sheet (SDS), you can identify the requirements for their storage. In this case, consult the SDS (heading 7 on handling and storage). The risk of dangerous reactions with other substances must be shown under heading 10 (stability and reactivity).

EU directives and regulations
Storage of products is described in safety data sheets, see Regulation (EC) 1907/2006 Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals Agency

54.0

Risk assessment

What is a risk assessment?

A risk assessment is an assessment of the risk of damage, for example when dealing with a chemical product or when exposed to the air contaminants generated (when the risk is related to one or more so-called ‘chemical hazards’).

The risk assessment is used to determine whether or not the work is being carried out in a manner that is safe enough, or if there is a need for action to reduce the risk.

When carrying out a risk assessment, it must be borne in mind that risk can depend on a number of different factors:

- how you work with the product or substance and how much you come into contact with it;
- the way in which you come into contact with the product or substance — skin, inhalation or ingestion;
- the intrinsic properties of the substances in the chemical product;
- the duration and frequency of the exposure;
- if high exposures may occur, for example during certain work tasks;
- the risk of accidents, for example temporary spillage or accidental release.

Simplify the risk assessment by starting with applying good practice!
In some cases, but not in all, the risk assessment might be easier. There is often ‘good practice’ for tasks and activities, including the safety measures that need to be applied. If good practice guidance includes how to control and reduce the chemical risks, it is good to start your risk assessment by checking that you apply good practice.

The application of good practice often provides good control of the risks. In this e-tool we provide information on what is good practice for various activities and substances.

Before starting a risk assessment, check that you apply good practice. Good practice is often based on risk assessments made by experts. In general, safety measures apply to other similar businesses like yours, but adaptation of good practice to the conditions in each company may also be needed.

Who will do the risk assessment?

The employer is responsible for the risk assessment. Often it is good to start together with the workers making a risk assessment of their work with chemical products. On the one hand this increases their knowledge of the chemical products they are working with and, on the other hand, the risk assessment will benefit from the workers' knowledge of how the chemical products are handled .

Sometimes a risk assessment might be more difficult, and help from someone more skilled may be needed. In order to, for example, assess the risk associated with substances generated from processes or the risk of inhalation of air contaminants from chemical products, it may be necessary to seek the help of occupational health and safety services or any other skilled consultant. It may, for example, be necessary to perform measurements to check if concentrations of air contaminants exceed the occupational exposure limit value.

What risks have to be assessed?

What should be assessed?

Risk assessment shall be carried out for all dangerous substances, that is to say, all chemical products and substances used at the workplace that are labelled with hazard pictograms (or previously used, orange, pictograms).
Other chemical products or substances may also have to be included in the risk assessment, for example hazardous waste and air contaminants generated. Air contaminants may, for example, be generated during:

- processing or treating materials in various ways, for example sanding;
- hot work, such as welding, soldering and vulcanisation of rubber;
- demolition work;
- chemical reactions.

Contaminants formed may for example be welding fumes, soldering fumes, combustion gases, different types of dusts and mists, or fumes/vapour from, for example, heating thermoplastics.
In the office environments, substances may evaporate and be emitted when for example starting to use new computers.
Risks can also be caused by products that are not labelled with pictograms, for example water and food. Permanent work with water can cause skin problems and food can cause allergic reactions. If these kinds of problems are present in your company, they must be includes in your risk assessment.

List the chemical products and air contaminants to be assessed
It is important to start by listing the chemical products and air contaminants

present in the establishment. You can choose and adapt how this is done so as to fit in with the activities.

The risks to be assessed?

When carrying out a risk assessment, it is assessed whether or not and where action is needed to avoid injuries due to the chemical product or substance generated. For certain substances there may be specific risks that should not be overlooked. This concerns:
the risk of fire and explosion when working with inflammable and explosive products;
the risk of burns when working with hot chemical products or hot water.

The risk assessment needs to take into account workers who are especially sensitive or vulnerable

Young workers: they do not have the same experience as older and experienced workers. In addition, young workers are more vulnerable to chemical substances than adults.
Pregnant and breastfeeding women: fetuses are very sensitive to chemical substances.

