Koninklijke PBNA

Theme A

Preparing, discussing and inspecting work

1 Regulation and safety rules

1.1 Safety and health; H&S-legislation

To work safely and healthily is important. That is why the government has made laws about working conditions. The Working Conditions Act (Arbo Act) [Occupational Health & Safety Act] states what employers and employees must adhere to with regard to working conditions in a company.

Goals of Working Conditions [Occupational Health & Safety]

The purpose of the Working Conditions Act is to prevent accidents and illnesses caused by work. This H&S legislation (H&S refers to health and safety) is about safety, health and well-being at work. Its purpose is to protect and improve the safety and health conditions so that the employee does not get sick and is not harmed by the work he does. The employer must ensure that the working conditions are arranged as well as possible. Think of a safe working environment, well-maintained machines and tools, but also, for example, making personal protective equipment available and giving instructions to employees. The employer is also responsible for supervising.

The employee also has rights and obligations when it comes to a safe workplace. The responsibility for good working conditions therefore rests with employers and employees together.

The legislation applies to all locations where work is performed. The legislation also applies to employers and employees, including temporary agency workers and assimilated employees. Think of interns and volunteers or employees of contractors. Visitors to a company are also supervised by the employer.

Local residents are not covered by H&S legislation.

The Dutch Labor Inspectorate (NLA)

The Dutch Labor Inspectorate of the Dutch Ministry of Social Affairs and Employment was created by merging the Labor Inspectorate, the Work and Income Inspectorate and the Social Intelligence and Investigation Service. The NLA Inspectorate supervises compliance with safety and health legislation. It checks whether companies and employees comply with the Working Conditions Act (Arbo Act) [Occupational Health & Safety Act] and the Working Hours Act. This is necessary to identify and improve bad working conditions and to prevent accidents. In order to be able to do their job properly, the employees of the NLA have special authorizations.

Visiting the company

Employees of the NLA can visit wherever work is done. They then carry out checks and conduct research. The NLA is authorized to:

- initiate an investigation following an accident;
- ask employees for valid identification;
- impose a requirement on how to comply with H&S legislation;
- to issue a warning when the employer or employees do not comply with the laws and regulations when performing work;

PRACTISE QUESTION

On the construction site, a contractor works together with several other companies.
What should the contractor as an employer take care of? (multiple answers can be correct)

a. Safety on the construction site for all employees present.
b. Information and instruction for local residents.
c. Instruction on safety at work for the trainees.
d. Guidance of visitors on the construction site.
e. Regular inspections of the NLA .

Answer: a, c, d

- draw up a penalty report (official report) in response to a violation (e.g. failure to follow safety instructions);
- stop work if there is serious danger to persons.

Measures of the NLA
(sanctioning possibilities)
If the law has been violated, the NLA will take measures to prevent a recurrence.
Sometimes the NLA only issues a warning. But the NLA can also hand out a hefty fine, for example. The employer will therefore always be addressed by the NLA. The employer is not only one who can be fined. The NLA can also impose fines on employees.

Always report a serious accident!
The employer is obliged to immediately report a serious accident to the NLA, by telephone or (preferably) with a digital reporting form via the internet.

Indicate: the Working Conditions Act applies to:

O the employer
O the temporary agency worker
O local residents
O all employees
O students

Answer: V, V, O, V, O

Well-arranged thanks to the Working Conditions Act (Arbo Act) [Occupational Health & Safety Act]:

✓ The employer and employee are jointly responsible for the health and safety policy.

✓ **Supervision by:** NLA

Thanks to the Working Conditions Act (Arbo Act) [Occupational Health & Safety Act]...

✓ work conditions are safer and healthier;

✓ there is less monotonous work;

✓ is there customization in safety and health;

✓ the responsibilities, duties and authorities between employees are clear.

1 Regulation and safety rules

1.2 Prevention and expert assistance

To comply with H&S legislation, a company has a working conditions policy. Companies receive assistance in drafting, implementing and monitoring of the working conditions policy. A prevention officer or an internal prevention service supports the company from within the organization itself. Externally, the health and safety service or a company doctor offers help with working condition issues

Internal support: the Working Conditions [Occupational Health & Safety] prevention officer(s)
Every employer is obliged to appoint at least one internal expert or prevention officer. In small companies, the employer can perform this function himself. The prevention officer advises and helps the company with safety, health and welfare. The prevention officer cooperates in drawing up, among other things, the risk inventory and evaluation [risk assessment and evaluation] (RI&E) and the associated action plan. The RI&E must be tested by an internally or externally certified expert in the field of working conditions, such as a safety expert, occupational hygienist or company doctor.
For some branches, a so-called branch RI&E is available. In this RI&E example, the common risks in the industry have already been included. Especially small companies (<25 employees) make use of this.
The prevention officer is the point of contact for the health and safety service and the NLA. He manages the health and safety care system and provides internal information and instruction. If a company does not have an in-house health and safety expert, the employer will make additional calls on external assistance, for example from an expert from a health and safety service.

External support: health and safety service and company doctor
An employer must have a contract with a certified company doctor. This may be done via an external health and safety service. The health and safety service or the company doctor must be called in for:

- counseling sick employees;
- performing (voluntary) Periodic Medical Examination (PMO);
- performing pre-employment examinations

Pre-employment inspections are compulsory for, for example, crane drivers, people who work with Self-Contained Breathing Apparatus (compressed air), people who work with particularly hazardous substances (radioactivity, asbestos).

PRACTISE QUESTION

A new workshop is being set up in the company where you work. There will be several machines and there is room for assembly work. During the work meeting it is reported that a Risk Inventory and Evaluation (RI&E) will also be drawn up. Which of the statements below about the RI&E is correct?

a. As an employee you must make the risk inventory yourself. You do the risk evaluation together with the employer.
b. The Risk Inventory and Evaluation is drawn up in collaboration with the prevention officer.
c. The employer may determine whether the Risk Inventory and Evaluation is drawn up.

Answer: b

Indicate: which of the following expert employees must the employer appoint?

- O company doctor
- O company nurse
- O prevention employee
- O certified safety expert

Answer: O, O, V, O

Right to Targeted Periodic Examination

Employees who do high-risk work receive a periodic medical examination; the so-called Targeted Periodic Examination (GPO). For example, do you work in the offshore or (petro) chemical industry? Do you work with asbestos or contaminated soil? Then a medical examination is mandatory. This obligation also applies to work with independent breathing air or, for example, to operate a crane. You are not allowed to perform these activities without demonstrable medical fitness.

The employee decides whether the results of this medical examination are passed on to the employer.
The occupational health and safety service or company doctor must report established occupational diseases to the Dutch Center for Occupational diseases (NCvB). This report is anonymous, just like the one to the employer.
In addition to a healthy and safe working environment, as an employee you are also entitled to information and training in the field of health and safety.

The prevention officer

- ✓ provides information about safety, health and wellbeing;
- ✓ contributes to the drawing up of a risk inventory and evaluation (RI&E) and helps to draw up a Plan of Action.

The health and safety service / company doctor are for:

- ✓ The occupational health and safety service investigates: noise pollution; climate; physical strain; Hazardous Substances; work equipment;
- ✓ the guidance of sick employees;
- ✓ conducting medical examinations and job-related pre-employment examinations;
- ✓ testing the Risk Inventory and Evaluation (RI&E).

1 Regulation and safety rules

1.3 Working Hours Act, Environmental Legislation and CE Marking

In addition to the Working Conditions Act, we also have to deal with the Working Hours Act, environmental legislation and European directives.

Working Hours Act
The Working Hours Act provides rules for working and resting hours. The law regulates how often you have to rest and how long that rest period should be. This takes into account the type of work you do and the stressful circumstances under which you work. Additional rules apply when you work in confined spaces or in extreme hot or cold conditions. The law also takes into account the care tasks that you have as an employee in your family. Examples are illness of housemates, pregnancy and special circumstances.

Environmental legislation
The objectives of environmental legislation are to protect people and their environment against harmful effects of (business) activities. Limiting emissions and waste flows are also part of these objectives. Efficient and correct disposal of waste must be ensured. Think of the separate collection and processing of these waste materials.

Energy savings and reusing raw materials are also part of this. That is why companies are increasingly working on adapting production processes to limit emissions, reduce waste and ensure separate collection. In this way fewer harmful substances enter the environment (water, soil and air pollution). The waste processor can thus remove and process the waste better. Waste can also be reused (recycling). Consider, for example, plastic and green waste.

European directives
European directives largely determine national regulations. Member states of the European Union are obliged to adapt their laws and regulations to these directives. For example, the Working Conditions Act is based on European regulations. Another example is the directive on (user) safety of products, the CE marking.

CE-marking (CE = Conformité Européenne)
CE marking is affixed to all products, such as machines, tools (work equipment), personal protective equipment, on household appliances and toys. The countries of the European Union have agreed that all these products must comply with the European Directive in terms of safety. Only CE marked products may be marketed in these countries.

The logo looks like this:

CE

PRACTISE QUESTION

1. The primary purpose of the Working Hours Act is:
   a. protect employees from long working days
   b. protect employees against irregular working hours
   c. prevent endangering health and safety

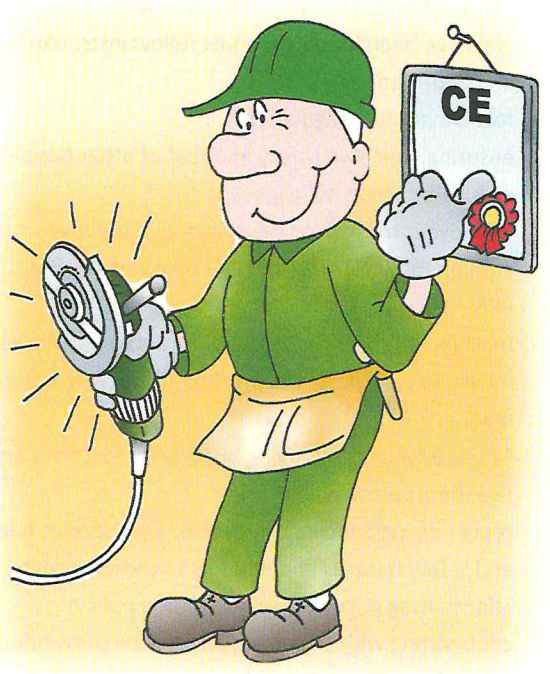
2. The Working Hours Act is controlled by
   a. the union
   b. the health and safety service
   c. the NLA

Answer: 1a, 2c

Indicate: the environmental legislation regulates:

- O which hazardous substances are allowed
- O how waste must be disposed of
- O what personal protection you should use when working with hazardous substances

Answer: √, √, O



Objectives of environmental legislation:

- ✓ adjusting production processes;
- ✓ limiting emissions;
- ✓ limiting and separating waste flows.

CE mark:

- ✓ European Directive for (use) safety of products;
- ✓ mandatory on work equipment and PPE;
- ✓ mandatory in all EU countries.

Objectives of the Working Hours Act:

- ✓ Maximum working hours;
- ✓ Minimum rest periods:
- ✓ To combine work and care tasks.
- ✓ Prevents health and safety from being in danger.

1 Regulation and safety rules

1.4 Tasks, responsibilities and authorities

Every law has rights and obligations. The Working Conditions Act specifies rights and obligations for both the employer and the employee in the field of safety and health at work and the circumstances in which work is performed.

Obligations of the employer

The employer must make a Risk Inventory and Evaluation (RI&E). The RI&E must be recorded in writing and consists of the following steps:

1. identifying the hazards;
2. inventory of the risks;
3. evaluation of the risks.

A plan of action is drawn up on the basis of the evaluation. It states which improvements the company will implement for safer and healthier work and within what period. The employer must additionally:

- ensure safe working practices;
- prevent dangers;
- provide effective protective equipment and supervise proper use;
- inform and instruct employees about safe and healthy work;
- monitor compliance with the instructions;
- take effective measures for assistance and evacuation.

The employer is ultimately responsible for complying with the Working Conditions Act and must pursue a prevention policy. This is also referred to as working conditions policy. The working conditions policy describes how matters are arranged by the employer, such as;

- promoting health and safety of employees and third parties at the workplace;
- the prevention and control of absenteeism;
- prevent bullying, sexual intimidation, discrimination, aggression and violence in the workplace.

The employer must also ensure sufficient working conditions consultation. The following are present during the work meeting (toolboxmeeting): managers, employees and prevention officer(s).

Duties of employees

Employees also have duties. For example:

- it is compulsory to follow information, instructions and training. Even if you work at a company where you have been hired, you must follow instructions and information;
- following safety regulations;
- ensuring your own safety and that of other people involved, such as colleagues;
- employees must wear the personal protective equipment (PPE) provided and take care of these PPE;
- machines, appliances, tools, hazardous substances, means of transport, etc. must be used in the correct manner;
- No modifying or removing installed protections and use them correctly;
- reporting incidents and situations with serious health and safety hazards immediately to the supervisor;
- contributing positively to prevention policy;
- cooperating with the employer and the prevention officer/occupational health and safety service to promote safety and health at work.

PRACTISE QUESTION

1. You work on a construction site together with various employees from other companies. The main contractor is not your boss. He regularly organizes toolbox meetings. Do you have to be present?
   a. yes
   b. no

2. On the first day you start work on the construction site, a lifting job will be carried out. The lifting activities take place above your workplace. Who should you report this unsafe situation to?
   a. the foreman of the main contractor
   b. the supervisor
   c. the operator of the crane

Answer: 1a, 2b

You work as a forklift driver in a warehouse and notice that a container of chemicals is leaking. The liquid slowly flows out of the vessel. Put in the correct order what to do:

a. You report the danger to your supervisor.
b. You warn colleagues in the area.
c. You stop working.
d. You bring yourself to safety.

Answer: c, d, b, a

Rights of the employee

If people are in immediate danger and the NLA cannot be at the dangerous location in time, you as an employee are entitled to work interruption.
As an employee you are allowed to take appropriate measures yourself to prevent the consequences of such a hazard. In that case, you must have the technical knowledge and the available resources to be able to do this. If this is not possible, then you must stop work immediately and bring yourself and colleagues to safety. The situation or danger must be reported immediately to the supervisor.

In addition to a healthy and safe working environment, you as an employee also have the right to information and training in the field of working conditions, safety and health at work.

Obligations of the employer:

- ✓ Conduct health and safety and absenteeism policy
- ✓ Making a risk inventory and evaluation
- ✓ Provide information and instruction
- ✓ Provide safe working practices and good working conditions
- ✓ Monitor compliance with instructions
- ✓ Provision of personal protective equipment (PPE)
- ✓ Consultation with (representation of) employees
- ✓ Ensure the safety of third parties, such as visitors.

Obligations of the employee:

- ✓ Following information and instructions
- ✓ Using and maintaining PPE properly
- ✓ Using protections
- ✓ Collaborating with employer and prevention service to improve well-being at work
- ✓ Reporting (imminent) danger
- ✓ Reporting accidents and incidents.

Employee rights:

- ✓ The employee is entitled to work stoppage in case of immediate, serious danger to people. The danger must be reported immediately to the supervisor.

1 Regulation and safety rules

1.5 Work permits

The use of work permits is not required by law, but a business rule. The working method is laid down in a procedure. Work permits are intended to properly organize work in high-risk environments, so that work can proceed safely. Work permits are applied for work in the (chemical) industry, but also in hospitals, the food industry and complex industrial installations, such as in data centers. This section explains the function of the work permit, when an additional work permit is necessary, which officials are involved in work permits and what tasks, responsibilities and authorities they have.

Functions of a work permit

The functions of the work permit are:

- consulting with all those involved in the job;
- making binding agreements with everyone involved in the job;
- record the conditions under which you must job;
- granting permission for the start of the job.

An additional work permit

An additional work permit is required for work with more or greater risks. For example with:

- entering a confined space;
- digging in contaminated soil;
- digging in soil containing pipes or opening floors, streets;
- working on or near dangerous radiation sources;
- lifting activities above or in the vicinity of important installations;
- working with or demolishing materials containing asbestos;
- working with hazardous substances;
- working at height

A **hot work permit** is required for work involving fire hazards, such as welding, burning and grinding or other work with a risk of fire.

Parts of the work permit

The work permit consists of four parts, namely:

1. Which activities must be carried out;
2. What measures are being taken by the issuer of the work permit;
3. What action should be taken by the operational employees;
4. Signing.

1. *Which activities must be carried out:*

- what the activities entail;
- how the activities take place;
- where the work takes place.

2. *What measures are taken by the issuer of the work permit:*

- the measures to be able to work safely;
- measures for securing: e.g. plugging flanges, electrical and/or mechanical locking;
- measures for measuring and detecting conditions that could pose risks.

3. *Which measures must be taken by the operational employee:*

This contains the measures that must be taken by the operational employees to work safely. All necessary personal protective equipment is also indicated.

PRACTISE QUESTION

You are going to be performing activities in a petrochemical company. You will be using hand tools and a grinder. What type of permit do you need?

a. general work permit without any additional safety measures
b. hot work permit
c. verbal work permit

Answer: b

4. Signing:

The work permit is signed by the permit issuer and the permit holder. This is called ratifying the work permit. A work permit is usually valid for one day, but can be extended under certain conditions. The work permit is not valid if one of the parties has not signed.

People involved in a work permit

Three officials* are involved in a work permit and the additional work permit:

1. the permit issuer;
2. the permit holder;
3. the operational employees.

1. Permit issuer

The issuer of the work permit is responsible for safety on the site or the installation where the work is carried out. The issuer of the permit has the following obligations:

- checking the exemption of the installation before signing the permit;
- discussing the nature of the activities, the conditions and the measures that must be taken with the work permit holder before signing the work permit;
- signing the work permit;
- ensuring that necessary measurements have been taken if necessary;
- ensuring coordination and agreements between the collaborating parties.

2. Permit holder

The holder is the supervisor of the operational employees. It is the holder's duty to:

- sign the work permit;
- give explanations to the operational employees; ensure that the work permit is present at the workplace

The correct work sequence for a work permit is:

a. determining the measures to be taken
b. signing
c. description of the requested activities
d. control exemption installation and measurements

Answer: c, a, d, b

Furthermore, the holder ensures that the activities are carried out in accordance with the conditions on the work permit. He also checks whether the necessary measurements have been carried out and signed off on the work permit.

3. Operational employees

The operational employees do not sign the permit, but they do have the following obligations:

- be informed of the contents of the work permit;
- adhere to the conditions for the work, as described in the work permit;
- adhere to the security measures stated on the work permit;
- only work with a valid work permit and take the period of validity into account.

** **Note**: the permit applicant also plays an important role in the widely used Deltalinqs system. See Appendix 3 for further explanation.*

- ✓ Always ask for a permit on time.
- ✓ Always follow the instructions.
- ✓ Make sure the is an example of the work permit at the workplace.
- ✓ For jobs carrying extra risk, an additional work permit is required.

- ✗ Never sign a work permit you don't understand.
- ✗ Don't start working if you're not sure what you're supposed to do.
- ✗ Never change something in the work permit yourself.

1.6 Guidelines for general and specific safety precautions

Within practically every company you have to deal with procedures and instructions. It contains both general and specific safety rules. These rules are included in the Safety Manual and are therefore part of the safety policy.

General safety rules

General safety rules are intended for the entire organization: its own personnel, temporary employees, other persons on site and personnel of contractors and subcontractors. The general safety rules include:

- logging in and out;
- traffic rules on site;
- how to act in case of calamities;
- waste separation;
- reporting accidents;
- fire and incidents.

Anyone to whom this is important must be aware of the general safety rules. Therefore, general safety rules should:

- be in writing;
- be communicated to anyone entering the site for the first time;
- be sufficiently clear and unambiguous;
- be understood, also by non-native speakers.

Specific safety rules

Specific safety rules apply to tasks, functions and activities with an increased risk. The rules concern supervision, training and inspection.

They can be about:

- entering confined spaces;
- working at height;
- warm/hot work;
- working in a potentially explosive atmosphere;
- use of required personal protective equipment;
- excavation work;
- use of specific tools, equipment and implements;
- shielding;
- ventilation;
- signaling;
- marking.

Employees for whom the specific safety rules are important must of course be well aware of those rules. That is why specific safety rules must be:

- recorded in writing;
- sufficiently clear and unambiguous;
- available to the employees involved;
- explained;
- tested to determine that the employees involved have understood the rules;
- also understood by non-native speakers.

PRACTISE QUESTION

Which of the following safety rules are specific safety rules?

a. Speed limit for vehicles on site.
b. Use of independent respiratory protection during work.
c. Ban on the use of cell phone in the factory.
d. Use of personal detection equipment when cutting trenches.
e. Alarms on the property.