EU directives and regulations

Directive 98/24/EG on protection of the health and safety of workers from the risks related to chemical agents at work

EU guidance

Online interactive risk assessment (OiRA) tools include descriptions of good practice for different sectors and operations.

For pracitical guidance on risk assessment look at the overview on national guidance documents: Practical tools and guidance on dangerous substances

Part III: Control measures to reduce the risks

37.0

Labelling of chemical products

Chemical products that are hazardous to health, harmful to the environment, flammable or explosive shall be properly marked with pictograms on the packaging. The staff working with chemical products must know what the label means. For more information, see:

What do the pictograms mean?
Look at these EU-oSHA-explanations,posters and videos!
Look at this one page ECHA-pictogram overview!

There are still old packages which are marked with the older orange symbols.
What do the previous hazard pictograms in orange mean?

The rules on labelling also apply to repackaged chemical products or substances. For more information, see:
Repacking of chemical products and substances: the new packaging must also be labelled

For certain dangerous products that are sold in shops, special rules apply. For more information see:
Need to check the labelling

The main responsibility for the accuracy of labels lies with the company that manufactures the products or imports them into the EU. The labelling shall, inter alia:

- include text in the national language;
- be clear and easily legible;
- be distinct from other text.

The label shall include:

- the product name;
- the pictogram with hazard statements on the packaging (with the relevant signal words such as ‘Danger’ or ‘Warning’;
- hazard and precautionary statements describing the risks and safety measures

in words (labelling with text on specific risks is necessary in exceptional cases for certain products even if they are not marked with pictograms);
- the dangerous components, that is, those substances that give the product the properties that make it, for example, a health hazard or flammable;
- the name of the supplier/importer/trader, address and phone number;
- EC number if available (only for products consisting of a single chemical substance).

If the packaging is too small for the necessary labelling, that is, if there is not enough space for the labelling or if the labelling is difficult to read and not clear enough, a specific instruction leaflet containing the same information must be provided.

The following types of products are not required to be labelled:

- chemical substances and chemical products handled in such small quantities that it cannot reasonably be dangerous, such as very small glue containers for office use;
- cosmetic products;
- vehicle fuels and fuel oil used for heating purposes;
- chemical products and substances that are only transported (check instead the rules for the transport of dangerous goods);
- samples to be analysed in chemical laboratories;
- substances produced in laboratories or that are directly imported for own use on a small scale.
- Sulphuric acid contained in batteries.

EU directives and regulations
Regulation (EC) No 1272/2008 on classification, labelling and packaging (CLP) of substances and mixtures
EU guidance
EU-OSHA explanations, posters and videos
One page ECHA-pictogram overview

51.0

Substitution – check the outcome

When a chemical product or substance is or has been replaced, it should be verified that the exchange is proceeding well.
Check:

- Have you received good information on the risks to human health and the environment of the new product?

The risks associated with these new substances can be poorly known. It can be difficult for an individual company to assess how well or how bad the information on that the risks posed by a new substance or chemical product really is. In this case, they may ask the assistance of an expert, for example from the occupational health service, or any other competent person.

- Use relevant portals for substitution and process evaluation, such as Subsportplus
- Have you in connection with your change of a chemical product or substance also changed the work process?

If also the way of working has changed you may need a broader assessment of the new chemical products or substances.
Proceed as follows:

- Speak with those who use or will use the new chemical product/substance and find out what is different.
- Examine what these changes mean for occupational health and safety and the environment. Review the whole.
- Take the action that is necessary to reduce problems arising from theses substitutes.

EU directives and regulations
Directive 98/24/EG on protection of the health and safety of workers from the risks related to chemical agents at work
EU guidance
Portal for substitution and process evaluation, Subsportplus from the German Federal Institute for Occupational Safety and Health

55.0

Follow-up of complaints, incidents, accidents and occupational diseases caused by chemical products or substances

Incidents, accidents and occupational diseases

Learn from the experience of the accidents, incidents and diseases that have occurred and ensure that such cases do not occur again. This is best achieved if you can address the problems as soon as you receive the first complaints, before

anyone has been affected.

Below, how you can follow-up on incidents, accidents and occupational illnesses is described.
The method described here is based on the same principles as the methods used to monitor other – not involving chemicals occupational incidents, accidents and diseases.

Proceed as follows:

Reporting

When a worker complains about any problems associated with working with a chemical product or substance, if there has been an incident or accident or if an occupational disease has been diagnosed, it should be reported to the nearest foreperson or the manager. Ensure that everyone knows that it is important to report complaints, incidents, accidents and occupational diseases.

Supervisors and managers should encourage workers to voice complaints, and report incidents, accidents and occupational diseases. The reporting of incidents provides an opportunity to address issues before a person has been seriously injured. Reporting of accidents and occupational illnesses provides an opportunity to take measures in order to prevent colleagues from getting injured.

Sometimes workers believe that it is best not to speak about the incident, because they do not want to be criticised or feel that they themselves have been negligent. In fact, it is very important to know what has happened. The cause is seldom negligence, but may involve for example stress, lack of information, poor working method or equipment.
If the same happens again, the effects may be much more serious. It is important, therefore, to talk about the incident with the foreperson or manager, and it is important not to criticise the injured. Such negative reactions towards those reporting injuries, etc., may hamper discussions about the injury, as well as the prevention of future injuries.

Follow-up
Following up complaints, incidents, accidents and occupational diseases is important in order to clarify the reason for the incident, accident or disease. Often several causes will have contributed.

Measures to prevent this from happening

The reason for following up is to decide whether or not measures need to be taken in order to reduce the risk that someone else gets injured or that a similar accident or incident occurs again.
Is a notification to the occupational safety and health authority needed?
If someone is injured at work by exposure to chemicals, this needs to be reported to the occupational safety and health authority.

Check
It may be good to check whether or not the follow-up works as intended and is good enough.

> **EU directives and regulations**
> Directive 98/24/EG on protection of the health and safety of workers from the risks related to chemical agents at work

58.0

Substitution of hazardous chemical products and substances

Chemical risks may be reduced by the substitution of a chemical product with a less dangerous product. Sometimes it is also possible to change processes in order to eliminate the need for the chemical product. Replacement of particularly hazardous chemical products is often the best course of action to mitigate risks.

Some particularly hazardous chemical products (containing carcinogenic, mutagenic or reprotoxic substances) may be used only if it is shown that it is not technically possible to replace the product with other chemical products that present a lower risk.

The substitution of hazardous chemical products and substances
An easy way to investigate if it is possible to substitute a hazardous product is to seek tips within the sector of activity, for example from colleagues, suppliers or trade journals. Another option is to investigate the alternatives yourself. This will require more work, but may also result in very good solutions. It is important to try not only to switch to a similar chemical product, which may often bear similar risks, but to review the whole approach or the production process.

Which are the most important chemical products to replace?
Where it is technically possible, it is necessary to substitute chemical products that are labelled with the following hazard statements (those with H) or similar risk phrases (those with R – according the previous legislation):
R45 or H350: May cause cancer.
R49 or H350i: May cause cancer by inhalation.
R61: May cause harm to the unborn child.

R46: May cause heritable genetic damage.
H340: May cause genetic defects
R60: May impair fertility.
H360: May damage fertility or the unborn child.

Certain substances shall not be used at all or have restrictions on their use. Normally, the suppliers have their own control measures regarding which substances cannot be used. If you suspect that a chemical product contains any non-authorised substance, you can search the ECHA database.