Answer: b, d

Procedures

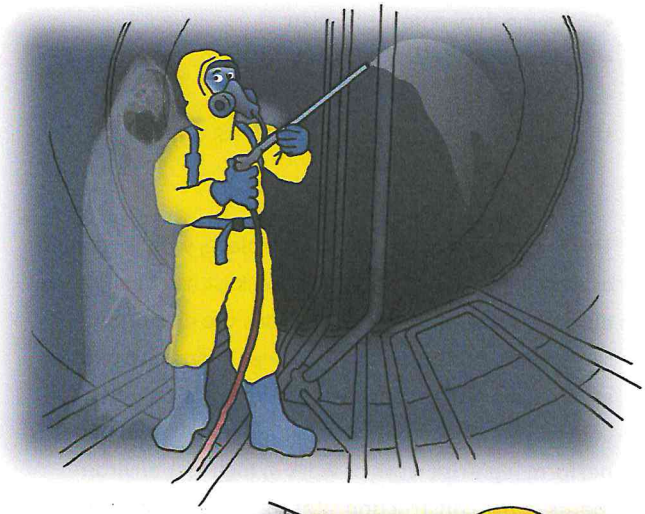
Procedures provide a clear and point-by-point description of the tasks and working method within a company. In this way we guarantee safety and maximum efficiency in the company. It is the supervisor's duty to inform every (new) employee about this.

Safety procedures are an important part of instruction for new employees and temporary workers, such as hired workers and temporary agency workers.

Who is required to participate in instructions on safety procedures?

a. employees of the company
b. contractors
c. visitors
d. trainees
e. parcel delivery drivers

Answer: a, b, d



- ✓ General safety rules are important for the entire organization.
- ✓ Specific safety rules apply to tasks or activities with increased risks.
- ✓ Safety procedures are an important part of instruction about safety in the workplace.

- ✓ The supervisor gives instructions about safety rules, regulations and HSE in general.
- ✓ All employees must be aware of this.

1 Regulation and safety rules

1.7 VCA and certification

Working safely is an important starting point for every company. By working safely, there is less chance of accidents, less absenteeism and work is done more efficiently. There are various systems to monitor work safely. One of these systems is the Safety, Health and Environment Checklist for Contractors (VCA).

VCA certification

The VCA certificate is a quality mark to demonstrate that a company, in accordance with the VCA rules, performs HSE control. A certified company meets a number of requirements, such as:

- having drawn up a HSE plan;
- assessing work performed;
- training and instructing personnel;
- performing workplace inspections; drafting HSE purchasing policy.

This controls activities in the workplace, with the aim of preventing incidents. The VCA checklist has been drawn up as a questionnaire and describes the exact requirements that a company must meet in order to obtain approval for the certificate. The system is intended for contractors and companies that have their employees perform high-risk work or work in high-risk environments in the construction sites, factories, installations or workshops of others (clients).

Different levels of VCA certification:

- VCA* (one star): this certification level is aimed at direct HSE care in the activities on the work floor;
- VCA** (two stars): in addition to the elements from VCA*, the safety structures and systems within the contractor's company are also assessed;
- VCA petrochemicals: for companies that carry out complex high-risk activities in the petrochemistry or petrochemical industry. These companies are subject to additional requirements in addition to the VCA**.

Additionally, we also have two special certificates. Which are:

- VCU (Safety, and Health Checklist Temporary Employment Agencies). These organizations, which make temporary agency workers available to companies, also have specific requirements for managing safety and health at work.
- VCO (Safety, Health and Environment Checklist for Clients). Certifies that the client ensures the right conditions and circumstances so that VCA-certified contractors and temporary agency workers, who are deployed via VCU-certified organizations and who come to do risky work for them on their site, work in accordance with VGM.

PRACTISE QUESTION

The company where you work has a VCA certification. What does this mean?

a. The company registers unsafe situations and accidents and has a certified safety register.
b. The company has a safety management system according to established rules.
c. The company has a safety management system that is tested based on the safety report.

Answer: b

One of the obligations under the VCA is that employees are trained in the context of VCA. The following diplomas and/or certificates are required for this:

- for operational employees: "Basic safety VCA" (BVCA) diploma;
- for operational supervisors: "Safety Operational Supervisors VCA" (VOL-VCA) diploma
- for consultants and supervisors: Safety for intermediaries and supervisors (VIL-VCU) diploma;
- for high-risk tasks: certificate of the relevant SOG test (formerly GORW).

SSVV [Cooperation for Safety Foundation] Course Guide

In the petrochemical industry, it is mandatory to have operational employees take an exam for high-risk tasks. Examples of activities in the petrochemical industry with mandatory examination by a SOG examination center are:

- work with a forklift truck;
- work with a telehandler;
- working with an aerial work platform;
- work on low-pressure flanges;
- work as an outside guard;
- moving loads;
- work with Self-Contained Breathing Apparatus;
- gas measurement: explosive and toxic substances and oxygen.

In the CDR (Central Diploma Register) all issued VCA and SOG diplomas since 1 January 2004 are included.
You can therefore quickly see whether an employee has the required and valid diplomas.

What are the obligations within VCA certification?

a. drawing up safety regulations for third parties
b. training and instruction of personnel
c. workplace inspections
d. employee appraisal interviews
e. HSE purchasing policy
f. appointing employee representation

Answer: b, c, e

✓ The objective of VCA certification is control of the activities in the workplace in the field of HSE.

✓ Annual audit by an accredited certification authority in the workplace in the field of HSE.

✓ VCA is not a legal obligation, but an agreement between companies, whereby the general duty of care required by the Working Conditions Act can also be met.

1 Regulation and safety rules

1.8 Tasks and responsibilities of the hiring company and temporary work agency

Temporary work refers to a triangular relationship between the temporary work agency, hirer and temporary agency worker. A temporary agency worker has a so-called *"formal"* and *"material"* employer. The temporary work agency is the formal employer, because the temporary agency worker is actually employed here. The hirer has authority as a material employer.

Hiring company

The hirer is responsible for the working conditions of the temporary agency worker at the workplace, provides leadership and supervises the workplace.
The hirer must provide the temporary work agency and the temporary agency worker with sufficient information about the activities to be performed and the qualifications of the temporary agency worker well before the work starts. In addition, the hirer makes a description from the risk inventory available to the temporary work agency, containing the dangers and risk-limiting measures of the risks for the employee in the job to be taken.

Obligation to pass on information

In the Netherlands, the temporary work agency and the hiring company have a shared duty when it comes to instructions and information to the temporary agency worker. On the basis of the information that the hirer must provide to the temporary work agency about the work to be performed, the knowledge and skills for this position and the safety measures at the workplace, the temporary work agency ensures that this information is passed on to the temporary agency worker. This is called the obligation to pass on information.

Necessary points for attention that must be recorded by the hirer with the application:

- job title;
- place, department and work environment;
- activities and tasks to be performed;
- high-risk tasks and control measures of the task and workplace;
- required medical fitness;
- risks present (hazardous substances, machines, situations, processes);
- which PPEs are used to control these risks;
- who takes care of the PPE (temporary work agency or hirer);
- who provides the instructions for use of PPE (temporary work agency or hirer);
- vocational training/education level;
- experience;
- language skills;
- being in possession of a valid certificate / attestation/diploma Basic Safety VCA, unless stated in the application and motivated by the hirer that Basic Safety VCA is not compulsory;
- requirements related to high-risk tasks;
- other relevant education.

PRACTISE QUESTION

The company where you work has a VCU certification. What does this mean for you as an intermediary?

a. Agreeing with the hiring company which specific instructions will be given to the temporary worker.
b. Providing the temporary worker with the necessary training for the use of the machines in the workplace.
c. Regularly checking at the workplace whether the temporary worker is following the instructions.

Answer: a

The following health and safety aspects (H&S aspects) are important for employment when posting a temporary agency worker:

- H&S risks and control measures of the temporary positions;
- procedure to be followed when applying for temporary agency workers and making agreements about H&S aspects (instruction, information, PPE, training and experience);
- requesting required H&S documents and being able to interpret them correctly, for example the results of a risk analysis, H&S rules and regulations, professional competence;
- diligent selection of temporary agency workers;
- information to temporary agency worker(s) about H&S aspects and agreements made with the hirer;
- procedure to be followed in the event of a serious accident involving temporary workers.

Points to consider during the selection are:

- selection procedure of temporary agency worker(s) who meet the requirements set in the application;
- a deviation or exception from the requirements set in the application is submitted to the hirer before the final selection takes place;
- additional precautions or statements are recorded on the selection or application document(s);
- the hirer agrees to the deviating selection. If there is a discrepancy between the application and the selection, the temporary employment agency will note this (date, name, position).

What must be recorded by the hiring company when applying for a temporary agency worker?

a. The conditions for working overtime under safe conditions.
b. Quality requirements that the personal protective equipment (PPE) must meet.
c. Which personal protective equipment (PPE) should be worn.

Answer: c

Temporary agency worker file

The following must be present in the temporary agency worker's file:

- personal data, social data, work permits;
- copy of an identification document (proof of identity);
- copies of relevant vocational training, additional training, training for high-risk tasks;
- work experience;
- copies or proof of required valid certificates/attestations/diplomas;
- evaluations, notes regarding broadcast, incidents, etc. .;
- job-related restrictions;
- language skills;
- certificate of medical fitness (if applicable);
- copy of driver's license (if applicable).

✓ The hirer is responsible for working conditions at the workplace.

✓ The temporary work agency provides general instruction and information to the temporary agency worker.

✓ Agreements between the temporary work agency and the hirer about the provision of PPE and specific instructions.

1.8 Tasks and responsibilities hiring company and temporary work agency (continued)

The intermediary checks the agreements with the hirer and informs the temporary agency worker about:

- reception and introduction to the company;
- the contact person for instructions about workplace and tasks;
- providing and wearing PPE;
- activities, work location and circumstances;
- competence and medical fitness to perform hazardous work;
- specific H&S risks and precautions.

With regard to accidents with absenteeism/lost time the following must be arranged in a procedure:

- procedure for notification and registration;
- communication of the procedure to temporary agency workers;
- correctly and completely fill in the accident form;
- registration of all accidents, stating the duration of absenteeism/absence from work;
- annual preparation of accident statistics (IF).

When evaluating the temporary agency worker with the hirer, attention should be paid to the following aspects:

- professional competence; theoretical knowledge; independence; performing tasks safely;
- motivation; attitude; communication; language proficiency;
- following HSE rules and regulations; adhering to work permits; honoring existing commitments;
- handling tools correctly; providing tools; tidiness;
- correct use of PPE; taking care of PPE; cleaning;
- adhering to working hours; work pace; accuracy; effort;
- asking questions when there are uncertainties; reporting deviations; reporting unsafe situations;
- communication and contact with the temporary work agency.

During an evaluation with the temporary agency worker, attention should be paid to the following aspects:

- introduction and receiving instructions regarding the HSE regulations and rules;
- provision of personal protective equipment and work clothing;
- communication with contact person and/or direct supervisor;
- work situation and working conditions with regard to safety and health;
- work performed, pace, circumstances, supervision/ working hours, breaks;
- facilities such as changing room, canteen, sanitary facilities;
- attention to and supervision of safe working conditions;
- involvement in H&S instructions / meetings (toolbox meetings; start-work instruction).

PRACTISE QUESTION

1. A temporary agency worker is put to work by a temporary work agency at a hiring company. Who is responsible for the application of the Health and Safety legislation (H&S legislation)?
   a. This is established in the temporary employment contract.
   b. The hiring company.
   c. The temporary work agency.

2. What is an important point of attention when assigning an assignment to the temporary agency worker?
   a. Approval of the temporary worker if the selection deviates from the terms of the application.
   b. Information from the hiring company if the selection deviates from the terms of the application.
   c. Approval of the hiring company if the selection deviates from the terms of the application.

Answer: 1b, 2c


TAKEN
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2 Safe working and consultation

2.1 Safe working and behavior

Safe working starts with safe behavior and the avoidance of unsafe behavior. If you identify unsafe behavior, you must report it to protect your colleagues and yourself.

Safe behavior means:

- ensuring safety and health for yourself and other persons;
- being positive about working safely and healthily;
- adhering to the safety regulations;
- following directions and instructions;
- confronting others about unsafe actions;
- reporting unsafe situations and incidents and taking appropriate action;
- attention to personal hygiene, order and cleanliness.

Alcohol and drugs

One form of unsafe behavior is the use of medication, alcohol and drugs. That leads to:

- reduced vigilance;
- impaired or problematic functioning;
- reduced ability to assess situations;
- lowered threshold for unacceptable behavior;
- overestimation of your own capabilities;
- increased work pressure on colleagues and disruption of work organization.

You are therefore not allowed to use alcohol or drugs during work. But you may not do this outside of working hours if the alcohol or drugs can still have an adverse effect on you when you start your work. If you notice that a colleague is under the influence of alcohol or drugs to such an extent that he poses a danger to himself or colleagues or that it can cause damage, report this to your supervisor. This not only protects yourself and other colleagues, but also the user against himself. Anyone with a chronic problem with alcohol or drugs should seek help. Often addicts also deny that they have a problem.

Medicines

Some medicines can have the same effects as drugs. If you do risky work or, for example, operate machines, the use of such medicines can be dangerous. Ask the doctor whether you can perform these activities and whether you can operate machines. The use of these medicines must also be reported to the supervisor.

Order and tidiness

With order and tidiness in the workplace you prevent accidents and pollution.

Order and tidiness includes:

- tidying up the environment, removing and storing residual materials;
- using the tool and material storage system;
- hanging up or concealing cables;
- using safety hooks (S-hooks) to suspend temporary cords of electricity cables, hoses and pipes so that there is no tripping hazard;
- setting up the workplace properly.

PRACTISE QUESTION

John is a construction worker and works in a workshop with metalworking machines. John has received medication from the general practitioner with a warning sticker: "can affect responsiveness"
What should John do? (multiple answers possible)

a. John stays at home, because he is not allowed to work now;
b. John asks the general practitioner for advice on what activities he can and cannot perform;
c. John feels good and carries out all the work that he normally does;
d. John reports to his supervisor that he is using this medication.

Answer: b and d

Order and tidiness ensure a pleasant working environment which has a positive influence on motivation. It prevents loss of tools and materials and thus also pollution and environmental damage. And that in turn has a positive effect on your motivation and that of your colleagues.

Put in the correct order.

Order and tidiness are stimulated by:

a. Tidying up together at the end of the working day;
b. A good layout of the workplace;
c. Sufficient workspace and space to store tools and materials
d. Preventing leaks and contamination during work.

Answer: b, c, d, a

- ✓ Safe behavior motivates and you set a good example.
- ✓ Order and tidiness in the workplace provides a safe and pleasant working environment.
- ✓ Avoid unsafe behavior.

- ✘ No alcohol and drugs in the workplace.
- ✘ Medication use can be dangerous; get well-informed by the general practitioner.
- ✘ Clutter increases the risk of accidents and environmental damage.

2.2 Consultation and information

One of the obligations under the VCA system is to provide information and instruction, such as regularly holding a HSE meeting or a toolbox meeting. The aim is to make safety topics negotiable and to motivate employees to avoid unsafe actions and situations as much as possible. Work consultation is also an important means.

Information

There are different types of information and instruction. General information to new employees consists of:

- general safety and health rules;
- general regulations in case of fire and alarm;
- the reporting procedure for accidents, near accidents and unsafe situations;
- guidelines to be followed in the event of an accident during or on the way to and from work;
- the necessity and use of personal protective equipment
- information about the workplace to be occupied (function requirements, hazards, control measures) based on the information provided by the client.

The supervisor can also provide specific information to new employees about:

- specific workplace-related safety and health rules;
- specific safety and health rules related to the installations, machines, work equipment;
- specific company-related data on hazardous areas, evacuation routes, canteen, sanitary facilities, etc.

Information about the workplace to be occupied with regard to:

- workplace hazards;
- measures taken;
- job requirements.

After the introduction, regular information and instruction remains necessary.

Employees are therefore obliged to participate in these meetings:

- before starting work (when recruiting, including temporary employees);
- in the event of a transfer or change of workplace and/or position;
- when introducing new work equipment or changing work equipment;
- when introducing new work procedures and/or new technology.

Good information or instruction has the following characteristics:

- tailored to the nature, capacity and experience of the employee;
- tailored to the specific activities;
- understandable;
- practical, not just in writing.

PRACTISE QUESTION

What is the purpose of a toolbox meeting?

a. Inform employees about liability in the field of safety on projects.
b. Making topics that employees consider important for discussion.
c. Stimulate safe behavior through instruction.

Answer: c

The following topics should be included in information and instruction:

- safety, health and wellbeing in general;
- workplace hazards;
- measures taken;
- regulations and rules drawn up by the employer.

With regard to temporary agency workers, the hiring company and the temporary work agency have a shared obligation to provide information and education. The temporary work agency must provide the temporary agency worker with general information about the workplace and job requirements. The information about specific and work-related subjects is provided by the hirer at the reception of the temporary agency worker, preferably at the workplace.

This is usually done by the relevant operational manager before the start of the work.

Toolbox meeting

A toolbox meeting is a short and structured meeting with an agenda and a report on safety, health and the environment. Participants in the toolbox meeting are of course the operational employees, but also temporary workers and temporary agency workers. In addition, the management of the department or service is also present.

A toolbox meeting has the following characteristics:

- short meeting;
- about risks at work and safety measures to be taken;
- interactive participation of all attendees.

A toolbox meeting should be held regularly. It is best to discuss one main topic per meeting. The topic should be understandable and useful to attendees.

A toolbox meeting or instruction:

a. Is preferably given in writing and documented in the personnel file.
b. Must be tailored to specific tasks of the employees.
c. Should only be given by experts.

Answer: b

Topics for a toolbox meeting can be:

- using personal protective equipment;
- order, tidiness;
- working methods;
- (emergency) procedures;
- incidents, accidents;
- workplace inspections.

Important points for attention for a good HSE meeting (toolbox meeting):

- make clear agreements and record them in writing in the report of the meeting;
- check whether the message(s) is (are) understood.

✓ A toolbox meeting is a good tool for promoting safe working practices and for involving operational employees.

✓ Every employee is obliged to participate in information and instruction.

✓ Temporary agency workers and hired staff also participate in toolbox meetings.

2 Safe working and consultation

2.3 Workplace inspection and observation rounds

Workplace safety inspections are important to detect unsafe workplace practices and situations. Moreover, we thereby increase the safety awareness of employees. The supervisor must therefore regularly inspect the workplace.

Guidelines that must be used are:

- allow sufficient time (approx. 30 minutes);
- make clear what the intention is;
- it is a regular task of the supervisor (each supervisor at least once a month);
- observe 1 person, never a whole group at the same time;
- prevent disruption of the activities, do not get in the way of employees;
- observe the work, preferably with 2 people (max. 3 people) and pay particular attention to HSE aspects;
- check whether the procedures and regulations are being followed;
- where your presence changes the approach to work, discuss this with employees;
- take notes;
- your presence leads to reactions; if this is counter-productive, discuss this with the person(s) involved at a later moment;
- do not just watch, but listen, interview, give advice and make agreements;
- inform the person concerned about the positive and negative safety aspects of the findings;
- communicate in such a way that the employee is respected;
- make corrections in such a way that it is positive for the employee's motivation;
- pay attention to incidents that have occurred.

During safety inspections, attention is paid to:

- use of PPE;
- attitude and behavior of employees;
- actions and working methods of employees;
- use of tools and equipment;
- order and tidiness;
- applying procedures.

The following items are noted in the safety observation report:

- findings;
- was safe behavior easy, difficult or impossible?
- did observers and the observed agree on (un)safe behavior?

Performing workplace inspections has advantages. It increases safety awareness and provides a good insight into the safety situation in the workplace.

PRACTISE QUESTION

What is a guideline that is used when carrying out a workplace inspection?

a. Inspect as many subjects as possible, in addition to important HSE aspects.
b. Prevent disruption of the activities and ensure that employees are not hindered by the inspection.
c. Only observe and only give advice when all findings have been elaborated in a report.

Answer: b

The workplace inspection focuses on:

- collective protection appliances;
- personal protective equipment;
- arrangement (location) of employees;
- actions of employees;
- resources: machines, tools and equipment;
- order and tidiness;
- application of procedures.

The following items are also included in the report of a workplace inspection:

- findings with possible cause/motive;
- is safe working and behavior easy/difficult/impossible;
- did observers and the observed agree on safe work and behavior;
- which actions are taken to improve/prevent; which persons/services are responsible for this action and the follow-up thereof.

What should be described in a safety observation report?

a. The time required for the actions to be taken.
b. The progress of the work.
c. The findings of the inspection or observation.

Answer: c

SAFETY OBSERVATION REPORT

Date : .....
Department : .....
Location : .....
Involved : .....

Findings	Action	Who	Timing
Scaffold builder not attached to scaffolding with safety harness	*Directly addressed*	-	-
Lots of clutter around workplace T 5000	*Tidy up*	*Supervisor*	*ASAP*

- ✓ Observation rounds and workplace inspections should be performed regularly.
- ✓ Register findings and action points.
- ✓ Involve employees: listen, interview, give advice, create agreements.

- ✓ Manager has an exemplary function: other will follow a good example.
- ✓ Good organisation of work and environment influences behaviour.

2 Safe working and consultation

2.4 Promoting the safe behavior of temporary agency workers

The temporary agency worker performs the work under the supervision of the hirer. The hiring company is therefore primarily designated to promote safety in the workplace and the safe behavior of the temporary agency worker. But the temporary work agency also has responsibilities in this as a formal employer.