To select which chemical products are most important to substitute, you may apply the following rule of thumb:

Substitute if possible products marked with the following hazard pictograms:



Substitute if possible products labelled with hazard statements indicating that the product may cause allergies.
Substitute if possible products containing dangerous substances, such as those that contribute to the depletion of the ozone layer or are persistent, and substances with endocrine-disrupting effects.
Many of these substances are marked:

EU directives and regulations
Directive 98/24/EG on protection of the health and safety of workers from the risks related to chemical agents at work
EU guidance
There are many good examples of the successful substitution of dangerous chemical products with less dangerous ones. You can find examples on the EU OSHA website under Dangerous substances, Practical tools and guidance on dangerous substances
Portal for substitution and process evaluation, Subsportplus from the German Federal Institute for Occupational Safety and Health

60.0

Reducing spreading of contaminants to colleagues workplaces

Often, not only those who use chemical products are exposed to the risks, but other workers in the vicinity are also exposed to vapours or come into contact, in other ways, with the chemical product.
It is important to ensure that as few workers as possible come into contact with chemical products and that the contact is as limited as possible. The higher the risks involved with the chemical products, the more important this is.

Reduce the number of persons who come into contact with the chemical product through:

- improving ventilation in order to ensure that it captures emissions of air contaminants at the source;
- ensuring that information about risks and safety routines reaches temporary workers in the premises, such as cleaners and maintenance workers;
- if possible, carrying out the work with the chemical product or adjacent work in another, better suited, location;
- if possible, working with the chemical product at a time when there are no or few other workers present (Observe! Do not forget the risks associated with working alone);
- working with the chemical product in a designated area to which other staff do not have access and in which safety is ensured;
- reducing the amounts of chemicals at each place of work, to minimum that is necessary.

EU directives and regulations
Directive 98/24/EG on protection of the health and safety of workers from the risks related to chemical agents at work

61.0

Good hygiene practice

Measures contributing to good hygiene practice:

Those working with chemical products shall have the possibility of maintaining personal hygiene, for example through access to sanitation facilities.
In the event of contact of chemicals with the skin, workers need to wash as soon as possible.
If clothes become contaminated by chemical products, the clothing shall be replaced immediately.
Do not eat or store food in places where hazardous chemicals are used or in places where there is a risk of food contamination by chemicals.

When working with chemical products, do not smoke. If your hand has been in contact with chemicals, some chemicals can be inhaled with the cigarette smoke.

EU directives and regulations
Directive 98/24/EG on protection of the health and safety of workers from the risks related to chemical agents at work

62.0

Personal protective equipment

When other measures do not provide sufficient protection, personal protective equipment, or PPE, is necessary. The personal protective equipment can only provide a high level of protection if the right type of equipment is used and if it is used in the right way.

In a safety data sheet, section 8 (Exposure controls/personal protection), there shall be an indication of the personal protective equipment that may be required. The types of gloves or respiratory protective equipment that will provide protection against products or substances.

More information:

- Respiratory protection
- Protective gloves
- Safety glasses and masks

EU directives and regulations

Directive 89/656/EEC - use of personal protective equipment
Directive 98/24/EG on protection of the health and safety of workers from the risks related to chemical agents at work

62.1

Respiratory protection

Respiratory protective equipment shall be used in such a way that it provides good protection against air contaminants and not just a false sense of security.

Respiratory protective equipment must be fitted with the right kind of filters to protect against air contaminants present at the workplace. Gas filters do not protect against particles, and particulate filters do not protect against gases. Active carbon

filters protect against gases, but not against all gases. In some cases, you may have to use a combined filter to protect yourself from the mixture of air contaminants present in the workplace. The supplier can help to choose the appropriate filter.

It is often difficult and hot to work while wearing respiratory protective equipment. It is therefore important to select the respiratory protective equipment that is as comfortable as possible. Powered-air or supplied-air respirators are more convenient to use than those without such a support. For hard physically demanding work, it is especially important to provide this kind of respirator.

Respiratory protective equipment should be fitted to the individual. This is important, since one and the same piece of respiratory protective equipment will not fit all workers. For example, the size and form of the face varies.

A person with a beard shall not use a full or half mask. The mask must be tight and a beard will prevent the mask from fitting tightly and there will be leakages between the face and the mask.

For effective respiratory protection, the filter must be replaced regularly. Without renewal, filters can get tight, making it more difficult to breathe (if it is a particulate filter) or it may not clean the air anymore. Therefore, respiratory protective equipment has to be cleaned and filters must be replaced on a regular basis.