Safe working and mentality of the temporary agency worker

The intermediary has the important tasks of promoting safe work and improving the mentality of the temporary agency worker.

Regarding working safely:

- make correct selections in function of:
  - the request of the hirer;
  - task content;
  - capacities and experiences of the temporary agency worker.
- verification of the temporary agency worker's basic knowledge of health and safety (e.g. Basic Safety VCA);
- evaluation of the temporary worker after the assignment;
- information about the necessity, benefits and importance of working safely.

Regarding mindset:

- endeavor to gain as much insight as possible into capabilities of the temporary agency worker;
- do not give a temporary agency worker assignments above/below his or her capacities;
- take into account the opinions, proposals, wishes and advice of the temporary agency worker themselves;
- inquire about any negative work experiences;
- let the temporary agency worker know how you and the hirer feel about him, including safety performance.
- assess the temporary agency worker as objectively as possible;
- take corrective action to ensure that the temporary agency worker is not impaired in his/her value as a professional and as a person;
- provide a healthy dose of self-criticism;
- avoid emotional situations as much as possible;
- do not be "bossy" as an intermediary;
- try to listen carefully to what the other has to say to you.

Obligation to pass on information

In the context of the Allocation of Work by Intermediaries Act (WAADI), the temporary work agency has various obligations towards both the temporary agency worker and the hirer. The temporary work agency is the formal employer of the temporary agency worker and actually employs the employee. As such, the temporary work agency is therefore legally liable with regard to health and safety in connection with the so-called "forwarding obligation".

PRACTISE QUESTION

1. What is the task of the intermediary when a temporary agency worker is posted for a high-risk task?
   a. Agree with the hiring company which specific instructions will be given to the temporary agency worker.
   b. Provide the temporary worker with the necessary training for the use of the machines in the workplace.
   c. Regularly check at the workplace whether the temporary agency worker is following the instructions.

2. Which toolbox meetings must a temporary worker participate in?
   a. He is not obliged to participate in toolbox meetings.
   b. The toolbox meetings that the hiring company organizes and in which the temporary agency worker is involved as an operational employee.
   c. The toolbox meetings that the temporary work agency organizes.

Answer: 1a, 2b

The obligation to pass on information means:

- the hirer and temporary work agency have a shared duty with regard to providing information to the temporary agency worker;
- the temporary work agency must provide the temporary agency worker with information about the workplace and the requirements associated with the position and the work;
- this information is provided by the hirer.

The temporary work agency must check whether the temporary agency worker is treated properly by the hirer (so-called good employment practices). Regular feedback or involvement with both hirer and temporary agency worker is important in this respect. A visit to the temporary agency worker's workplace can give the intermediary a good idea of the current situation.
The intermediary can also be involved in workplace inspections and HSE consultations.

Temporary agency workers, just like their own employees, should be involved in work meetings, instructions and toolbox meetings. The intermediary will inform the temporary agency worker about this.

In order to get a good indication of the work and the requested/suitable temporary agency worker, the temporary work agency asks the hirer for:

- a description of the hazards and risk mitigation measures;
- description of professional qualifications necessary for the job;
- any additional measures.

The above information is often recorded in a so-called Working Conditions document or H&S document.
It contains relevant matters about working conditions, such as:

- HSE professional qualifications;
- HSE risks and mitigation measures;

What is the role of the temporary employment agency with regard to health and safety at work?

a. Organize the specific safety instruction.
b. Provide the possible personal protective equipment (PPE).
c. Providing the temporary worker with general information about content, risks and preventive measures.

Answer: c

- instruction on use of personal protection;
- management and supervision;
- machine and workplace instruction;
- act in case of calamities.

The temporary work agency has no substantive involvement with specific instructions from the hirer, but must ask for this information and check whether the temporary agency worker has received instructions.
The employment agency is responsible for general information to the temporary agency worker. This information can be about the company where the temporary agency worker is going to work, the activities to be performed, general safety measures such as personal protective equipment and general rules of conduct.
It also checks whether the temporary agency worker meets the professional qualifications and requirements of the hirer (see also "temporary agency worker file").
Certificates, safety instructions, etc. obtained by the temporary agency worker at a hirer must be registered and documented by the temporary work agency.

✓ The hirer and the temporary work agency have a shared responsibility with regard to providing information to the temporary agency worker.

✓ Temporary agency workers should be involved in consultations and toolbox meetings, just like our own employees.

✓ Regularly consult with the hirer about the performance of the temporary agency worker.

✓ Involvement of the intermediary: also visit the workplace of the temporary agency worker. It provides a picture of the work environment, atmosphere and commitment of the temporary agency worker.

3 Prevention

3.1 Dangers and Risks

Everyone is at risk every day. In traffic (if you hit the gas a bit much), at home (if you're changing a lightbulb) and on the football field (if you slip). It is good to be aware you are at risk. This certainly applies to your work: if you know what the dangers of your work are, you can remove them or at least make them reasonable. Therefore, each company has the risk inventory and evaluation (RI&E).

Dangers

There are several dangers at work. Consider, for example: working at heights, falling, fire, explosions, toxic substances, noise, radiation, becoming trapped between moving parts, cutting on sharp parts, being hit by moving parts, falling objects, loads, vehicles and traffic in or near the workplace. You do not always have to deal with them and you do not run the same amount of danger or risk everywhere.

Sources of danger are:

- the type of work you do;
- the available knowledge of and experience with the work and the risks (competences);
- the workplace or the environment of the workplace;
- the tools, vehicles, products, materials that are used;
- well-being;
- the attitude and behavior of you and your colleagues with regard to working safely.

What is a risk?

The definition of a risk is: the chance that something will happen that has a harmful or undesired effect.

As a formula: risk = probability x effect.

Work involving risk-increasing conditions, is:

- working with dangerous machines or tools;
- working with hazardous substances;
- work with high pressures;
- work with electricity;
- work with radiation sources;
- excavation work;
- work in cold or heat;
- work in an environment with a lot of noise;
- work at heights.

Unsafe actions and unsafe situations

In order to limit the risks as much as possible, you must prevent unsafe actions and unsafe situations.

Examples of unsafe actions are:

- work without a work permit or allow this in a situation where a work permit is required;
- not using prescribed personal protective equipment;
- disabling security devices;
- use tools incorrectly;
- use a broken tool;
- incorrectly moving a load.

PRACTISE QUESTION

Indicate: unsafe action or unsafe situation?

1. Not wearing a helmet on the construction site is an unsafe action/situation.
2. A slippery work floor is an unsafe action/situation.
3. Scaffolding without a railing is an unsafe operation/situation.
4. Working with unapproved tools is an unsafe action/situation.
5. Disabling safety devices is an unsafe act/situation.
6. Many activities in a small workplace, under, above and next to each other is an unsafe act / situation.

Answer: 1 = action 2 = situation 3 = situation 4 = action 5 = action 6 = situation

An unsafe action can lead to an accident.
Stop the unsafe act and notify the supervisor.

Even in an unsafe situation, the conditions for safe working are not met. This could lead to an accident or damage.
An unsafe situation can arise, for example, due to a loose pavement tile or manhole cover, which you can trip over.
Other examples of unsafe situations are:

- no or insufficient lighting;
- no or blocked escape routes;
- untidy work floors;
- no or insufficiently secured equipment;
- many activities being performed at the same time on a limited work floor, working below, above and next to each other.

Set the right priority if you want to tackle an unsafe situation. First, try to remove the cause of the unsafe situation. You can remove loose cables or debris on the floor. If that is not possible, take safety precautions.

Summarizing:

- you see an unsafe situation;
- you do an unsafe action.

Unsafe actions and situations are causes of accidents. About 80% of accidents are caused by an unsafe action and 20% by unsafe situations.

A new sawing machine is installed in the workplace. This type of machine makes a lot of noise. Put the measures in the right order, with the best measure first:

a. wearing hearing protection.
b. closing off the machine with noise isolating screens.
c. buying a machine with the lowest possible noise level.
d. setting up the workplace so that the noise level in the rest of the workplace isn't too high.

Answer: c, b, d, a

- ✓ Ensuring fewer accidents by preventing unsafe actions and/or situations.
- ✓ Eliminate or flag unsafe situations.
- ✓ Stop unsafe actions.
- ✓ Information and instruction.
- ✓ Tackle risks at the source!

- ✗ Do not override or disable any protections.
- ✗ Never ignore an unsafe situation.
- ✗ Do not perform risky activities if you do not have the right knowledge, experience or competence.
- ✗ Never work unsafely.

3 Prevention

3.2 Preventing accidents

An accident is always unexpected and causes material and/or physical and mental damage to people. Accidents occur because people act unsafely or cause unsafe situations. It is not easy to determine why people work unsafely. It has to do with character, expertise, behavior and mental well-being. The Working Conditions Act is aimed at preventing (near) accidents as much as possible.

Good housekeeping: prevent accidents through a tidy and therefore safe workplace!
For you as an employee, prevention means: a tidy, organized workplace. With a tidy, thus safe workplace, you prevent accidents, pollution and environmental damage. This is called good housekeeping and it means that you clean up or store your residual materials and that you store materials and tools safely. For example, hang cables from safety hooks or store them safely. And make sure, for example, that the workplace meets the hygiene requirements.
A tidy workplace is not only safe, but also contributes to working more efficiently. A tidy workplace is usually a pleasant working environment, which has a positive effect on all employees. Also, tools and other material will not get lost if you keep the workplace tidy.

If unsafe situations do occur, tackle them immediately (remove the cause). If that is not possible, shield the situation and make sure that you and colleagues are safe. Warn supervisors and ask them (and possibly others) to make the situation safe again. Speak to the person responsible for the unsafe situation or action immediately or report it to the manager.

Risk inventory and evaluation (RI&E)
Every employer is obliged to make an RI&E. This describes the risks of the work and the way in which the unacceptable risks are addressed. The action plan describes which measures and improvements must be implemented. A schedule is indicated. In the (occupational health and safety) annual report, the employer shows which objectives have been achieved and what the plans in the field of safety policy are for the coming year.

Preventive policy/HSE policy
If we take measures in advance - so preventively - we can prevent (many) accidents. When making preventive measures, attention is paid to four important topics:

- people: does every employee have the right training, instruction and experience?
- the organization: is the right employee in the right place?
- the technology: are the machines and tools safe?
- the environment: are the workplaces well equipped and adapted to the employee? Have sufficient safety measures been taken at the workplace?

PRACTISE QUESTION

In addition to accidents, near-accidents are also registered. Why do we do this?

a. Because all accidents and incidents must be reported to the NLA.
b. Because we can learn from it and take improvement measures.
c. To inform colleagues.

Answer: b

Preventive safety policy is drawn up with information from:

- The accident register: you need to know the risks and causes of accidents in order to take preventive measures. Then unsafe situations and actions can be prevented in the future. Reporting and registering all unsafe situations, near accidents and accidents with (minor) injuries is therefore very important for companies. The Working Conditions Act obliges an employer to report serious and fatal accidents to the NLA and to register.
- The risk inventory and evaluation and the Action Plan that results from this. In the H&S annual plan, the employer shows whether all objectives of the safety policy have been achieved.

Occupational hygiene strategy

Preventive measures are taken to prevent dangers and risks at work. By tackling the source of the danger first, the risk can be greatly reduced. When this is not possible, measures can be taken to limit the risks as much as possible. If these measures are also not sufficient, personal protective equipment can be used.
We call this approach the occupational hygiene strategy.

Which of the following accidents must be reported to the NLA?

a. You cut yourself on a box and have a cut in your finger.
b. An employee has fallen in the workshop. He has a broken ankle and needs surgery.
c. An employee has fallen from the scaffolding and has to be hospitalized.
d. An employee has a burn from welding spatter and has been treated by a doctor.

Answer: b, c

Prevention is:

✓ Ensuring fewer accidents by preventing unsafe actions and/or situations.

✓ Clarifying tasks, responsibilities and authorities.

There is a higher chance of accidents due to:

✗ Tough and unsafe behavior.
✗ An untidy workplace.
✗ Monotonous and short cyclical work.
✗ Too little work experience.
✗ The lack of instruction.
✗ Fire and explosion hazards.
✗ Too little light.
✗ Noise disturbance.

3 Prevention

3.2 Prevention of accidents (continued)

Accident pyramid
Many unsafe situations and actions can eventually lead to an accident with very serious injuries or fatalities. This is depicted in the accident pyramid (see image below).

Statistical research shows that every 30,000 unsafe actions and situations lead to more than 3,000 (10%) accidents with (minor to serious) injuries and even one accident with fatal injuries. Every year a lot of unsafe actions are performed and unsafe situations are not tackled, so that almost every year in the Netherlands 100,000 people had a work accident with absenteeism (of at least 1 day).

Understandably, no one on the job thinks, "Today I am going to perform an action with a high risk of fatal injury." Nevertheless, the above figures show that many employees perform (small) unsafe actions. The easiest way to reduce the number of serious/fatal occupational accidents is to tackle unsafe actions and situations.

Causes and consequences series of an accident
An accident is the result of various causes. The origin of these causes can lie at different levels within the company (for example, at the level of management, the supervisors and the executives).

The series of causes and consequences consists of 5 steps that are arranged like dominoes (see image on the next page). If one falls, the rest will follow. The domino theory clarifies the pattern behind the occurrence of accidents. The series of causes and consequences indicates that the policy to be pursued must therefore be aimed at different levels.

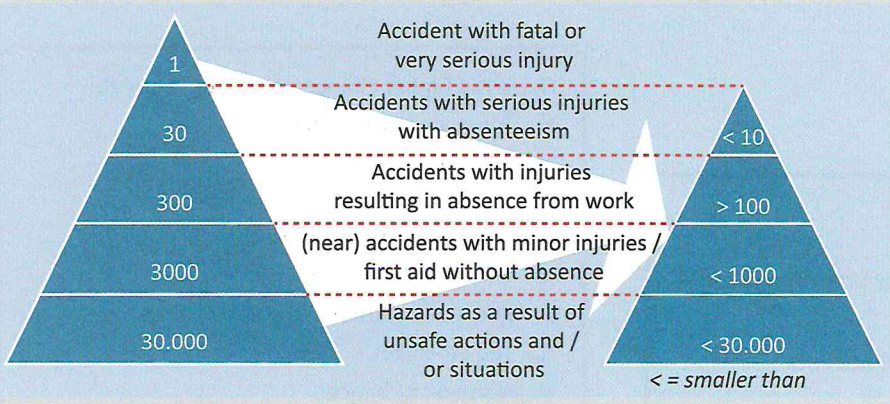
There are in total 5 dominoes:
1. Background
2. Human failure
3. Direct causes
   (unsafe behavior and unsafe situation)
4. The accident itself
5. Injury and/or damage

The first three relate to the causes and the last two to the consequence of an accident.

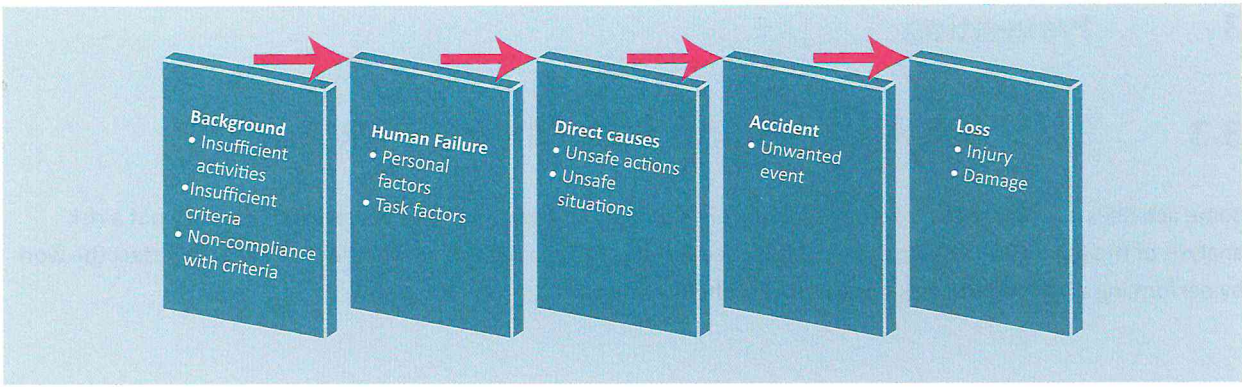
1. Background
The background consists of circumstances within an organization, such as safety policy and safety culture, along with as good resources, procedures and (reasonable) workload.

2. Human failure
The background leads to human failure. The basic causes of human failure consist of person-related factors and task-related factors.

Personal factors are:
- insufficient knowledge;
- insufficient experience;
- insufficient motivation;
- insufficient attention.



The accident pyramid makes clear that preventing and combating all unsafe situations and all unsafe actions leads to fewer accidents. By this we mean that every unsafe situation you tackle reduces the chance of an accident.



Causes and effects series

Task-related factors are:

- inadequate and/or improper management and supervision;
- incorrect working method;
- not being given enough time for the work;
- the lack of necessary equipment or tools;
- failure to properly maintain tools or equipment.

3. Direct causes

Human failure leads to unsafe actions and/or unsafe situations.

4. Accident

An accident (undesirable event) always occurs due to unsafe behavior, an unsafe situation or a combination of both.

5. Injury and/or damage

The result of an accident can be damage and/or injury.

Supervisor actions to prevent accidents

In line with the cause and effect series, management can prevent accidents by:

- Addressing all unsafe actions and all unsafe situations;
- Conducting periodic inspections;
- Conducting periodic consultation with employees (e.g. via toolbox meeting);
- Monitoring compliance with work procedures;
- Providing instructions about (health) risks of the work;
- Introducing and evaluating points for improvement due to unsafe actions and situations.

Actions for management to prevent accidents:

- Adopting a (multi-year) plan to improve working conditions;
- Delegating tasks and powers to departments and employees in the company;
- Ensuring proper organization of the working conditions policy;
- Ensuring a good consultation structure about working conditions and responsibilities;
- Elaboration of the health and safety policy in procedures and regulations;
- Providing adequate training and instruction.

✓ Prevent accidents by interrupting a series of causes and consequences.

✓ Prevent accidents by avoiding unsafe actions or situations.

✗ Lack of control due to the lack of guidelines for prevention and handling of adverse events (repression).

3.3 Task Risk Analysis and Last-Minute Risk Analysis

Some activities are very specific. Due to special work situations or hazards, it may be necessary to carry out a risk analysis of this job. A Task Risk Analysis (TRA) is used for this. You can determine whether you can safely start the work by performing a Last-Minute Risk Analysis (LMRA) before you start.

A Task Risk Analysis (TRA) is a written analysis of the dangers of risky work of the risks and safety aspects in the workplace. The purpose of a TRA is to agree on and apply the correct control measures. The risks for the work are analyzed and discussed per task (evaluation).

TASK-RISK-ANALYSIS		
Planner	Work place: Page ..... of ..... date	Agreed with : ..... Contractor : ..... Client : ..... Safety expert : ..... Copy : .....
TASK STEP OR ACTIVITY	RISK/HAZARD EXPOSURE	MANAGEMENT MEASURES

PRACTISE QUESTION

1. What is a job risk analysis?
   a. An inventory of hazards when performing risky work.
   b. A checklist of risk limitation measures that you go through prior to risky work.
   c. A risk analysis that companies make for all activities.

2. When should you perform an LMRA?
   a. Always, prior to work.
   b. Only when you work with colleagues on the same job.
   c. Only when a job risk analysis has been made.

Answer 1: a Answer 2: a

You do a Last-Minute Risk Analysis (LMRA) before you actually start working. It is a thought process to increase the level of security. By checking the risks and safety aspects in the workplace you, as an operational employee, can determine yourself whether you can start your work safely. You must do an LMRA before starting work (even after a break) or for new tasks, when working conditions change, but also for routine work. In short: "Think first, then act".

For an LMRA there must be a procedure or instruction in the company. You do the implementation of the LMRA yourself and does not always need to be registered.

An example of a Last-Minute Risk Analysis:

Before starting work:	OK
do I understand what to do and how to perform the work?	
have I read, discussed and understood the work permit and the TRA?	
do I have the right PPE?	
do I have the right tools?	
am I not at risk from activities in my area? (falling objects, contact with product, etc.)?	
am I sure that my actions do not endanger myself, other persons or the installation?	
do I know what to do if things go wrong (escape route, wind direction, collection plan,	
emergency number, emergency showers, etc.)?	

If a question is not answered with "ok", or something is wrong, you must first take measures or consult the supervisor.

Put in the correct order:Before you start the job you must first:

a. Know what to do.
b. Know if you have all the materials and the right tools.
c. Check whether the escape routes are accessible and clear.
d. Check whether the workplace is safe.