If the work is very heavy, respiratory protection might provide false safety. If breathing heavily, the air flows through the filter may be higher than intended, which may lead to leakages of contaminated air into the respirator. In addition, because in such cases it is very difficult to work while wearing respiratory protective equipment, it might be tempting to remove it. Appropriate measures should be envisaged for such cases, like additional training, awareness raising or even rethinking the work process itself.

EU directives and regulations

Directive 89/656/EEC - use of personal protective equipment
Directive 98/24/EG on protection of the health and safety of workers from the risks related to chemical agents at work

62.2

Protective gloves

How well a glove protects the skin from a substance varies depending on the substance and the material the glove is made of. The supplier knows which gloves

protect against which substances. When purchasing new gloves, indicate for which substances the gloves are intended and ask the supplier to advise on the right type of gloves for protection against that relevant substance.

If you want to check yourself what gloves protect against the chemicals you use, information catalogues are available on the web pages of several companies that sell protective gloves.

Protective gloves may provide a very high level of protection against chemical substances, but it is important to use them properly. It is also important to remember the following:

Those using the gloves need to be involved when buying/selecting the gloves. The gloves need to fit well to the hand in order to ensure good function without causing problems due to poor fitting. If gloves are felt not to be useful, users may not want to use them.
Change gloves on a regular basis. If the gloves are used for substances that are able to penetrate them, they may need to be changed on a daily basis or even several times a day.

Change gloves directly if they rip, or if they have become dirty inside. From a risk point of view, working with dirty gloves is associated with the same risk as working without gloves.

EU directives and regulations

Directive 89/656/EEC - use of personal protective equipment
Directive 98/24/EG on protection of the health and safety of workers from the risks related to chemical agents at work

62.3

Safety glasses and masks

Eye protection, such as protective goggles, face shields or goggles with lateral protection, is needed when working with hazardous substances that may cause damage to eyes. It is important that eye protection is adapted to the current need. Do not forget:

- eye protection googles shall fit tightly against the face;
- eye protection shall fit well and be comfortable;
- eye protection shall be designed in such a way that it does do not impair the sight;

- it is inappropriate to use contact lenses in dusty atmospheres or in air with aerosols;
- excessive heat radiation can make contact lenses stick in the eyes;
- to change eye protection that has been stained, scratched or has become limp.

EU directives and regulations

Directive 89/656/EEC - use of personal protective equipment
Directive 98/24/EG on protection of the health and safety of workers from the risks related to chemical agents at work

63.0

Signs

What signs are needed depends on the assessment of risks.

There may be a need for signs and labelling on pipes and containers and for warning signs if particularly dangerous substances are being handled.
Signs and labelling shall, inter alia, be maintained, checked and cleaned. Repair or replace damaged signs and labelling.
Signs including warning signs are usually sold in hardware shops.

Signs

Ensure that signs are placed at an appropriate height either at the entrance to a danger zone or near a particularly dangerous place. Ensure that the lighting is sufficient and that the signs are clearly visible.
Mark storage rooms, areas or enclosures used for the storage of large quantities of chemicals with signs. Place the signs near the storage area or on the door leading into the storage room.

Examples of when warning signs are good practice in order to warn about the risks are(depending on the national regulations):

- work with material that may contain asbestos, for example in demolition or when working in old buildings with asbestos;
- where chemical products that may cause allergies are handled;
- glue and other chemical products that contain ethyl-2-cyanoacrylate or methyl-2-cyanoacrylate;
- processes where formaldehyde is emitted

Labelling of tubes and pipes

When working with hazardous substances, it is good practice to mark tubes and pipes containing hazardous substances using appropriate labelling. Labelling can be placed on tubes containing the dangerous substance.

Pipes containing hazardous substances can be labelled with the relevant hazard pictogram (or pictogram) and the name of the product, and an arrow shall be placed showing the direction of the flow. The signs need to be clearly visible and placed at appropriate intervals and in the vicinity of valves and fittings.
Tubes and pipes with inflammable substances need to be labelled in order to avoid confusion among pipes and tubing.