Answer: a, b, d, c

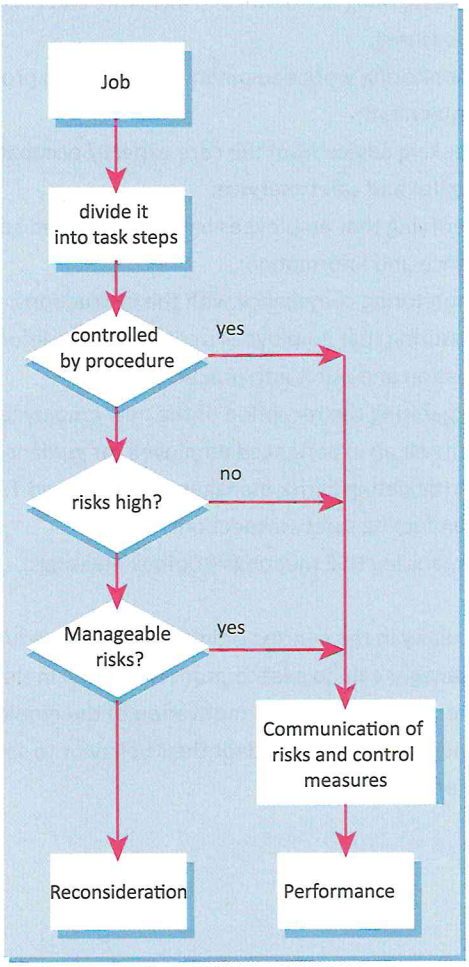


figure: TRA roadmap

✓ Always do a last-minute risk analysis before starting.

✓ Also check afterwards whether you leave the workplace safely.

✘ You cannot perform high-risk activities without a TRA.

✘ LMRA: if things are not in order, you cannot start working yet.

3.4 Prevention and the role of the supervisor

The supervisor can have a lot of influence on the behavior of the employees. What is important for a supervisor to be able to provide good leadership and what are the requirements when it comes to SHE policy?
This section deals with the most important points for attention.

The operational supervisor has a number of important HSE tasks:

- formulating proposals and advice to the employer;
- Investigating accidents and incidents and propose measures;
- monitoring work equipment and personal protective equipment;
- seeking advice from the core expert / occupational health and safety service;
- verifying that employees have the required competence and information;
- monitoring compliance with the instructions;
- ensuring that employees understand the information and put it into practice;
- organizing the reception of the new employees and entrust an experienced employee for guidance;
- participating in risk management (RI&E and TRA);
- conducting safety inspections;
- organizing HSE meetings (toolbox meetings).

Particularly in the context of information and education, the manager can do a lot to promote safety. In this way he contributes to the motivation of the employees and their willingness to adapt their behavior to safety requirements.

Employee motivation can be improved in various ways:

- try to gain as much insight as possible into the personality and capacities of the employees;
- do not give employees assignments that are below or above their capabilities;
- take into account the opinions, proposals, wishes and advice of the employees;
- let employees know how you feel about them, as well as their safety, health and environmental performance;
- assess the employees as objectively as possible;
- when taking corrective action, ensure that the employee's value as a professional and as a person is not affected;
- provide a healthy dose of self-criticism;
- listen carefully to what someone else has to say to you;
- do not only tell employees how to do something, but also why;
- set a good example.

In order to be able to perform these tasks properly and responsibly, the supervisor must have sufficient authorities and possibilities. This will have to be recorded in a task or job description.

PRACTISE QUESTION

As a supervisor you can have a lot of influence on the behavior of employees. What are causes of unsafe behavior?

a. The lack of good leadership and the lack of exemplary function.
b. Clear objectives in the field of HSE and required skills.
c. Clarity about the priority of safe working and HSE in the workplace.

Answer: a

During a safety observation round you see an unsafe situation. What should you do first?

a. Stay with the unsafe situation and give warning.
b. Try to eliminate the cause.
c. Prepare a report and contact the NLA

Answer: b

- ✓ The supervisor has an exemplary role.
- ✓ The supervisor supervises compliance with regulations and instructions.
- ✓ Good leadership is possible through job description with responsibilities and authorities.
- ✓ Promote safety through information and instruction: the motivation to listen and cooperate with regard to safety.

3 Prevention

3.5 RI&E, H&S annual plan and action plan

Under the Working Conditions Act, every company with personnel is obliged to make a risk inventory and evaluation (RI&E). The employer must investigate what possible dangers are at work and whether this can cause damage to the health of the employees.

RI&E

Companies are legally obliged to draw up an RI&E and have it tested by an (internal) certified health and safety expert. This includes: testing for completeness and topicality. An RI&E assessment is not mandatory for organizations with up to 25 employees. These organizations must then use an approved industry-specific RI&E included in the CLA. The supervisor has an active role when it comes to drawing up the RI&E and the implementation of action points from the action plan. This also includes providing information to employees and, for example, feedback from and to management.

The RI&E is one of the most important parts of a company's risk management system. A risk management system consists of the following components:

- planning the policy (methods, division of tasks);
- elaboration of the policy (objectives and resources) based on the RI&E;
- the RI&E is the implementation of the policy. Policy is adjusted through the evaluation.

H&S annual plan

The H&S annual plan is a written implementation plan for improving working conditions and the problems identified. The manager is also involved in the implementation of the H&S annual plan. The plan is clearly described:

- objectives to be achieved;
- concrete prevention measures;
- resources to be deployed (organizational, financial, material);
- division of labor;
- responsible for implementation;
- period within which the measures must be implemented.

PRACTISE QUESTION

What exactly does a risk inventory entail?

a. It is an overview of risky tasks in a company.
b. It is an evaluation of risks associated with specific activities.
c. It is an identification of hazards and an inventory of the associated risks.

Answer: c

Plan of action

An action plan is a written report of the results of the RI&E or a task risk analysis. It describes which measures must be taken on the work floor. An action plan is adapted or redrafted if necessary. This could be as a result of an accident or as a result of a specific RI&E.

The purpose of an action plan is to ensure that the results of the research lead to the implementation of effective measures. This can prevent recurrence of incidents in the future.

As in the H&S plan, the action plan also describes which measures must be taken, which resources and people are required and, if necessary, the costs.
The term within which these measures must be implemented and who is responsible for the implementation is also established.
In addition, it is also recorded who is monitoring progress and an evaluation of the measures is carried out.

Where are the measures to improve working conditions described?

a. in the Task Risk Analysis (TRA)
b. in the H&S annual plan
c. in the risk inventory

Answer: b

- ✓ RI&E = mandatory for all companies.
- ✓ RI&E = systematic approach that is regularly updated based on the current situation and the state of technique (and science).
- ✓ RI&E = concrete basis for a good working conditions policy.
- ✓ Testing by a certified health and safety expert for completeness and current affairs.

Summary

Chapter 1

Safe and healthy working is important. That is why the government has made laws about working conditions. The Working Conditions Act, or Arbo Act for short, states what employers and employees must adhere to with regard to working conditions in a company. Companies receive assistance in drafting, implementing and monitoring the health and safety policy. A prevention officer or a core expert supports the company from within the organization itself. Externally, the health and safety service or a company doctor offers help with health and safety issues. In addition to the Working Conditions Act, we also have to deal with the Working Hours Act, environmental legislation and European directives.

Every law has rights and obligations. The Working Conditions Act specifies rights and obligations for both the employer and the employee in the field of health and safety at work and the conditions in which work is performed. There are various activities that are risky. Consider, for example, working in tanks or deep excavations, dangerous work at height or work that is difficult to perform due to the circumstances. In case of risky or non-routine work, thorough preparation is required. Many companies use work permits for this.

In practically every company you have to deal with procedures and instructions. It contains both general and specific safety rules. These rules are included in the Safety Manual and are therefore part of the safety policy. General safety rules are intended for the entire organization: own personnel, temporary agency workers, other persons on site and personnel of contractors and subcontractors.

Specific safety rules apply to tasks, functions and activities with an increased risk. The rules concern supervision, training and inspection. Procedures provide a clear and point-by-point description of the tasks and working method within a company.

Working safely is an important starting point for every company. By working safely, there is less risk of accidents, lower absenteeism and work is done more efficiently. There are various systems to monitor work safely. One of these systems is the Safety, Health and Environment Checklist for Contractors (VCA). VCA is not a legal obligation.

Chapter 2

Safe working starts with safe behavior and the avoidance of unsafe behavior. If you identify unsafe behavior, you must report it to protect your colleagues and yourself. The use of alcohol and drugs at work is not allowed. Sometimes medicines can have the same effects as drugs. You should therefore be well informed by the general practitioner if you have to use medication.

Good housekeeping, or order and tidiness in the workplace, prevents accidents.

Ensuring a tidy workplace together is therefore important. It creates a better atmosphere at work and you prevent damage to tools and materials, for example.

One of the obligations arising from the VCA system is to provide information and instruction, such as regularly holding a HSE meeting or a Toolbox meeting. The aim is to make safety topics discussable and to motivate employees to prevent unsafe actions and situations as much as possible. Work consultation is also an important means.

Workplace safety inspections are important to detect unsafe workplace practices and situations. Moreover, we thereby increase the safety awareness of employees. The supervisor must therefore regularly inspect the workplace.

Performing workplace inspections increases safety awareness and provides a good insight into the safety situation in the workplace.

Everyone is at risk every day. It is good to deal consciously with the risks you run. This certainly applies to your work: if you know what the dangers of your work are, you can remove them or at least limit them. We call this making risks acceptable. To do this, every company has the Risk Inventory and Evaluation (RI&E). In addition to the risks, the accompanying measures are also discussed with which the risks are removed or reduced.

An accident is always unexpected and causes material and/or physical and mental damage to people. Accidents occur because people act unsafely or cause unsafe situations. It is not easy to determine why people work unsafely. It has to do with character, professional knowledge, behavior and mental well-being. The Working Conditions Act is aimed at preventing (near) accidents as much as possible.

Accidents can be prevented by interrupting the cause-and-effect series. This requires attention for:

Personal factors:
- knowledge level;
- experience;
- motivation;
- insufficient attention.

And task factors:
- unsuitable tools or working method
- insufficient attention;
- inadequate and/or improper management and supervision;
- insufficient time.

A Task Risk Analysis (TRA) is an analysis of the dangers of high-risk work for the safety and health of employees. The purpose of a TRA is to agree on and apply the correct control measures. The risks of the work to be performed are analyzed and discussed (evaluation).

You do a Last-Minute Risk Analysis (LMRA) before you start a task.

The supervisor can have a lot of influence on the behavior of the employees. It is important for a supervisor to be able to provide good leadership and to know what requirements are set when it comes to HSE policy.

Particularly in the context of information and education, the supervisor can do a lot for promoting safety. In this way he contributes to the motivation of the employees and their willingness to adapt their behavior to safety requirements. To be able to perform these tasks properly and responsibly, the supervisor must have sufficient powers and capabilities. This will have to be recorded in a task or job description.

The supervisor has an active role when it comes to drawing up the RI&E and the implementation of action points from the action plan. Also information provision to employees and, for example, feedback from and to management is part of this.

The RI&E and the accompanying H&S annual plan are one of the most important parts of a company's risk management system.

Questions

1. Where does the H&S legislation apply?
   a. In all public buildings
   b. In all buildings
   c. Wherever work is done

2. What is an important task of experts or services in the field of prevention?
   a. Conducting occupational medical examination
   b. Monitoring and advising about safety and health in the workplace
   c. Taking over responsibility in the field of Health and Safety (H&S)

3. One of the objectives of environmental legislation is: to limit emissions and waste flows.
   Put the measures in the correct order (with numbers 1,2,3,4) of most effective to least effective:

   .... Good housekeeping.
   .... Placing filters.
   .... Adjusting production processes so that less (hazardous) substances are used.
   .... Separating waste.

4. What duty does the holder of a work permit have?
   a. To ensure that the activities are carried out in accordance with the conditions on the permit
   b. To withhold wages if work instructions are not followed
   c. To give explanations to the provider

5. Welding work must be carried out in a tank. A work permit must be drawn up for this. The work permit passes through several people before it can be ratified. Who must sign the work permit in any case? Multiple answers can be correct.
   a. Executive (operational) employee
   b. Holder
   c. Provider
   d. Prevention officer

6. Where can you discuss your questions about safety? Multiple answers can be correct.
   a. During consultations between employer and employee representation
   b. During a visit by the NLA
   c. At a meeting of the staff association
   d. During work meetings with your colleagues

7. What promotes safe working?
   a. By a positive attitude towards safety
   b. By stimulating tough behavior
   c. By using more PPE than necessary

8. When is a Task Risk Analysis necessary?
   a. Only after a major calamity
   b. Before the start of new projects
   c. For setting up the H&S policy

9. Arrange the steps for performing an LMRA in chronological order. (what do you do first, then ... etc.)
   .... Assess the risks.
   .... Look around you, are there any dangers?
   .... Manage the risks, take measures.
   .... Think carefully about the risks.

10. Falling and tripping are two of the main causes of absenteeism in construction. How can you minimize these dangers? Multiple answers can be correct.
   O Good housekeeping
   O Layout of your workplace (e.g. certified scaffolding)
   O Sealing holes in floors and walls
   O Reporting an accident to your supervisor quickly
   O Working on flat, non-slippery floors
   O Using good and appropriate safety shoes

Additional questions for VOL-VCA & VIL-VCU

11. You work as a supervisor at a large construction contractor. You organize a toolbox meeting in which the Working Conditions Act and the effects on your company are discussed. Which subjects will you use to demonstrate that the company has its health and safety affairs in order?
    - O Name and duties of the prevention officer
    - O What is a PMO and how is it arranged?
    - O What matters have been arranged for VCA?
    - O How do we discuss safety in the company?
    - O What is an RI&E and what tasks does each employee have?

12. You work as a supervisor at a contracting company that is VCA** certified. Fitters must be hired through a VCU certified employment agency. Which diploma must the intermediary of the employment agency have?
    a. VIL-VCU
    b. B-VCA
    c. VOL-VCA

13. You carry out a H&S workplace inspection on a closed construction site. Which points for attention are part of a monthly inspection?
    a. Pictograms at the entrance to the construction site
    b. Wearing PPE
    c. Inspection preferably with two people
    d. Following regulations
    e. Providing reasons for good safety aspects
    f. Parked vehicles outside the construction site
    g. Shutting down work on the construction site
    h. Bringing employees together
    i. Checking all employees simultaneously
    j. Only responding to less correct safety aspects.

14. What formula can you use to determine the risk factor? Connect the right block from the left column with the one in the right column:

Risk =				
	Incident			Effect
	Chance	X		Cause
	Danger			Time

15. The company where you work specializes in cleaning ship spaces. When should you draw up or adjust a TRA? Multiple answers can be correct.
    - O When this is stated in the licensing system
    - O When you are going to change the work sequence or working method
    - O A TRA is not necessary for working in a ship
    - O At the request of your employees
    - O Only if you work alone
    - O Only if you work together with other contractors
    - O When the weather is very wintry: snow and ice

Koninklijke PBNA

Theme B

Executing work

4 The workplace

4.1 Risks of the work environment

There are several causes of workplace accidents. According to the Working Conditions Act, the employer and employee must jointly ensure a safe working environment. This is not only important for you and your colleagues, but also for the safety of third parties.

Falling, slipping, tripping and missteps

Falls, slips and trips are common. A slippery or uneven floor is usually the cause of tripping, slipping and missteps. If you run or wear the wrong shoes, you naturally run extra risk.

But even if you just walk, a height difference of one centimeter can be enough to sprain your ankle. Think of cables or a loose tile. On the other hand, some steps up and down are too big. Also think of pipes, rails or a sloping surface.

In addition to good housekeeping and solving unsafe situations, you have to be careful while walking. Don't wear things that obstruct your field of vision, such as a large box that you can't see over. Make use of the indicated walking routes and paths.

Lightning

There should be adequate lighting in the workplace so that you can see the details needed to do your job. Less light will be needed in the carpentry workshop than, for example, for very fine soldering work. Walkways and escape routes must also be sufficiently lit.

Dangers of noise pollution

A lot of noise in the workplace can lead to loss of concentration, loss of intelligibility and temporary or permanent hearing loss.

Noise pollution is risky in a number of ways.

The result can be:

- a disruption of communications required during the work;
- not hearing warnings or calls for help;
- health complaints, such as reduced concentration, fatigue, headache, accelerated breathing and, for example, nervousness;
- stomach and intestinal complaints or high blood pressure.

If you are exposed to a lot of noise for a long time, you can suffer permanent hearing loss. You can recognize permanent hearing loss by the following symptoms:

- difficulty hearing high tones or soft sounds;
- difficulty making a phone call or following a conversation in a noisy environment;
- hearing whistles, beeps, or hums not coming from the environment.

How much noise there is in a room can be measured. The unit in which the sound pressure level is measured is called Decibel, or dB (A) for short. The (A) indicates that the measurement has been corrected. The human ear is not equally sensitive to all frequencies.

A sound pressure level of 80 dB (A) and higher is harmful to your hearing.

PRACTISE QUESTION

1. Why is appropriate safety footwear important in the workplace?
   a. You do not have to take slippery floors into account.
   b. You reduce the risk of tripping and slipping.
   c. Loose material is then no longer a hazard.

2. What complaints can you get when there is too much noise in your workplace?
   a. Increased blood pressure.
   b. Chronic muscle cramps.
   c. Increased body weight.

Answer: 1b, 2a

Even without measuring, you can estimate yourself whether the noise level is harmful. The rule is: if you are standing 1 meter in front of someone and you have to raise your voice to be understood.

At the workplace it is indicated where wearing hearing protection is mandatory. You will then see this pictogram:

What increases the risk of falling, tripping and slipping?

a. Noise levels above 80 dB (A)
b. Slippery floors
c. Steps on and off
d. Bright lighting

Answer: b and c

- ✓ Provide a tidy work environment
- ✓ Provide good lighting in the workplace
- ✓ Use hearing protection: mandatory from 85 dB (A)

- ✗ Falling, tripping and missteps are the most common causes of accidents
- ✗ Too much noise (80 dB (A) or higher) is harmful to your hearing

4 The workplace

4.1 Risks of the work environment (continued)

For the Occupational Health and Safety legislation, the design of the workplace mainly concerns the health and well-being of the employee. Because by setting ergonomic preconditions for machines, tools and utensils you protect people's health. The environmental factors also play a role in this. The supervisor is involved in various ways in ergonomics in the workplace. Not only for his own workplace, the workplace of the employees, but also when performing the RI&E and, for example, in the work preparation.

The environmental factors are:
- climate;
- light (lighting, daylight);
- sound;
- vibrations.

We also include the following items among these factors:
- dimensions of workspaces;
- ventilation;
- furnishing aspects;
- furniture.

Climatic conditions

There are various factors that determine the working comfort in a room or environment. This includes:
- climatic conditions (location, indoor, outdoor);
- physical activity;
- clothing.

At the workplace, the climate is also determined by:
- temperature;
- radiant heat (e.g. by equipment);
- humidity;
- obtrusive air movement (air conditioners, drafts).

Although the perception of the climate is very personal, there are various measures that can improve working comfort:
- keeping the temperature as comfortable and even as reasonable as possible, adapted to physical activity;
- no disturbing air movement;
- limiting exposure;
- providing specific PPE if necessary;
- maintaining humidity balance in the room.

Lightning

A well-lit workplace is very important. In addition to the type and color of the light, the light intensity mainly depends on the work to be done. To get the right lighting in the workplace, the following points must be taken into account:
- the smaller the detail that must be perceived, the higher the brightness must be;
- older workers need more light;
- light contrasts in a workspace cannot be too great;
- reflection of light must be avoided;
- the light intensity of the lamps may decrease with the increase of the operating time.

Depending on the work, the illuminance must comply with existing regulations.

Noise

Sound has different effects on people. We indicate the sound strength (volume) in dB (A).

PRACTISE QUESTION

Which conditions does the employer have to ensure?

a. An inside temperature that is bearable for all coworkers.
b. An office workplace without drafts.
c. No noise in the workplace.
d. Lighting adjusted to the activities.
e. A workplace layout which ensures that no extra exertion is necessary.

Answer: b, d

The frequency (sound pitch) is indicated in Hz. Almost everyone knows that too much noise, higher than 80 dB(A), causes noise deafness. But it is less well known that long-term exposure to high noise levels also has other physical effects. Moreover, too much noise can create a dangerous situation due to:

- decreased speech intelligibility;
- disruption of communication required during work;
- not hearing warnings or calls for help.

Table 1 shows the loudness of some known sounds. The employer must take the following measures:

- from 80 dB(A), possibility of hearing examination, making hearing protection available;
- from 85 dB(A), management plan with measures, compulsory hearing protection, signage.

To be able to take the correct control measures, it is important to know how sound pressure level is built up. When two sound sources are "active" at the same time, the sound pressure level does not automatically double (see table 2). Suppose there are two sound sources. Sound source A = 80 dB (A) and sound source B = 83 dB (A). The difference between these two sources is 3 dB (A); (83 dB (A) - 80 dB (A)). From table 2 you can now read that you have to add 2 dB (A) to the largest sound source to determine the total sound pressure level. So in this example 85 dB (A) (83 dB (A) + 2 dB (A)).
For the sound pressure level it also applies that doubling the distance to the sound source gives a reduction of approximately 6 dB (A).