EU directives and regulations
Directive 92/58/EEC - safety and/or health signs

64.0

Eye flushing and emergency shower

When is eye flushing or an emergency shower needed?
Eye washes and/or emergency showers are needed if working with any chemical product in such a way that it may need to be washed away quickly, for example after a splash into the eyes or on the skin.
The safety data sheet for the chemical product provides information under heading 2 (Hazards identification) if there is a risk of injuries to the skin or eyes and under heading 4 (First aid measures) if access to an eye wash or emergency shower is needed.

An eye wash is required where there is a **risk of splashing** that might cause **damage to the eyes.**
An emergency shower is needed if there is a **risk of splashes** of a chemical product that may cause injuries when in **contact with the skin.**
Even if there is access to an eye wash and emergency shower, there is often also a need for access to running tap water, for example for rinsing hands and arms rapidly.

Who needs to have knowledge of the eye wash and emergency shower?
All those who run the risk of splashes in the eyes and on the skin shall know how emergency showers and eye washes work.
New recruits and those working on a temporary basis shall be informed about the

emergency shower/eye wash and equipment for eye flushing.

Location
Place emergency shower/eye wash close to the places of work where there is a risk of splashes. It is important to easily and without assistance find the eye wash for anyone that has been splashed, for example, in the eyes.
Ensure that the ways to the emergency shower and eye-wash facilities are not blocked.
More information:

About eye flushing
Information on how dangerous the chemical product is and for how long rinsing is needed after a splash can be found in the safety data sheet under headings 2 and 4.

Select eye washes adapted to the risks and needs of the workplace.
A device connected to the drinking water is often the best choice if working with chemical products requiring flushing for a long period, for example 15 minutes. An eye-wash fountain is also best if it may be important to rinse both eyes at the same time.

Cheaper alternatives are eye-wash bottles, but they are insufficient if you need to rinse for a long time or if there is a need to rinse both eyes at the same time.

It is possible to choose a mix of a fixed eye-wash fountain and eye-wash bottles located close to places of work where there is a risk of splashing.
Eye-wash bottles are also useful in the event of transport to a hospital.

About fixed eye showers
Ensure that the eye wash is easy to trigger and to use and has a sufficient rinsing time.
If you need to rinse for a longer time (at least 15 minutes), the water must be tempered.

Check at least once every 6 months that the eye-wash showers work. It is good to note when these checks have been carried out, for example on a sheet of paper on the wall near the eye-wash showers

About eyewash bottles
Eye-wash bottles need to be replaced on a regular basis because they have a limited shelf life.

The ‘best before’ date is usually stamped on the bottle.
Is it clear who is responsible to make sure that the bottles are replaced?

About emergency showers
Ensure that the emergency shower is easy to trigger, even by someone creeping on the floor.
It is also good if the emergency shower has tempered water. This is particularly important if handling substances where there may be a need to take a shower for a long time to avoid the risk of injury, for example from corrosive substances. It is easier to shower for a longer period of time if water is temperate.
Check that the water runs into the sewage system and cannot remain on the floor (30 minutes renders a lot of water).
Check at least once every 6 months that the emergency shower works as intended and note when the inspection has been conducted, for example on a sheet of paper on the wall near the emergency shower.

Verification that the eye wash/emergency shower meets the requirements
Are all who might need an eye wash or emergency shower aware of where the eye washes and emergency showers are located and do they know how they work?
Is the location well selected and easily accessible and not blocked in any way?
If there may be a need for long-term eye washing or showering, can the water be tempered?
If there may be a need for long-term washing or showering, will the water run to a drain?
If washing of both eyes at the same time may be needed, is there an eye-wash fountain (eye-wash bottles are not sufficient for this purpose)?
If eye-wash bottles are available, are they exchanged regularly and not exceeding their shelf life? See the ‘best before’ date on the bottle.

Short trainings of such an emergency situations will probably help using the eye washes effectively and without handling difficulties.

EU directives and regulations
Directive 98/24/EG on protection of the health and safety of workers from the risks related to chemical agents at work