Measures against too much noise

To prevent noise nuisance as much as possible, the following control measures can be taken (by priority):

1. reduce the sound level of the sound source;
2. shield the sound source;
3. mute noise in the environment (prevent resonance, physically separate people and the sound source);
4. personal hearing protection.

Two machines are set up in the same room. Machine A produces 85 dB(a) noise, machine B 90 dB(A). How much noise do these machines make when they are running simultaneously?

a. 95 dB(A)
b. 91 dB(A)
c. 90 dB(A)

Answer: b

noise level [dB(A)]	noise source	area
10	rustle of leaves	safe area
20	quiet house	
30	soft whispers	
40	soft radio music	
50	quiet conversation	
60	ordinary conversation	
70	passenger car	
80	very heavy traffic	crit. area
85-90	heavy truck	Damaging
100	steel construction company	area
110	masonry drill	
120	Propeller motor	pain threshold
130	riveter	unbearable
140	jet engine	

Table 1

Difference in dB(A) between two sound sources	Add to the highest dB(A) value
0 - 1	3
2 - 3	2
4 - 8	1
9 or higher	0

Table 2

- ✓ Climate: personal measures are very dependent on the type of work in relation to the work environment.
- ✓ Mental stress: preventive programs (how to handle work pressure, time management, etc.) to prevent sick leave.

- ✓ RI&E: also gives advice for ergonomic workplaces
- ✓ 85 dB(A): required to take action
- ✓ 85 dB(A): hearing protection mandatory

4 The workplace

4.2 Risks of physical strain

In addition to risks from the work environment, there are also risks as a result of work that puts stress on the body. We speak of physical strain when you lift, pull or push or when you work a lot in a certain position. Physical strain can also arise from the tools or machines you use.

Risks of lifting

Many people have become incapacitated for work because they have often lifted too heavily or incorrectly. It is therefore best to avoid manual lifting as much as possible. There are also rules for this: you can lift a maximum of 23 kg on your own.
If you lift too heavily or incorrectly, you can suffer a back injury. This happens if, for example, you lift with a bent back or if you have to reach far from you while lifting. But back pain isn't the only risk of lifting. With manual lifting you can drop the object(s) due to insufficient grip. It also sometimes happens that someone gets their fingers trapped when putting down a heavy object. Sometimes lifting with two people is a solution. But if that is still too heavy, make sure that a forklift or pallet truck is used, for example.

Safe lifting

- lift carefully, with your back straight and change positions regularly;
- do not lift while sitting, lift too high or move the load too far;
- watch out for slippery and uneven floors and stairs;
- set your own pace and take short breaks;
- wear PPE (e.g. safety shoes to protect the toes, safety gloves for more grip)

Vibrations

The use of mechanical (hand) tools can cause hand and arm vibrations. Examples are working with an impact drill, pneumatic soil rammer or a vibrating plate. This can cause pain in your hands and arms and numb fingertips. If you work a lot and for a long time with such tools, damage to joints in the hand and wrist can cause problems. Damage to blood vessels in the fingers can eventually lead to so-called "white fingers".

Body vibrations can originate from a vehicle, a large installation or machine or a moving work floor. This can cause complaints such as muscle pain, fatigue and headache, stomach and back complaints. Long-term and regular exposure to whole-body vibrations can also cause disorders of the vestibular system.

If there is no alternative working method, measures must be taken. Vibrations can be reduced by the use of vibration damping materials or insulation. An example is a vibration-damping handle on the machine. Special gloves are also sometimes used to dampen the vibrations.

PRACTISE QUESTION

You help your colleagues with the relocation of the company. Boxes and furniture have to be moved.
Which of the statements below are correct?

a. When lifting, keep your arms straight as much as possible.
b. Lift furniture with two people, when possible.
c. When lifting, keep the load as close to you as possible.
d. You can lift a maximum of 10 kilograms on your own.

Answer: b and c

What measures do you take to limit the physical strain caused by vibrations?

a. Taking regular breaks
b. Use of safety shoes
c. Relaxing your abs
d. Use of special gloves

Answer: a and d

✓ Limit risks from physical strain:
- determine your own work pace
- take short breaks regularly
- do not lift more than 23 kg
- provide a varied posture

✗ Know your limits and don't ignore your body's warning
✗ Pushing and pulling is also stressful on your back
✗ Vibrations can cause many physical complaints

4.2 Risk of physical strain (continued)

In addition to machines, tools and environmental factors, physical strain (exertion, movement, posture) and mental strain are also decisive for a healthy workplace.

Physical strain

Because heavy or incorrect lifting can lead to sick leave or even more serious injuries, the supervisor must be extra alert to the manner of lifting, the amount or weight, but also the capacity of the employee. Incorrect lifting techniques, but also incorrect work organization, can often put unnecessary strain on employees. Individual load capacity is determined by the degree to which one is physically able to lift. This will allow one employee to lift more or heavier than another. The risk of lifting depends on:

- horizontal distance between body and load;
- vertical distance between load and ground;
- vertical travel distance;
- frequency;
- the degree to which the upper body is in a rotated position with respect to the lower body;
- contact surface of hands with the load;
- weight of the load;
- size of the load in relation to the center of gravity.

The following organizational measures must therefore be observed when lifting:

- let employees determine the pace themselves;
- take short breaks;
- divide the lifting work among several people.

Safety precautions

If the lifting cannot be performed safely in any way, the employer must have another method of operation applied. Furthermore, if the rules for safe lifting and moving do not reduce the danger enough, the employer must provide suitable equipment and have it used. In addition, it is good to provide training and instruction for safe lifting and moving (see image Lifting instructions).

This should also be repeated with some regularity. Finally, health surveillance can be instituted if there is a risk of back injury. Pregnant women should not lift loads in the last three months of pregnancy.

Seated and standing work

Seated work can be tiring and stressful due to the static load on the vertebrae, shoulders and the like. If someone often has to sit for longer than an hour and a half at a time, complaints may occur. Alternating postures by walking, standing and different sitting postures can prevent many complaints. In addition, make sure you have a good, adjustable chair and an optimal sitting posture (see figure Settings and dimensions of a chair). A good chair offers:

- good support for the thighs on the seat of the chair;
- good back position;
- relief for the shoulders, e.g. armrests.

PRACTISE QUESTION

1. What are organizational measures for safe manual lifting and moving of loads?
   a. The use of lifting equipment and aids.
   b. Dividing the load into smaller parts before lifting.
   c. Letting the employee determine the work pace and take short breaks.

2. Under which working conditions can you best do standing work?
   a. When forces lower than 45 N (4.5 kg) are used.
   b. When the work takes place low and/or high in relation to the body.
   c. If there is enough legroom.

Answer: 1c, 2b

In some cases standing work can be better than sitting work. Especially when dealing with:

- insufficient legroom;
- forces greater than 45 N (4.5 kg);
- often having to reach low, high, or far from the body;
- often getting up from the workplace;
- applying downward forces.

A good aid for standing work is a standing support. This support relieves the legs and feet by absorbing the body weight.

Vibrations

With physical vibrations, you can think of:

- hand and arm vibrations; these can arise when using mechanical (hand) tools;
- body vibrations that can be transmitted via a vehicle, large installation or moving floor.

Various physical complaints can occur due to too many vibrations during work. Body vibrations can cause the following complaints: stomach complaints, back complaints, fatigue, headache, muscle pain, reduced concentration and disorders of the vestibular system.

Measures against vibrations

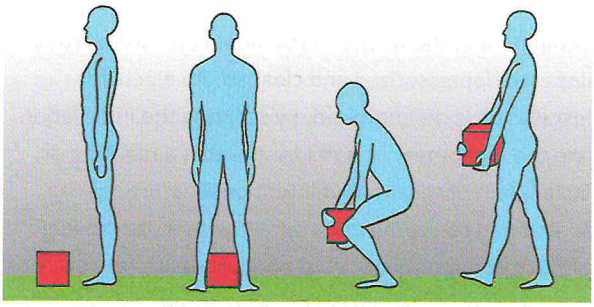
The following safety measures can be taken to prevent and minimize health hazards from vibrations:

- paying attention to the purchase of machines;
- the application of damping/insulation, e.g. hand tools with a damped handle, using anti-vibration gloves;
- applying alternative techniques;
- limiting the exposure time.

Which factor can determine the individual load capacity for manual lifting?

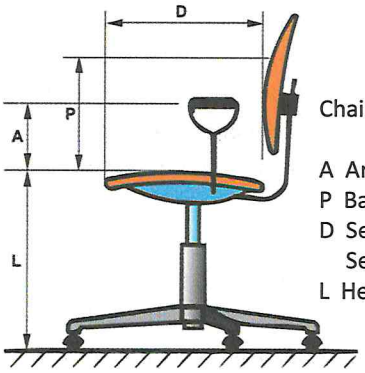
a. The availability of resources.
b. The degree to which one is physically able to lift.
c. The presence of colleagues.

Answer: b



Make a plan | Spread legs, feet 45º to outside | Bend knees, back straight | Start walking from standing position

Lifting instructions



Chair

A Armrest rel. to seat 18-30 cm
P Back rel. to seat 15-30 cm
D Seat depth 40-45 cm
Seat width 45 cm
L Height adjustment 40-53 cm

Settings and dimensions of a chair

- ✓ Vibrations: measures are necessary to protect the (physical) health of employees
- ✓ Prevent physical overload by alternating movement and regular rest breaks
- ✓ Avoid short-cycle and monotonous work

4.3 Safeguarding the workplace and installation

There are many workplaces where you cannot just go to work. Examples include working in basements, a confined space, but also on or near process installations, electrical installations and an industrial working environment. First, measures will have to be taken to safeguard the working environment, so that the work can be carried out safely.

Safeguarding the working environment
Before work can be started, the installation and equipment in the work environment is secured. Product lines are depressurized and cleaned. An electrical installation is de-energized. By securing the installation and the equipment, it is made sure that a machine or installation part cannot unintentionally start moving, so that you can come into contact with these moving parts. making sure electrical appliances are free of tension prevents you from being exposed to electricity. Depressurizing and cleaning pipes prevents you from coming into contact with the product.

Safeguarding equipment or installations may only be carried out by authorized persons. They ensure that the installation is safely decommissioned and checked. The equipment is secured to prevent the equipment from being switched on again unintentionally. A marking indicates that the system is out of order. This is often a lock, a latch or a card.

Before you start working in a confined space, pipes must sometimes first be closed. This is done with a valve, often remotely controlled. But just like a tap, such a valve can also leak or be opened accidentally. The consequences can be devastating! The consequences can be devastating!

That is why a plug-in flange is placed between the workplace and the nearest valve.

Flange connection
With a flange connection you can connect two pieces of a pipe together. A flange connection consists of two flat discs that are welded to the pipe. They are secured together with bolts through the holes. The gasket ensures that no gas or liquid leaks from the flange connection.

Sometimes it is necessary to separate two pipe sections from each other, or to close off supply pipes to tanks, vessels or installations.
For example during inspections or when repairing, cleaning, gas-freeing, steaming or rinsing a pipe, vessel or tank or installation. But also when replacing valves and equipment on pipes that transport products. To prevent leaks, a plug-in flange is then placed as a kind of second (safety) valve.

Plug-in flange
A plug-in flange is a round, dense metal plate that comes between a flange connection. This is done by opening the flange connection, placing the plug-in flange and closing the flange connection again.

PRACTISE QUESTION

You are working at a chemical company. Today you will be doing work in a storage tank. Plug-in flanges are used as a precautionary measure to secure the workplace. What is a plug-in flange used for?

a. For closing off supply lines to barrels, storage tanks or installations.
b. As a partition wall for the storage of two hazardous substances.
c. To protect you from high flames.

Answer: a

This is the only way to make sure that no more substances flow through the line to the place of work. Turning off valves alone is NOT sufficient. Someone can always accidentally open the valve again. A valve can also leak, causing product(s) to reach the workplace. The picture shows an example of a plug flange in the pipe to a tank.

After last valve

Sometimes people work in a confined space with pipes (think of storage tanks). In that case, all these pipes are (compulsorily) fitted with a plug flange. You place these plug flanges after the last valve, as close as possible to the workplace. This is to prevent products from still flowing into the enclosed spaces, for example due to poor flushing.

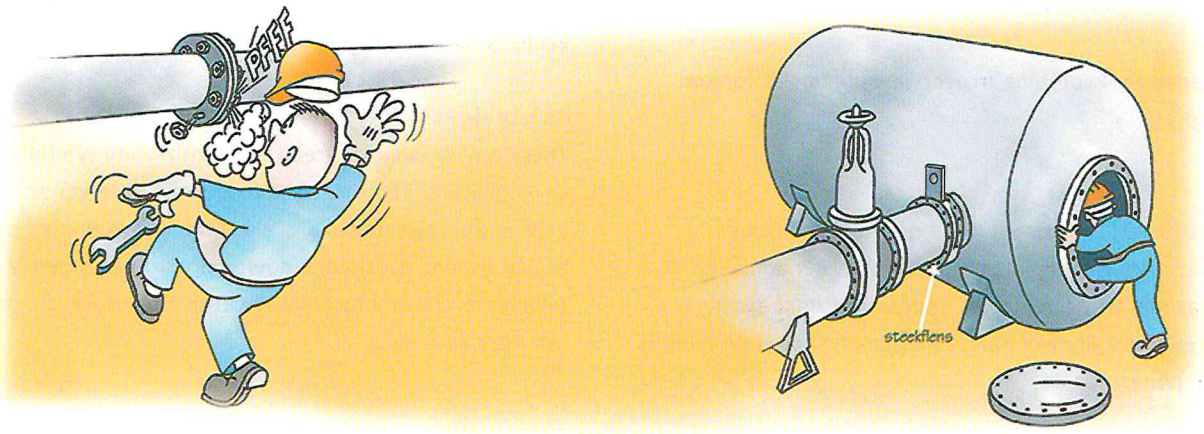
Environment

Parting off pipes by placing a plug-in flange is not only important for safe working. It is also important for the environment. No hazardous substance can leak into the ground or the air from a pipe closed with a plug-in flange.

Which statements are correct?

a. Place the plug-in flange after the last valve.
b. You can always install a plug flange yourself.
c. A plug-in flange is a personal protective device.
d. Plug flanges are only used to plug or block a pipe.

Answer: a and d



- ✓ Before starting, check whether the installation has been secured
- ✓ Ensure that all safety measures stated on the work permit have been taken and checked
- ✓ Regularly check the connections and the plug-in flange for leaks
- ✓ Only an authorized person may

- ✗ Never stand under the pipe when (dis)assembling the plug flange
- ✗ Never use the wrong size plug flange
- ✗ Stay away from process pipes and installations if you do not have permission
- ✗ Do not remove any protections or locks

4.4 Safety and health signage at the workplace

The H&S legislation indicates that a good prevention approach also includes signaling. In the workplace you come across different types of signs, pictograms and signs.

Signaling
Signs, pictograms and markings draw attention to:

- possible dangers;
- imposed measures;
- mandatory personal protection;
- first aid and firefighting equipment;
- evacuation routes.

The Working Conditions Act prescribes that this signaling must be indicated in the work environment by means of signs. In this way, accidents can be prevented and in an emergency, for example, a fire extinguisher or an escape route can be found quickly.
The signaling is divided into:

- prohibition signs;
- mandatory action signs;
- warning signs;
- safety features;
- firefighting facilities.

Appendix 4 contains an overview of many common signs.

Prohibition signs (you are not allowed to...)
These are round plates with a red border and a red diagonal stripe. A pictogram tells you what exactly is prohibited. For example, a pictogram shows: Prohibited for pedestrians!

Do not extinguish with water! No drinking water! No unauthorized access! Prohibited for transport vehicles!

Mandatory action signs (you must ...)
These are round blue signs with a white symbol or pictogram. The sign indicates an obligation. For example: mandatory wearing of eye protection, face protection, a safety suit, a safety helmet, safety shoes or fall protection.

Warning signs (caution ...)
These are triangular, yellow plates with a black border. A black symbol or pictogram indicates what the warning applies to. The text on the sign is for example: "danger: strong magnetic field". But also: "Danger of electrical voltage!" "Beware: radioactive materials". There are also signs that warn with a pictogram for dangers, such as laser beams, environmentally hazardous substances, non-ionizing radiation, height difference or for transport vehicles.

Safety signs/safety devices
These are rectangular green signs with white symbols or pictograms. They are used to indicate emergency exits and escape routes and also refer, for example, to first aid and evacuation equipment, the emergency telephone, the emergency shower or a place where you can rinse your eyes.

PRACTISE QUESTION

What is the meaning of the signs below?

Sign 1
a. helmet and hearing protection compulsory
b. caution: danger of hearing damage
c. hearing protection mandatory

Sign 3
a. (fire)ladder
b. escape route
c. firefighting access

Sign 2
a. caution: danger
b. caution: danger of electrical voltage
c. caution: Danger for electrical appliances

Sign 4
a. forbidden to touch
b. no unauthorized access
c. wearing gloves is prohibited

Answer: 1 = c, 2 = b, 3 = a, 4 = b

Fire-fighting signs

This marking is indicated by a red square sign with a white plate or pictogram. There are signs for escape ladders, fire extinguishers, fire hose reels, telephones for alerting to fire, fire detectors and, for example, the way to fire-fighting equipment.

Markings and stripes

Hazards in the workplace are often indicated by markings, such as yellow-black stripes. To warn of a tripping or falling hazard, diagonal yellow-black stripes are painted on the respective obstacle. Passages and stacking areas are marked with white or yellow stripes. Storage or stacking is then only allowed within the marked area and passages must remain free. Walkways are also indicated by markings.

Markers and ribbons

Ribbons are not a shield, because it is not a physical block. Ribbons indicate that there is a danger or risk. Ribbons (red-white or yellow-black) are indications for narrow/low passages and tripping hazards, for example. They are also used to mark objects that can be bumped against, such as a crane block. Areas with hazardous substances are also sometimes marked. You also use markings to indicate the top and bottom steps, and with little distinction between floor and stair step.

Put in the correct order: the image below shows the following types of signalling:

a. command sign
b. safety feature
c. prohibition sign
d. warning.

Answer: c, a, d, b

signage

- ✓ You indicate a dangerous situation with marking
- ✓ You use markers if you cannot remove the danger
- ✓ Signaling must be clearly visible

- ✗ A ribbon is not suitable as a barrier, but as a marking for a dangerous situation
- ✗ If the meaning of a sign is unclear, ask your supervisor
- ✗ You may not remove or cover signals or signs

5 Personal protective equipment

5.1 Personal protection

You can do several things to limit the "risks of the profession". The best solution is to combat dangers at the source. This is not always possible and therefore various measures are taken, such as shielding the machine or extraction. But whatever measures you take, an accident can always happen. To be protected, you use personal protective equipment, or PPE for short.

Definition PPE's:
Personal protective equipment (PPE) and its additions or accessories are worn by the employee for the purpose of protecting him from risks to safety or health at work.

Limiting consequences
PPE cannot eliminate the risks, but they can limit the consequences. A safety helmet, for example, cannot prevent accidents, but it can limit their consequences. It is therefore also the last step in the occupational hygiene strategy. Employers or the hiring company are legally obliged (Working Conditions Act) to make sufficient good PPE available and to give instructions on how to use it. As an employee you are obliged to wear the PPE if the work or workplace requires it.

Requirements and use
Because PPE is so important, they must meet certain requirements. For example, they must be strong and reliable. And they must be tested. What they are suitable for is stated in the instructions for use. These instructions must be drawn up in Dutch and understandable for the user.

CE marking is mandatory for PPE. The same rules apply to PPE everywhere in Europe. One of those rules is that they must be effective. This means that there is a corresponding PPE for every risk.
The circumstances therefore determine what is needed. In addition, PPE must be ergonomic: easy to wear, so that it bother you as little as possible. A concrete helmet would be very safe, but in practice no one will wear it.

As a user, your PPE must be:
- used correctly;
- checked regularly;
- well maintained/cleaned according to instructions;
- stored safely and carefully;
- managed properly (e.g. by warehouse supervisor).

Body protection
There are many PPEs to protect your body. Often you also use more than one at a time. The most important PPE to protect (part of) your body are: safety helmets, safety shoes and boots, safety gloves and overalls and other forms of protective clothing.

PRACTISE QUESTIONS

Which PPE do you use for the following activities?

1. welding, burning and grinding — a. special protective clothing / b. overall / c. flame retardant clothing
2. working at low temperatures — a. Flame-retardant clothing / b. work clothing and insulating underwear / c. rain gear /
3. working along the road — a. Signal clothing / b. overall / c. anti-static clothing
4. working with corrosive substances — a. Anti-static clothing / b. chemical resistant clothing / c. overall

Answer: 1=c, 2=b, 3=a, 4=b

Protective clothing

The most common body protection is overalls. Overalls must fit properly. There should be no loose buttons, torn pockets and sleeves. Overalls protect against dirt, rain and poor visibility. For better visibility you can also use signal clothing.

Contaminated protective clothing must be changed in a timely manner and cleaned or replaced. Broken clothes must be repaired or replaced. You should not blow clothes with compressed air.

You must wear your clothing closed in case of moving, rotating parts. You can only use disposable clothing once.

As PPE, an overall (protective clothing) is resistant to specific dangers such as welding and grinding, chemicals, heat, cold, radiation or fire. The overall is then made of special material.

At low temperatures you use workwear and insulating underwear. If you work with hazardous materials, such as asbestos and radioactive materials, use disposable clothing.

In an environment with a risk of explosion, use anti-static clothing.

You use personal protective equipment:

a. if no source approach or other approach is possible;
b. if it is prescribed in the work permit;
c. if you cannot apply the safety procedures;
d. if it means safety can be arranged cheaper

Answer: a and b

- ✓ PPE must have a CE mark;
- ✓ PPE also includes clear instructions for use;
- ✓ You must maintain your PPE regularly;
- ✓ Wear PPE that fits well and is suitable for the job you do.

- ✗ PPE cannot prevent accidents; they can limit the consequences;
- ✗ Not wearing PPE is an unsafe practice;
- ✗ PPE must not cause new risks.

5 Personal protective equipment

5.2 PPE for head, hands, feet

There are many different PPEs to protect your body. Often you use more than one at a time. In addition to the use of overalls, other PPE is also worn such as safety helmets, gloves, safety shoes and boots.

Safety helmets

You see a lot of safety helmets, both in construction and in industry. The outside of the helmet protects your head against sharp and hard objects. The helmet absorbs the impact and the interior distributes the shock over the head.

Helmets can be made of polyethylene, polycarbonate or glass fiber reinforced polyester. Metal helmets are prohibited in the industry because they conduct electricity.

The instructions for use and the helmet state when it needs to be replaced. If a helmet has been hit, dropped or damaged, you must replace it. It is also important that you always adjust the interior of your helmet properly.

Gloves

You use your hands and arms in almost everything you do. It is therefore important to protect them properly. There are different types of gloves for this, including gloves with extended wrist and/or arm protection. Gloves offer protection against sharp objects, but there are also gloves that protect against heat, cold, radiation and various types of hazardous substances.

Do not use gloves if there is a risk of being caught by rotating parts. When working with hazardous substances, you may not use leather and cloth gloves, because they can absorb those substances and are not resistant to hazardous substances. You then use plastic or rubber gloves, which also cover at least the wrist, but preferably the entire forearm.

Gloves can be made of textile, leather, rubber, neoprene, PVC and vinyl. You should always choose gloves of the right material. They must also fit properly so that no (hazardous) liquid can enter the glove. If you work with knives or other sharp tools, you wear cut-resistant gloves.

Safety footwear and boots

Safety footwear and boots also come in all shapes and sizes. The best type to use depends on your job. There are several dangers to feet and legs during work. Like:

- falling objects;
- stepping into sharp objects;
- dangerous substances;
- slipping;
- charging of static electricity.

PRACTISE QUESTION

This sign with pictograms is located at the entrance to the construction site. What personal protective equipment should you wear?

a. overalls, safety helmet and safety footwear;
b. safety goggles, safety helmet and gloves;
c. safety footwear and safety helmet.

Answer: c

A good safety shoe or boot has:

- a reinforced nose to protect your toes
- against heavy objects;
- a reinforced midsole to protect the sole of the foot (for example against nails);
- an anti-slip sole with prescribed tread depth, which is resistant to oil and chemicals;
- anti-static properties

The degree of protection of safety footwear is indicated by code: S1, S2 or S3.

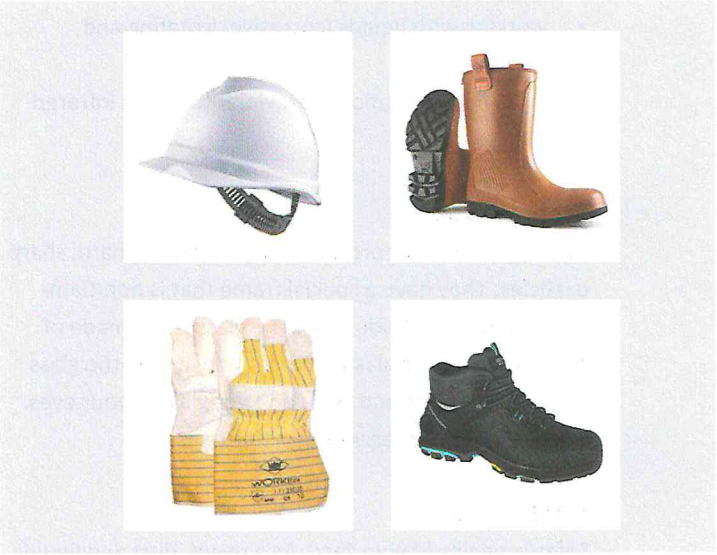
In construction, but also in many other workplaces (e.g. ports, industry), safety footwear with reinforced toe and reinforced midsole are mandatory. Safety boots are mandatory where water and hazardous substances may be present. Anti-static shoes are mandatory in explosive areas.

Safety footwear and boots must be maintained regularly. In this way they remain waterproof and more resistant to the effects of various substances. Do not dry wet shoes near the heater. Replace them when they are worn out or if they have come into contact with hazardous substances.

Which statements are correct?

a. Safety helmets have an expiry date.
b. Safety footwear does not have a CE mark.
c. Safety gloves come in different sizes and made of different materials.
d. S1, S2, S3 is a degree of protection for gloves.

Answer: a and c



- ✓ Safety helmets and safety footwear must be replaced in time;
- ✓ Adjust your helmet properly;
- ✓ Regularly clean and maintain your safety footwear.

- ✗ Never put a safety helmet on the dashboard in the car;
- ✗ Do not wear broken gloves;
- ✗ Do not wear gloves when working with machine tools;
- ✗ Never wear safety shoes without laces;
- ✗ Ordinary boots made of rubber or leather are not safetyboots.

5 Personal protective equipment

5.3 Eye protection

Eye protection

You really need your eyes at work. So protect them well against the many risks, even if you wear glasses. Ordinary frames and lenses do not provide sufficient protection. You must protect your eyes against flying hard, sharp particles or splashes. Think of activities such as:

- grinding, welding and burning;
- chopping and drilling;
- working with liquids (corrosive, irritating and harmful);
- heat, light, radiation: ultraviolet (UV) and infrared (IR).

Safety glasses

Safety glasses offer protection against flying hard, sharp particles. They have a special frame that is non-flammable and special side caps. The glasses are made of tempered glass or plastic. Even if they break, the glass stays in the frame and you don't get glass in your eyes. You can also get prescription safety glasses.

Safety goggles

Safety goggles fit your face. As a result, dust and liquids cannot get into your eyes past the glasses. Safety goggles are fitted with an elastic band around your head or helmet. They have vents in the raised edge. A protective layer ensures that the glasses fog up less quickly. Safety goggles can be used in a dusty environment, for chopping, grinding and drilling.

You can also use safety goggles when working with acids and alkalis, but they only protect your eyes and not the skin. If you want to protect the whole face, use a face shield

Safety face shields

Safety face shields are transparent caps of polycarbonate or metal mesh. They protect your entire face from dust and liquids. However, they do not provide any protection against substances, gases, vapors and dust particles coming from below. Safety face shields are especially suitable if you have to work above your head. You can easily attach them to a helmet. When working with high-pressure cleaners and acids, it is mandatory to wear a safety face shield.

Welding googles and hoods

Welding goggles and welding hoods have extra dark glass because welding produces radiation and a lot of bright light. You use welding goggles when welding with gas (oxy-fuel) and also when chipping and grinding - to protect you against flying particles. Welding goggles do not provide sufficient protection against ultraviolet radiation. That is why you use a welding hood or helmet for electric welding. The hood with dark diamond protects your entire face from harmful rays. In addition to your eyes, the skin of your face is also protected against burning. In combination with a clear window, a welding hood also protects against flying metal particles and sparks.

PRACTISE QUESTION

Connect the work with the correct PPE

1. work with grinding machine	a. welding goggles
2. chopping and breaking work	b. helmet with mesh screen
3. work with a brush cutter	c. safety goggles
4. work with a high-pressure cleaner	d. safety glasses
5. autogenous welding and burning	e. safety face shield

Answer: 1d, 2c, 3b, 4e, 5a

Welding goggles or a welding hood are not only mandatory for the welder, but also for the welding helper! Welding screens are also used in workshops to shield the welding area from the other areas. You will also find welding screens in electrical installations. During switching with medium and high voltages, glowing particles can be released in the event of a short circuit and start flying.

Which PPE do you use for these activities?

1. Welding (electrical)	a. welding goggles
2. grinding concrete strip	b. welding shield
3. metal drilling	c. goggles
	d. safety glasses
	e. face shield

Answer: 1b, 2c, 3d

Safety glasses, for various activities in construction, (petro-) chemical industry, metal workshop

Welding goggles, for oxy-fuel welding

Safety face shield with mesh (mesh screen), for work with chainsaw, brush cutter and forestry work

Welding hood, for electric welding

(Full) safety face shield, for paint spraying, high pressure cleaning, working with acids, alkalis and other chemicals (risk of splashing)

Safety goggles for use during grinding, drilling and working with liquids

- ✓ Features of a good safety goggles: safety lenses, special (non-combustible) frame and also fits on the sides of your face (if necessary, with side shields).
- ✓ Safety face shield protects your entire face
- ✓ Welding goggles for oxy-fuel welding/cutting
- ✓ Welding hood / welding helmet for electric welding

- ✗ Regular glasses or contact lenses do not provide protection
- ✗ You cannot chop and grind without safety glasses or goggles
- ✗ You cannot work with acids without goggles or safety face shield
- ✗ Welding without a welding hood or welding goggles is an unsafe operation

5.4 Hearing protection

If there is too much noise, you can no longer understand each other. In addition, certain sounds can no longer be heard. That can be risky. In any case, it is risky for your hearing. In the longer term, the cilia and nerves in your ear damage and you become "noise-deaf"; irreparable hearing damage. To protect your ears against too much harmful noise (noise) you must wear good hearing protection. The Working Conditions Act sets a number of rules for this.

Sound (pressure) level from 80 dB(A)
Hearing damage can occur if you regularly have to deal with noise of 80 dB(A) or more for 8 hours a day and 40 hours a week. dB(A) is the number of decibels, measured as sound pressure at the ear. You can determine the approximate amount of 80 dB(A) without a measuring device. If you are one meter apart and the other person cannot understand you without raising your voice (not having your lips read), then there is more than 80 dB(A) of noise. The Working Conditions Act states that the employer is obliged to distribute hearing protection products at 80 dB(A) and that their use is recommended. As an employee you are obliged to wear hearing protection from 85 dB(A).

Types of hearing protection
You wear most types of hearing protection in your ear. Ear wads and ear plugs are simple forms of hearing protection. These are not ordinary household cotton wool (they do not suffice!), but plasticized cotton wool. The yellow rolls swell when you put them in your ear. Depending on the pitch (sound frequency), they provide a protection (damping) of approximately 10 dB(A). It is important that ear wads and ear plugs are not dirty. So insert them with clean hands and replace after each use. Dirty ear wads or ear plugs can cause an ear infection.

The ear wads and ear plugs are for single use. When you take a break or stop work, throw away used ear wads or earplugs. Ear wads and ear plugs are unsuitable at a sound pressure level above 90 dB(A).

Universal earplugs are attached to a bracket that you wear around your neck. Depending on the pitch, they provide protection between 10 and 15 dB(A). Ear plugs are specially designed plastic rods. They offer protection especially at high tones, up to about 10-15 dB(A).

Otoplastics are plastic earplugs that are custom made. You wear them in your ear. The filter in an otoplastic is set in such a way that the harmful noise levels in your work are stopped. An advantage of these otoplastics is that you can continue to understand each other, while the excess noise (from machines, for example) is filtered. The protection is 25 dB(A). Otoplastics can also be used in combination with earmuffs at very high sound pressure levels;

You don't wear ear muffs in the ear, but over them. They look like a large pair of headphones and block the ears from the environment.

PRACTISE QUESTION

You are going to carry out demolition work. You cut the tiles off the wall with a hammer and a chisel (noise level 75 dB(A). The wall itself you cut away with a pneumatic demolition hammer (90 dB(A). For which activities do you have to wear hearing protection according to H&S legislation?

a. When working with the hammer and chisel.
b. When working with the pneumatic breaker.
c. When working with the hammer and chisel if you do this for more than 4 hours a day.

Answer: b

The protection factor depends on the type of earmuff and the height of the sound. In general, the protection is about 25 dB(A). Modern ear muffs sometimes have a built-in radio receiver to enable communication, for example for activities where two-way radio traffic is required, such as when loading (container) ships or for example for tours of a factory with a lot of noise.

Put in the correct order; start with the hearing protection with the most protection

a. otoplastics
b. ear wads
c. earplugs
d. ear wads with earmuffs

Answer: d,a,c,b

Ear wads / earplugs
(approximately 10 dB(A))

Earmuffs
(approximately 25 dB(A))

Earplugs
(approximately 10 to 15 dB(A))

Otoplastics
(25 dB(A))

Earplugs
(approximately 10 to 15 dB(A))

- ✓ 80 dB(A): risk of hearing damage; employer makes hearing protection available
- ✓ 85 dB(A): compulsory wearing of hearing protection
- ✓ Good maintenance is necessary for hygiene
- ✓ Measurement of the hearing is part of a periodic inspection

- ✗ Not using hearing protection in a noisy environment is an unsafe practice;
- ✗ You may not remove sound-insulating hoods from machines;
- ✗ Never work alone in traffic when wearing hearing protection. Have a colleague watch out for traffic (coming from behind)

5 Personal protective equipment

5.5 Fall protection

If you have to work at height, you must of course first of all make sure that you cannot fall down. However, sometimes it is not possible to take enough security measures. Then you use fall protection. You also do this in situations where H&S legislation prescribes this. Just think of working in a work basket or hanging scaffolding, but also, for example, when working above water.

Safety harness

Only one form of fall protection is permissible: a safety harness. That is a combination of straps that fit around your thighs, stomach and shoulders.
Depending on the version, there is a ring on the front or back of the belt. You attach a lanyard to the height-adjustable ring. You also use safety lines (maximum 1.5 meters) in an aerial work platform. You can also use a safety harness as a rescue harness: if you get into trouble or get injured, the harness can help in a quick rescue. When working at a higher height, a safety harness alone is no longer sufficient. Because you often use longer lines (15 to 40 meters), you must also use a fall protection device.

Fall arrest systems

There are different types of fall arrest systems. A fall arrest is a descender. When you are connected to the device, you can descend slowly. When you climb up, the device rewinds. In the event of a fall, the device slows down your fall, but you can continue to descend. Make sure you stay right under the device, otherwise you could swing badly in the event of a fall. A fall arrest system is used in tanks or when working at great heights, such as in wind turbines.

A system that absorbs the fall is also called a fall absorber. The shock absorber is attached to an anchoring point with a connecting line. The fall protection system is used in such a way that the fall height is limited as much as possible and the shock in the event of a fall is cushioned as much as possible. An example of a shock absorber is the fall restraint. You use a fall restraint if you have to work at height while there is a risk of falling. Because the device keeps the line taut again and again, you can just walk around with it. If you fall, the device locks like a seat belt and you do not fall further than about 30 centimeters.

Connecting line (position line)

If you want to prevent a fall, use a connecting line or position line. Attach the end of the connecting line to an anchor point. To prevent the fall, the length of the connecting line must be shorter than the distance between the anchorage point and the point where you can fall down.

Inspection of fall protection

Fall protection systems and safety harnesses must be inspected annually by a certified company. If a fall protection device has caught a fall, you may no longer use it and it must be checked and inspected again.

PRACTISE QUESTION

Which fall protection system do you use for the following activities:

1. work above water
2. working on a roof without roof edge protection
3. working in a wind turbine
4. work on an approved scaffolding
5. work on an aerial work platform
6. work in suspended scaffolding
7. work on the roof of a storage tank
8. work in an underground tank (> 4 meters)

a. safety harness with connecting line and shock absorber
b. safety harness with fall arrest
c. safety harness with lanyard or positioning line
d. no fall protection required

Answer: 1a, 2c, 3b, 4d, 5c, 6c, 7a, 8b

Safe use of a safety harness:

- A safety harness must fit properly and be tailored to the wearer.
- check a safety harness before each use, including wear and tear and fraying.
- lanyards must not be dirty.
- always store fall protection equipment in a dry and clean place.
- always keep fall protection systems in a dry, clean area.

In the event of a fall

The greatest danger in a fall is the cut off of the blood circulation to your lower body. This can cause you to become unconscious and die within 10 to 20 minutes. That is why it is very important that you use a safety harness in the prescribed manner. Immediately call for help after a fall and try to pull yourself up on the lanyard. Keep moving to release the pressure on your legs.

Are you offering assistance to the victim? Preferably do that with at least two people.

What should be done with a fall protection system that has caught a fall?

a. All parts of the fall protection system must be discarded.
b. You must inspect all parts of the fall protection system for damage and have defective parts repaired.
c. Safety harness, lanyards and shock absorber must be re-inspected.

Answer: c

Safety harness

Line with line clamp

Fall arrest

- ✓ Lanyards must be clean and free of damage
- ✓ A safety harness is provided with an inspection label
- ✓ A safety harness is available in different sizes. Check in advance whether the harness fits your body

- ✗ You may no longer use a fall protection system that has caught a fall (must first be inspected)
- ✗ An anchor point must be strong enough to absorb weight in the event of a fall
- ✗ Do not work alone if you are working with a fall protection system

5.6 Respiratory protection

Personal respiratory protection (also called respiratory protection) is required when there are harmful substances in the air or when the oxygen content in the air is too low (less than 19%). You must also use respiratory protection if ventilation or extraction is not sufficient.

Dependent and independent respiratory protection

A dependent respiratory protection filters the surrounding air. Filter masks are an example of this. Independent respiratory protection works differently. You do not breathe (filtered) air from the surroundings, but air from cylinders, or from a breathing air line or breathing air unit. The air is blown into the mask via hoses. You must use independent respiratory protection if the oxygen percentage in the ambient air is insufficient (less than 19 vol%), but also for large or unknown concentrations of hazardous substances in the air. Independent respiratory protection is often also used when working in a confined space.

Types of masks

Filter masks are a form of dependent respiratory protection: they filter the ambient air, but do not add oxygen. You only use filter masks for small quantities of hazardous substances. Filter masks are limited to use. The duration of use depends on the type of filter, concentration of substance or product and the amount of air that is inhaled.

Examples of filter masks:

- disposable masks
- half face masks
- full face masks

Filters are subdivided into dust filters and gas/vapor filters and have an applied protection factor (TPF). Dust filters are divided into protection factors:

- P1 (coarse) annoying dust;
- P2 (medium) harmful substance;
- P3 (fine) toxic dust.

A disposable mask or dust muzzle is really only suitable for coarse and harmless dust (P1). Most filter masks consist of a fixed mask (half or full-face mask) on which you screw or click a filter canister with a certain protection factor. Some masks have an inlay mechanism. These are only suitable against dust, not against gases or vapors.

Gas filters also come in different types and with different protection factors. This has to do with the type of fabric for which they are used and with the absorption capacity.

Replace in time

When a filter becomes saturated, it blows out. You then breathe in the substance you wanted to protect yourself from. Sometimes you can even smell or taste the substance. To prevent that, you need to know what the protection factor of the filter is. You must determine or have determined the maximum concentration of the gas or vapor in the room. This information can be used to calculate how much time you can work safely with a gas/vapor filter.

PRACTISE QUESTION

Which respiratory protection do you wear for the following activities?

1. 
2. 
3. 
4. 

a. grinding and drilling (fine dust)
b. high pressure paint spraying
c. cleaning work in a storage tank (confined space)
d. asbestos remediation work

Answer: 1d, 2b, 3a, 4c

Always make sure that you change the filter on time (in a clean environment), so before the filter blows out.

Independent respiratory protection

For independent respiratory protection, use a full-face mask with breathing air cylinders or fresh air hoods. With a breathing mask you breathe air from breathing air cylinders. For this you must be medically tested and specially trained. With a breathing air line you get breathing air from a clean air unit or cylinder battery. Note: working air lines (for tools) are not suitable as breathing air! The air must first be filtered and of good quality.

The user of a respiratory mask must not have facial hair. The mask will then not close properly, causing leakage. Dust and air from the work area can enter the mask and are then inhaled.

To check if a mask seals properly and is not leaking, do a test: with your hand you close the air supply to the mask and breathe. If the mask presses on your face, it seals well.

Fresh air hoods are worn loosely over your head with supports on your shoulders. A fan or compressor sucks air from outside (clean room). If necessary, air can be added from a breathing air line. The added air enters the air cap without obstruction and is discharged again. Due to the higher air pressure in the mask, it does not fog up. Sometimes you do need hearing protection because the outflowing air can make a lot of noise.

Independent respiratory protection equipment must be properly maintained. The various components must be regularly inspected by a specialist company.

Put in the correct order from highest protection factor to lowest protection factor:

a. Half-face mask with inlay filter
b. Dust muzzle
c. Breathing mask
d. Full face mask with gas filter canister

Answer: c, d, a, b

P1 dust mask

Half-face filter mask

Full face filter mask

- ✓ Always use a well-fitting mask; control by means of fit test
- ✓ Pay attention to the correct filter and read the user manual carefully
- ✓ Remove and dispose of filter after use
- ✓ You must be trained and medically certified to use independent respiratory protection

- ✗ Do not exceed the maximum operating time of a filter
- ✗ No facial hair when wearing a full-face mask
- ✗ Dust caps are only suitable for coarse and harmless dust. Do not use a gas filter that is not sealed
- ✗ Expiration date passed? Do not use the filter!

6 Work equipment

6.1 Working with permanently installed machines (1)

Fixed machine tools are machines that are fixed in one place. Examples are the pillar drill, grinder and saw. We also count lathes, milling machines and planing machines among the machine tools.

Machine tools in general

Working with machine tools is not without risks. That is why a number of rules have been drawn up for safety and the prevention of incidents. Machine tools (after 1995) must in any case have the CE mark. Good maintenance and periodic inspection are also part of this. Test standards are used to ensure that the machine remains safe during its entire service life. The period of validity of the inspection is stated on the inspection sticker. Sometimes color coding is also used. During an inspection, it is checked whether the technical condition of the machine is in order. In addition to regular inspection and lubrication, it is checked that moving parts (danger zone) are adequately shielded and that the emergency stop device works properly. If a machine tool contains electrical installation parts, these parts are inspected according to inspection standard NEN 3140. Use and maintenance instructions for the machine tool must be available in the language of the country where the machine is used. The employer is obliged to look at the risks per machine and which safety measures must be taken. An instruction card must be available with each machine. The main hazards and the PPE you must wear when operating the machine must be indicated with pictograms or stickers.

Before you start working with a machine tool, you must first have received instruction. You may only work with a machine tool if you are 18 or older. During the training, young people are only allowed to work with these machines under supervision.

Safety features

Hazardous areas, such as moving parts, must be shielded. Machine tools must be equipped with an emergency stop with which you can stop the machine immediately. The emergency stop device must be easily accessible, clearly visible and recognizable.
After using the emergency stop, the installation can only restart with the normal start-up procedure.
Electrically powered machines have a no-load switch or a zero-voltage switch. This automatic switch prevents a machine from restarting after a power failure when the power is switched on again.
Machine tools are often equipped with a dead man's switch. This works through the operation of the machine. As soon as the button or lever is released, the machine or tool will stop. An example is the double (2-hand) operation of e.g. metalworking machines.
Machine tools have a brake to prevent the machine from running out for a long time. If the machine is opened or guards have been removed, a safety device ensures that the machine cannot be started.

PRACTISE QUESTION

What safety conditions apply when working with machine tools?

a. The machine must be CE marked.
b. You must be 16 or older.
c. There must be an emergency stop on the machine.
d. Instructions for use must be available at the machine.
e. You must be able to remove protection covers and protections.

Answer: a, c, d

Dangers

Working with machine tools involves dangers. Flying particles or material can cause injury. If these particles are also warm, they can cause a fire. Material can also become so hot through processing that a fire starts. Faults in the control system or poor maintenance can cause malfunctions and some dangers to occur earlier.

Machine users must be aware of moving parts. Sharp parts can cause serious cuts even when the machine is standing still.
Vibrations, noise levels and an incorrect working posture can lead to physical complaints and physical overload. Live parts can cause electrocution. You can become trapped by pneumatically or hydraulically operated clamps.

Workplace design

Proper workplace design is very important to working safely. The floors of the workplace must be sufficiently non-slip, flat, clean and dry. There should be sufficient walkways with sufficient space between the machines, also for transporting materials.

Safe use

Instruction, skill and experience are necessary for the safe and responsible use of machine tools. When working with these machines you may not wear loose clothing, jewelry or hair. Don't use gloves if there is a risk of being caught by rotating parts. It is forbidden to disable or bypass machine tool protections. You may not leave machines unattended and running. As an operator, you must know the location and function of the emergency stop devices.

Which PPE should you wear when working with machine tools?

a. hearing protection, eye protection
b. dust mask, hearing protection, gloves
c. hearing protection, eye protection, hand protection

Answer: a

- ✓ Only use approved machine tools
- ✓ Read the operating instructions and safety instructions
- ✓ Wear the indicated PPE
- ✓ Ensure order and tidiness in the workplace
- ✓ Machine tools should be connected to the dust extraction installation if applicable

- ✗ No maintenance while the machine is still running
- ✗ Do not wear loose clothing or jewelry while machines are running
- ✗ Make sure that the emergency stop is clearly visible and accessible

6 Work equipment

6.2 Working with permanently installed machines (2)

The main risks of machine tools are the rotating parts and the clamping and/or feed-through devices. There is also the risk of parts flying off. So you have to be aware of the dangers of pinching, crushing and cutting, especially fingers and hands. In addition, you have to take into account that the noise and dust are unhealthy. In this section some commonly used machines are discussed.Pillar drill

Pillar drills

When working with a pillar drill, it is very important to properly secure the workpiece. It still happens too often that the drill "bites" into the workpiece. This causes the workpiece to rotate or fly away, resulting in an accident. It is also very dangerous (and therefore prohibited) to hold the workpiece. This can dislocate your hand and wrist or get bruises. Always put the workpiece in a workpiece clamp. You can also hold the workpiece in place (on the drill table) with bolts and/or cleats. Always use a protective glass or clear screen between yourself and the drill. Dangers during drilling are:

- breaking the drill;
- wiping off cuttings by hand; use a curling brush or curling hook to remove drill cuttings;
- ejected chips and glowing particles;
- splashes of (hot) cooling and cutting oil. Some varieties also pose health risks.

Use PPEs

Wear safety glasses and, if necessary, also hearing protection. Also make sure you have good work clothes. And be careful not to wear loose-fitting clothing, hair, or jewelry near the running drill.

Permanently installed grinders

You use this machine for grinding, but especially to sharpen chisels and other tools. The settings of the grinder are very important. For example, the distance between the leaning trowel (the support on which the chisel rests, for example) and the sharpening stone may be a maximum of 3 mm. Because the sharpening stone wears with use, you have to adjust the leaning trowel regularly. This prevents the workpiece from getting stuck between the leaning trowel and the sharpening stone. Of course you can only adjust the recliner when the machine is standing still! The sharpening stones must be of the same size. If the speed of a grinding machine is higher than the sharpening stone can handle, the stone can fly apart during use. This can also happen if the use by date of the sharpening stone has passed, because the binder of the sharpening stone has aged.

Safety rules

- only expert employees are allowed to assemble the grinding wheels;
- the circumference and the sides of the grinding wheel must be adequately shielded;
- pay attention to the due date;
- always use the (compulsory) protective glass;
- wear PPE (safety glasses, hearing protection);
- avoid inhaling grinding dust.

PRACTISE QUESTIONS

There are various safety features on the machine tools in the workshop. Indicate to which machine the safety provisions belong.

machine tool:

1. pillar drill
2. permanently installed grinder
3. circular saw machine

safety precautions:

a. riving knife and riving knife support
b. protective glass
c. adjustable protection cover
d. rest
e. roundwood
f. curling brush

Answer: 1 = b and f, 2 = b and d, 3 = a, c and e

Permanently installed circular saws

Circular saws are used for cutting beams or sheet material. Dangers can be that the workpiece knocks away or that you are caught by the rotating saw blade. This can cause very serious injuries. The dust that is released during sawing can also cause health problems.

Requirements for the machine

Universal circular saws must have at least the the following requirements:

- the machine must have a good protective cover over the saw.
- the riving knife (sword-shaped part behind the saw blade) must match the saw blade used (thickness and height).
- It must have a properly constructed and properly adjustable auxiliary guide.
- it must have one or more dust extraction connections.

Safety precautions

The guards prevent you from hitting between the machine parts:

- if you are machining large workpieces, you must do it together with a second person, or use a roller conveyor;
- set the saw blade as high as possible. This makes sure the workpiece knocks away less quickly;
- use a push stick with interchangeable handle;
- do not distract the operator of a machine;
- use a brake to prevent the circular saw from rotating for a long time after it has been switched off and someone getting injured;
- wear PPE (hearing protection).

Which of the statements below is correct?

a. The circular saw must be checked monthly by an inspection body.
b. The leaning trowel of the grinder should be adjusted regularly.
c. You have to hold your workpiece well when you start drilling with the pillar drill.

Answer: b

- ✓ Read the operating instructions and safety instructions
- ✓ Assemble grinding stones and saw blades correctly; pay attention to direction of rotation and speed
- ✓ Use PPE (hearing protection, eye protection)
- ✓ Only carry out maintenance when the machine is stationary and secured

- ✗ Do not wipe off cuttings or sawdust by hand
- ✗ You may not remove protective caps or protective panes
- ✗ Do not store cleaning cloths or dry dusters near drilling and grinding machines (fire hazard!)

6.3 Working with powered hand-held tools

Hand-held tools can be driven in different ways: electric, hydraulic and pneumatic or with a petrol engine. In this chapter we discuss the dangers of different types of powered hand-held tools.

Electric hand-held tools

Electric hand tools include drilling and grinding machines, hand-held circular saws, deco saws, chain saws, and nail and staplers. Battery tools are also part of this. With these tools you have to deal with the risks of electricity and the danger of rotating and sharp parts.
Electric hand-held tools are not grounded. They must be double insulated, recognizable by this mark: ⧈
A shield or plastic housing is then applied, which ensures that you cannot come into direct contact with parts that are under voltage. Note: double insulated offers no protection against water or a damp environment. A malfunction in the control system or energy source can also pose a hazard.
Powered hand-held tools must also have a dead man's switch.
This protection ensures that the machine stops immediately when the button is released and is integrated in the operation of the machine. Another example of a dead man's switch is the protection in a forklift or lawn mower. When you are not in the seat, the motor cannot run.

Hand drills, hand saws and hand-held grinders

With drilling, sawing and grinding machines, your clothing can get into the sharp parts due to the rapid rotation. You can also loose direction (for example when breaking a drill) and injure yourself. Other hazards and possible injuries include: being crushed, electrocution, physical overload due to incorrect posture or vibrations, noise.

Hand-held grinder

You can use a hand-held grinder to grind material or for deburring. To prevent injuries during work, the grinder must be equipped with a side handle and a protective cover over the grinding wheel. When grinding, make sure that the workpiece is secure and that you are using the grinding wheel correctly. Do not put the grinder down until the grinding wheel is stationary. On the grinding wheel you will find:

- the name of the manufacturer;
- maximum permissible speed; do not exceed!
- size of the disc;
- expiry date (due to limited shelf life of the disc);
- application: type of material, cutting or deburring.

When you use a cutting disc for grinding, the disc is overloaded sideways and can break. Use grinding wheels for deburring.

PRACTISE QUESTION

You need an electric drill and circular saw for your work. Before you start, check the machines.
What do you pay attention to?

a. The machines must be double insulated.
b. The machines must have an Ex marking.
c. The machines must be equipped with an emergency stop and a dead man's switch
d. The machines must be well maintained and inspected.

Answer: a and d

Hand-held circular saws

The following safety precautions apply to be able to work safely with a circular saw:

- adjust the saw blade and guide so that the saw blade protrudes as little as possible under the workpiece to be cut;
- do not allow the saw to jam;
- always keep the power cord behind the saw;
- get help from a second person if needed.

Of course, the hand-held circular saw itself must also be safe. A safe hand-held circular saw meets the following requirements:

- the guard must completely cover the cutting part of the saw that is not cutting;
- if the machine is in operation, there must be an automatic protective cover over the part that cuts;
- the riving knife is adapted to the diameter and thickness of the saw.

Nail gun and staple gun

Always keep your free hand far from the nail and staple gun. And take these risks into account:

- ejection of the nail;
- kickback and deflection of the nail on hard materials;
- piercing the workpiece with the nail.

Caution

- that it is protected against accidental firing;
- the nail and staple gun will only fire when you press the tool against the workpiece.

Before using the machine, you must:

- check the maximum working pressure;
- Make sure the guide is empty when you place a charger;
- provide staples or nails tailored to the tool, material and shape of the workpiece.

What information is on a grinding wheel?

a. expiration date / expiry date
b. minimum speed
c. type of grinding machine
d. application (cutting disc) and type of material

Answer: a and d

Circular saw

Working with a chainsaw can be very dangerous. Safety measures are therefore absolutely necessary. To be able to use a chainsaw, you must have followed appropriate training that is concluded with a test. Take these safety precautions:

- position yourself so that the chain does not hit your body in the event of a kickback;
- wear pants and gloves with anti-cut and blocking fibers;
- use correct bar/chain combination;
- always operate the chainsaw with two hands;
- place a transport cap over the chain during transport.

The chainsaw must meet these requirements:

- handles: vibration-free with anti-slip;
- internal vibration damping;
- rear handle: protection against chain breakage;
- chain brake with kickback protection;
- chain catch mechanism;
- guard (for the chain);
- balanced;
- protective bar;
- locking of the control with automatic release of the control knob.

✓ Make sure to wear well-fitting clothing;

✓ Always use safety glasses for work that creates dust or splinters;

✓ Use hearing protection;

✓ If possible, clamp the workpiece in the vice on the workbench;

✓ Regular and proper maintenance is necessary for safety.

✗ Do not wear loose jewelry and (long) hair. These can get into the rotating parts;

✗ Don't use gloves when contact with rotating parts is possible and/or danger of being caught;

✗ Never brake the tool by hand;

✗ Do not pull tools towards you or out of the socket by the cord. Also, don't let it drop by the cord.

6 Work equipment

6.4 Working with hand-held tools

Working with hand-held tools, with or without a drive, entails risks. Defective tools, poor maintenance and incorrect use cause many injuries every year, sometimes with permanent consequences. Good workmanship and checking of the tool before use are required to work neatly and safely. In addition, there are also various safety requirements for "simple" tools.

Responsibilities

As with powered hand tools and machine tools, you should use hand tools properly, check them regularly and maintain them carefully.

Hammers

Hammers should have a nice handle that is not too smooth. You can hurt your hand from splinters and saw cuts in the handle. The stem could also break. Like the handle, the hammer head must be clean (no burrs). The head must be secured (with a spigot) on the stem, so that it does not fly off when you work.

Spanners

There are open-ended and ring spanners (a ring spanner is safer than a spanner), impact wrenches and adjustable spanners. Whichever spanner you use, it is very important that it is undamaged and fits properly. Otherwise the wrench can shoot off the nut if you apply force. This can injure yourself. What you should definitely never do is lengthen the stem of the spanner with a piece of pipe. You can use more force, but the wrench can slip off the nut or break. Extension is only allowed with the right accessories. Slogging spanners have a short handle with a surface that you hit with a hammer. You use this spanner for to loosen large bolts and nuts. You have to grind away the burrs that get on the striking part.
You always have to be very careful with slogging spanners. To prevent the bump key from flying like a loose cannon, secure it with a string.

Files

The biggest problem with files is that the handle is often damaged or even completely missing. This is dangerous because the material is sharp. A file must have a sturdy handle that is in good condition and undamaged. It must be securely mounted to the file.

Screwdrivers

Always use a suitable screwdriver, with not too sharp a blade, and clamp small workpieces. In practice, screwdrivers are also used as a chisel, can opener and for all kinds of other unintended applications. That is dangerous. In addition, this will damage the screwdriver, so that it can easily slip out of a screw slot.

Chisel

You must grind away burrs on the hitting part of chisels, cold chisels, punches and center punches. This way you protect your hands and prevent a burr from hitting your eye. You must replace the handle of a wood chisel in time. Chisels must have hand protection.

PRACTISE QUESTION

You can use various hand tools for small repair work. In addition to screwdrivers and wrenches, you also use a hammer and a chisel.

1. What requirements do you place on a hammer?
   a. The stem should not have more than one damage.
   b. The weight of the head should be on the hammer.
   c. Head and stem must be firmly attached.

2. Why is it better to use a ring spanner than a spanner when tightening a nut?
   a. It is safer for the user.
   b. A ring spanner fits better on the nu.
   c. You can then use more force.

Answer: 1c, 2a

Pliers

The jaws and hinges of pliers must be clean and undamaged. Do you use pliers to cut metal straps? Make sure that the tension straps do not slip away.

Knives

A knife must be suitable for the nature of the job. It must also be sharp. Always cut away from yourself. Use if possible a safety knife. The blade can be retracted into the handle. This way you limit the risk of cuts. Ceramic knives are safer than metal knives. If you cut yourself, it is often less deep. Do not extend an extendable blade too far and break off the worn part with a blade breaker or pliers.

Hand saw

Use a handsaw suitable for the job. Make sure the saw is well sharpened and sharp and has a good setting. The blade must be properly tensioned, the teeth must be forward.

Which of the statements below is correct?

a. If you open a box with a knife, it is best to cut along the side towards you.
b. A hand saw blade should be properly tensioned with the teeth forward.
c. The blade of a screwdriver should always be sharp.
d. Hand tools should be regularly maintained and checked.

Answer: b and d

- ✓ Use only safe tools
- ✓ Regularly inspect the tool and maintain proper maintenance
- ✓ Use appropriate tools
- ✓ Use tools as intended

- ✘ Do not use damaged or defective tools
- ✘ Do not use a screwdriver as a chisel or can opener

6.5 Working with hoisting equipment

In chapter 4 you saw that you cannot and should not lift everything. Tools such as hand trucks and forklifts are indispensable for heavy objects. And for moving large objects vertically and horizontally, you cannot do without hoisting tools, such as cranes and hoists.

Hoisting equipment

Hoisting equipment is useful. You use them for hanging loads, both horizontally and vertically. But the lifting gear is also dangerous.
Inadequate tools and misuse have resulted in many serious and even fatal accidents. Safe handling of hoisting and lifting equipment is a must. Regular checks for damage and wear are part of this.

Types of overhead cranes

Cranes come in all kinds, such as:

- obile cranes;
- verhead traveling cranes (gantries) and gantry cranes;
- oader cranes;
- ite cranes.

Pile rigs also fall under the cranes.

Annual inspection

Everything is inspected annually to check whether a hoisting gear and all accessories meet the legal requirements. The inspector inspects the hoisting equipment and all its parts (winches, hoists and masts) and records his findings in a log: the crane book.

Documentation

Various documents must be present with a hoist. The crane book contains the (inspection and maintenance) history of the hoisting equipment.
The lifting tables and charts show which weights you can move at what distance.

With a pile-driving rig, pile-driving tables contain information about the weights of the pile drivers. The inspection date is stated on the inspection certificates for winches, hoists, lifting masts, lifting beams, chains and slings. Obviously, the operator of the hoisting equipment must also have the necessary papers, such as the TCVT expertise certificate (foundation Supervision Certification Vertical Transport) (formerly called a hoisting certificate). This is a mandatory certificate for operators of tower cranes, mobile cranes and piling rigs with a load moment from 10 ton-meters.
A driver also has a registration booklet containing the experience (number of years, on which type of hoisting equipment, etc.) and medical certificates.

Risks

Hoisting equipment entails risks for everyone in the area. It is important to always be aware of this. The biggest risk is that the burden will fall. That is why you should never be within the swivel range of a lifting device. You can also be hit by moving parts of lifting equipment, such as chains and slings. A hoist can fall over if it is not set up properly (outrigged).
Hoisting equipment can also tip over due to heavy loads. That is why a lifting plan is drawn up in advance, which takes into account the surface on which the crane must stand and the load to be lifted.
To work safely with hoisting equipment, proper support of the crane is necessary.

PRACTISE QUESTION

What safety measures must be taken to work safely with lifting equipment?

a. The hoisting equipment must be set up on a stable surface and properly supported.
b. You may work within the rotating range of the crane if you are wearing a safety vest.
c. Lifting accessories should be replaced regularly to prevent damage from wear.

Answer: a

Furthermore, a good communication must be possible between the operator of the hoist and his assistant. Possible bad weather (including strong wind, thunderstorms) can also cause risks. The wind force at which hoisting activities are no longer safe depends on the hoisting equipment used. The instructions of the manufacturer of the hoisting equipment state the regulations and at which wind force hoisting activities are no longer safe.
The use of multiple hoists at the work terrain entails additional dangers. Good coordination is necessary.

Choice of hoisting accessories:
Which hoisting accessories you should use depends on the following factors: dimensions and shape of the load and distance of the displacement of the load.
The materials and lifting accessories must be regularly checked for wear and damage.

Manual hoist
If you cannot or are not allowed to use a crane or it is not efficient, you can often use a hoist. There are hoists for hoisting work, but there are also hoists with which you can move loads horizontally. You may also know hoists by trade names such as "Tirfor" or "pull-lift".
Hoists usually do not have their own drive. You operate them by hand.
The greatest risk is that the hoist or any part of it will break. This often happens through incorrect use. Also, the point to which the hoist is attached can break off.
Of course you should never hoist loads that exceed the maximum weight on the hoist. The attachment must be strong enough to lift the load. If the hoist can lift 1000 kg, then the beam or lifting eye to which the hoist is attached must also be able to. Never extend the lever control of the hoist with an extra pipe.
With this you could apply too much force and the hoist is not built for that. Always check the entire hoist before use. You must report defects and repairs to the supervisor.

A crane must contain the following documents:

a. crane book
b. expertise certificate (TCVT)
c. inspection certificates for lifting accessories
d. lifting tables
registration booklet

Answer: a, c and d

- ✓ Hoisting gear and lifting accessories must have a CE mark
- ✓ Loads must be properly attached
- ✓ Communication between operator and load supervisor (rigger) arm signals or via walkie-talkie

- ✗ Never stand under the load or within the swivel range of the crane
- ✗ Thunderstorms or strong winds are very dangerous when lifting
- ✗ Follow the manufacturer's instructions in case of strong winds
- ✗ Never lift more weight than allowed according to the lifting tables

6.6 Working with hoisting accessories and manual hoists

Various hoisting accessories are used for hoisting activities, such as chain work, steel cables, hoisting yokes and various loose (fastening) parts that you can assemble as required. But misuse, damage and overloading can lead to dangerous situations. Therefore, hoisting accessories must be inspected regularly. Periodic inspections are also mandatory.

Chains

Chains consist of several parts. There are chains with (coupling) links, hooks, swivels, rings, closures and eye bolts. You can use parts separately or together as a larger whole. That is called an assembly. Chains must indicate the maximum working load. That, together with the certificate number, is punched into the chain or it is written on a plate that hangs from the chain.
Are you going to use a chain? First check if it is not damaged. You may only load the links of a chain in the direction of the long axis of the link. If there is also side load, too much force will be applied to the chain. For this reason, it is forbidden to put the hook in or around the chain to make a loop. You should also never tie a knot in a chain or force the chain. Don't take any chances:

- Choose a chain that is suitable for the load;
- Check the chain and tools for possible damage;
- Tighten closures completely;
- Never put stress on the point of the hook;
- Do not force chains by hitting them in place with a hammer;
- You may not use chains with stretched or closed links;
- Do not allow chains to rub against sharp edges. Protect them with wood or rubber blocks.
- You may only extend a chain with special coupling links.

Steel cables

Steel cables are made from a tough core of steel or plastic. Steel wires are woven around it. An advantage of steel cables is that they are often lighter than chains. The downside is that they are quite stiff. The thicker, the less flexible. The strength of the steel cable depends on the composition, thickness and quality of the steel wire and the quality of the core.
As with chains, a periodic inspection of steel cables by an expert is mandatory. Are you going to use a steel cable yourself? Then inspect it first!
Good maintenance is very important for steel cables. They are quite sensitive to dirt and rust. Moisture, lye and acid can attack the steel, weakening the steel cable. Clean steel cables after use and grease them with acid-free oil or grease. Store cables in a dry, well-ventilated area. Regularly inspect wire ropes for corrosion and wear.

PRACTISE QUESTION

Which of the statements below is/are correct?

a. Connecting links are used to extend steel cables.
b. You may not use a steel cable if it has broken wires and frayed splices.
c. You can repair a chain yourself if a link is damaged, provided you have a welding certificate.
d. Steel cables should be cleaned and maintained after use with acid-free oil or grease.
e. If you use multiple steel cables to lift a metal beam, the maximum spread angle between the cables should not exceed 120°.
f. You may use a manual hoist if you cannot use a crane.

Answer: b, d, e and f

If you come across steel cables that display one or more of the following characteristics, you must have them rejected:

- frayed and bad splices at the end of the wire rope;
- over a greater length various broken wires ("meat hooks");
- threads that are broken in one place ("break nest");
- cable bent from the outside (bend or kink);
- reduced or uneven diameter;
- a lot of rust or wear.

Assembly

An assembly is a combination of different hoisting tools to lift a load. You can think of two or four chains (crossed). Each chain then has a hook.

Hoisting yoke

A hoisting yoke is a special assembly: a steel construction for lifting large, heavy objects. It is used when there is little space above the lifting load. A hoisting yoke can also be ideal for frequently moving the same type of load (for example containers or concrete elements). A special version of the hoisting yoke is the equator: a beam with an attachment point and two lifting eyes.

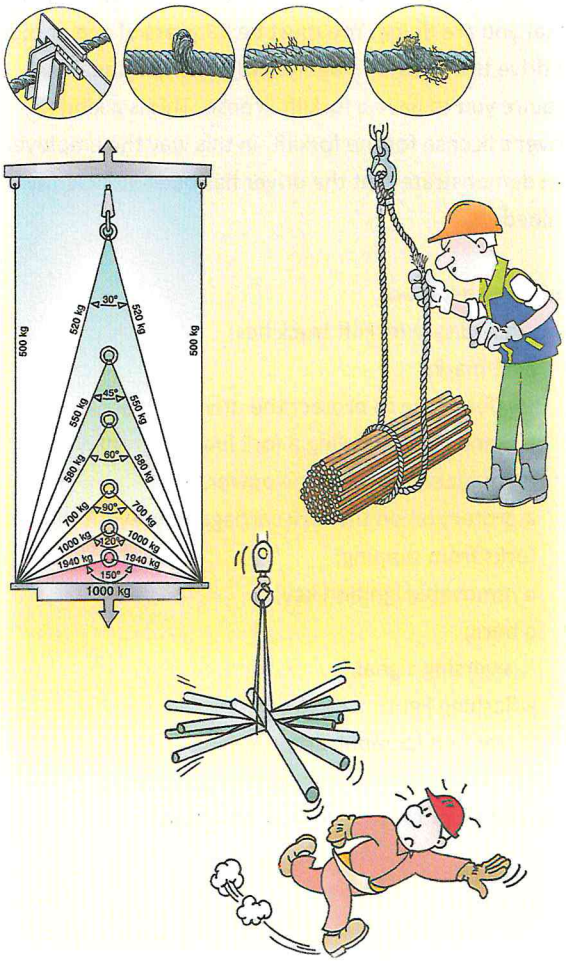
Maximum spreading angle

If you are lifting with several cables or chains, the load must be evenly distributed so that the cables "bear" the same weight. If the cables on a hoisting yoke or lifting eye do not hang straight down, an angle will be created. The greater the angle, the greater the load on the cables. Compare it to carrying a bag: if you extend your arm sideways, the bag feels heavier. In the figure you can see that if the angle is 120º, the load of each cable is 1000 kg. That is the legal maximum spread angle: 120°, but in practice a safe spread angle of maximum 90° applies.

Put the following actions in the correct order for hoisting.

a. Choose chains suitable for the load.
b. Fully tighten the links and closures.
c. Check the chain for damage.
d. Cleaning and maintenance.

Answer: a, c, b, d



- ✓ Chains and steel cables must be strong enough;
- ✓ The manufacturer indicates which specific inspections and tests are required;
- ✓ Tighten all connections properly;
- ✓ Avoid kinks, twists and knots in the chain or steel cable;
- ✓ Protect chains and steel cables from sharp corners and edges.

- ✗ You may not use damaged chains or steel cables;
- ✗ Do not carry out repairs yourself;
- ✗ Extension is only allowed with the correct materials (coupling links, swivels, etc.).

6.7 Forklift trucks and pallet trucks

Many companies use forklifts to move pallets and for storage in warehouses and on site. A forklift is a very useful tool. Unfortunately, many accidents also happen, sometimes leading to serious or fatal injuries. Many accidents can be prevented. They are usually caused by fast driving, improper use, too much load on the forks and by inattention. The use of pallet trucks also has the necessary risks.

Expertise required

To use a forklift truck safely, you need to know very well what you are doing. You must be 18 years of age or older to drive the forklift independently. Many companies require you to have a forklift license. This is a kind of driver's license for the forklift. In this way the employer can demonstrate that the driver has been sufficiently trained.

Safe forklift truck

A good and safe forklift truck has:

- a CE mark;
- a safety cage to protect the driver;
- a brand plate showing a fork load diagram, year of manufacture and engine power;
- a protection on the fork carriage to prevent the forks from slipping;
- a removable ignition key;
- a horn;
- a reversing signal;
- a flashing light;
- a seat belt (compulsory).

A forklift truck must be inspected annually.

Dangers when working with the forklift truck

Dangers and risks are:

- falling or tipping over of the load;
- tilting the forklift;
- colliding with people, goods, buildings;
- damage to goods and equipment through misuse;
- inhaling exhaust gas in an enclosed space (diesel forklift). Good ventilation is necessary.

The following safety measures are in place when using a forklift:

- the load must be spread stably over the two forks;
- you are not allowed to ride along, unless a second seat has been built in;
- A work basket on the forklift truck for lifting people is only possible if it concerns a forklift work basket combination that has been approved for that application in accordance with the applicable legislation;
- do not lift unless the forklift truck has been adapted for this purpose;
- the driver must have a good view;
- you may not make the counterweight heavier;
- you have to take people in the
- surroundings into account.
- if the load is too high you have to reverse.
- Use the available safety equipment (such as seat belt, protective gates, bar or cabins).

PRACTISE QUESTION

In the logistics center of a large transport company, a lot of work is done with forklift trucks. Which regulations must be followed with regard to working safely with the forklift truck?

a. As a driver you must be at least 18 years or older.
b. The lift truck has a seat belt. You must wear these while driving.
c. You must (legally required) have a forklift truck certificate.
d. You may use the help of a colleague to place boxes from the box pallet onto the rack.
e. If the load is too high, you have to reverse.

Answer: a, b, e

Pallet truck

A pallet truck is a vehicle with a lifting height of 20 cm, with which you can lift and move pallets manually or electrically. You have to pull a pallet truck, you cannot push it. When pulling a pallet truck, you must pay attention to the correct body position. Risks can include:

- back complaints due to incorrect working posture;
- sore shoulders and arms from pulling an overloaded pallet truck;
- pinching of fingers, ankles, feet and toes;
- the load falling;
- colliding with persons, goods, environment, damage to goods and equipment due to incorrect use.

Also make sure that the load is stable and the load is distributed between the two forks. A level surface and sufficient maneuvering space are required in order to work safely.

What should you take into account when transporting a load on a pallet truck?

a. That the load protrudes a maximum of 75 cm on both sides.
b. That the load is evenly distributed over the forks.
c. That the load is not higher than 1.5 meters.

Answer: b

- ✓ Ensure stable loading
- ✓ Make sure you have a good view and consider people in the environs
- ✓ Only work with the forklift if you have been trained and qualified.
- ✓ A forklift truck certificate is often required by the company.

- ✗ Not 18 yet? Then you are not allowed to drive the forklift independently!
- ✗ The seatbelt may not be removed
- ✗ Do not keep hands and/or feet outside the truck while driving
- ✗ Don't let anyone ride along

7 Specific working conditions

7.1 Welding, cutting and burning

Welding, cutting and burning can be done in different ways. You can weld electrically, but also with gases (oxy-fuel). Gases are also used in cutting and burning. Various dangers can occur. Due to the risks, a hot work permit is required for this type of work.

Electric welding

An arc is created by means of electric current. Due to the high temperature, metal parts are heated and melted together. The dangers and risks with electric welding are:

- electrocution;
- fire and explosion due to heat build-up and flaring glowing metal particles (splashes);
- burning of the skin or cornea (eye) due to released UV radiation;
- blinding of the eyes by infrared radiation;
- heat radiation;
- poisoning from welding fumes;
- lung disorders due to inhalation of welding fumes;
- wrong work posture.

Safety precautions

With these safety measures you can protect yourself against these dangers and risks: personal protection such as welding hood, welding apron, welding clothing, safety footwear, air-ventilated welding hood;

- welding curtains for protecting people in the vicinity against UV and infrared radiation;
- extraction of welding fumes (as close as possible to the welding point or surface to be welded);
- ventilation if extraction is not possible;
- extinguishing agents within reach;
- work permit when required.

Autogenous welding, cutting and burning

Autogenous welding, cutting and burning use a mixture of pure oxygen and gas. For example: acetylene or propane. Other dangers/risks are associated with autogenous welding. This can cause uncontrolled gas release and an explosion or fire. Acetylene is lighter than air and can accumulate in a space. Acetylene is very explosive. Propane is heavier than air and will easily accumulate in excavations, pits and trenches. Pure oxygen is also dangerous because it is highly fire-prone.
Other dangers and risks are:

- being hit by splashes of glowing material;
- fire and explosion due to heat build-up and flaring glowing metal particles (splashes);
- pressurized oxygen cylinder;
- fire and explosion due to:
  - flashback (with acetylene);
  - leakage of gas and oxygen.

With the following safety measures you protect yourself against the mentioned risks:

- wear the correct protective clothing, such as welding goggles, a welding apron and welding clothing;
- remove or cover flammable materials in your environment;
- use a flame arrestor in the hose between the acetylene cylinder and the burner (immediately after the reducer).

PRACTISE QUESTION

Which personal protective equipment do you wear for the following activities

1. electric weldin
2. cutting and burning

a b c d e f

Answer: 1 = b,c and d: 2 = b,d and f

- use backflow preventers on the burner's gas and oxygen hose;
- be aware of gas and oxygen leaks in a low-lying working environment;
- use hose rupture protection
- if you have to work in a confined space, you must continuously measure (oxygen percentage, dangerous concentrations of (smoke) gas);
- use an acetylene cylinder in an upright position or at least at an angle of 30 degrees;
- provide room ventilation and local extraction of welding fumes and gases.

What measures do you take with oxy-fuel welding?

a. You wear welding goggles and flame-retardant overalls.
b. You remove all materials from the environment.
c. You provide a fire extinguisher at the workplace.
d. You remove the flame arrestor from the appliance before use.
e. You check that there are no flammable materials near the workplace.

Answer: a, c, e

✓ Wear the correct PPE

✓ The helper must also wear the correct PPE

✓ Always have an extinguishing agent ready at the workplace

✘ Never lay an acetylene cylinder flat

✘ Leakage of oxygen or gas can cause an explosion!

✘ Do not leave cleaning cloths and other materials lying around; this can catch fire from hot splashes

7.2 Demolition work

When demolishing buildings or installations, you have to take many risks into account. Demolition work requires good preparation to prevent unforeseen circumstances as much as possible. Demolition work is therefore carried out by companies that specialize in this.

There are several dangers and risks in demolition work:

- missteps and tripping over loose materials and protruding construction parts;
- work at height;
- instability of the structure at the demolition front;
- falling demolition material;
- collapsing;
- release of hazardous substances, such as asbestos and quartz dust;
- hearing damage because of the amount of noise.

There are several safety precautions that must be takeninto account in demolition work. For example, a demolition plan is drawn up to properly coordinate the work. Calculations are made to determine the load-bearing capacity of the remaining structure during demolition. A work schedule is also included to prevent, for example, working under or above each other simultaneously. The demolition plan also contains an inventory of hazardous substances (e.g. asbestos inventory). Chutes are used to dispose of material.

PRACTISE QUESTION

1. Why is the demolition of ceramic fibers so dangerous?
   a. Dangerous gases can be released.
   b. Dangerous dust particles can be released.
   c. Dangerous fumes can be released.

2. What personal protective equipment should you use when dismantling ceramic fibers?
   a. A dust mask (P1) and safety clothing (helmet, overalls and gloves).
   b. Safety shoes S2 and overalls.
   c. A mask with P3 filter and safety clothing.

Answer: 1b, 2c

Ceramic fibers can also be released during the demolition and removal of buildings and installations.

Ceramic fibers are used in materials for insulation of installations with high temperatures. Consider, for example, process installations (petrochemical industry) or steel furnaces and steel foundries.

Ceramic fibers can be found in

- ceramic sheet material;
- ceramic molding and fillers;
- cement and hardeners
- electrical insulation material;
- flexible ceramic materials.

To remove these materials, a fixative paste is applied to limit the loosening and spreading of fibers. Breaking, drilling and sawing of material should be limited as much as possible. The material must not be discharged through the chute. It will be well packed in plastic film or bags.
Wear disposable overalls and a full-face mask with P3 filter when removing materials with ceramic fibers.

What measures must be taken during demolition work?

a. There must be a demolition plan
b. There must be a work permit
c. Gas measurements must be taken prior to the work
d. An inventory must be made of hazardous substances

Answer: a, d

- ✓ Demolition work is specialist work
- ✓ You must wear enough PPE for demolition work
- ✓ Use chutes for material disposal.

- ✗ Falling and tripping is a major danger! Fall protection is necessary!
- ✗ Do not work above or below each other without a specific plan
- ✗ Do not throw materials or demolition

7.3 Excavator

Excavation for pits and trenches is done to lay, add or repair cables or pipes. When digging you have to take into account various dangers/risks. Consider the danger of collapse of a trench or an incorrectly installed machine near a trench or construction pit. A deep excavation is considered a confined space.

Safe slope

To work safely in trenches, you must maintain a safe slope when digging. This means that depending on the type of soil and the depth of the trench, you make a certain "slope". If it is not possible to excavate a safe slope, you can apply stampings, formwork or sheet piling.

Setting up the excavator

If an excavator is not properly set up, there is a risk of it tipping over when the embankment slope is crumbled by the weight of the machine. The most favorable arrangement of the machine is with the tracks or wheels perpendicular to the longitudinal direction of the burrow. The distance from the tracks or wheels must be at least as great as the burrow is deep. Regular inspection of slopes is necessary, especially in unfavorable weather conditions because an embankment can collapse due to rainwater. Frost and thaw, as well as heavy road traffic and vibrations caused by machines, can also damage an embankment.

Prior to digging

Before you start digging, you need to know what may be in the soil. You must notify the *Cables and Pipelines Information Center (KLIC)/Land Registry* three days before the start of the work. The KLIC ensures that you know where the water pipes, electricity cables, telephone cables and gas pipes are located.

This information is indicated on drawings. Above ground there are signs and marks. If the exact location of cables or pipes is unclear, you will need to use equipment to locate the pipe.
You must make sure you have a valid digging permit. Digging may only be carried out on the instructions of the manager or contractor.
A trial trench is first dug manually, within 1.5 meters of the specified location. Deviating positions of cables and pipelines must be reported to the *Center (KLIC)/Land Registry* or to the pipeline manager. The information must be digitally available at the excavation site during excavation. To dig carefully with an excavator, use a no-toothed bucket.

Safety precautions

- provide good support and slope facilities;
- always deposit excavated soil at a safe distance from the trench;
- place vehicles, materials and equipment at a safe distance;
- make sure that the sheeting is flush with the edge of the excavation;
- place a fence around the excavation;
- do not place gas cylinders in the excavation;
- a deep excavation must have two entrances;
- there should be no gas cylinders in a deep excavation.

A deep excavation (more than 1.5 meters) is considered a confined space.

PRACTISE QUESTION

Why do you have to dig test trenches for excavation work?

a. You determine whether the soil is suitable for digging.
b. You determine the location of cables and pipes at the location where you will be carrying out excavation work.
c. You determine whether there is a risk of collapse in order to determine the correct safety measures.

Answer: b

Dangers and risks

If you are working in a trench, you can be buried by the ground due to the trench notching. This can happen due to incoming water. If you damage cables or pipes while digging, it can lead to economic damage. Think of the loss of power at companies, which means that production comes to a standstill. When you damage an electricity cable, there is also a risk of electrocution. In the event of damage to water and gas pipes, the security of supply of these products by utility companies is endangered. If you leak a gas pipe, it can cause an explosion and/or fire. There is also a risk of suffocation. When opening existing sewers and when pipes with hazardous substances are leaking, substances can be released that are harmful to the environment. Digging in and around contaminated soil can pose hazards due to hazardous substances and/or biological substances.

Supplement VOL-VCA/VIL-VCU

Incidents regularly occur during excavation work. In addition to accidents with machines or unsafe practices, damage is often also caused because people were not or insufficiently aware of the location of pipework. According to the Earthmoving Regulations (WION), the following obligations apply to digging:

- orientation by means of requesting data about the location of pipes;
- for the excavator or the actual excavator to dig carefully and provide the opportunity to do so;
- reporting damage to the cable or pipeline to the grid operator;
- mandatory reporting of every excavation activity to KLIC/Land Registry;
- Notification of anomalous location (deviation> 1 meter) and the presence of an unknown network (so-called orphaned pipeline) to KLIC/Land Registry;
- only dig (or have it dug) when KLIC/Land Registry information is available.

You will carry out excavation work for laying cables and piping. Put the activities in the correct order:

a. Pre-cutting and digging a trial trench.
b. Excavation with excavator.
c. Make a KLIC report.
d. Check embankment, stamping and sheet piling.

Answer: c, a, b, d

✓ Prepare excavation well
✓ First precut and dig a trial trench
✓ Provide two entrances for deep excavations

✘ Digging in polluted soil can release hazardous substances or fumes
✘ Hit a cable? Report to the supervisor and line manager
✘ Do not place gas cylinders in a deep trench

7.4 Working at heights

Working at heights is very risky. Many people suffer serious, often permanent injuries from a fall. The H&S legislation is very clear about what should be understood by "high": all the work that must be done from a standing height of more than 2.5 meters. Even when working from a dangerous point, above moving parts or, for example, above the water surface, where there is a risk of falling, safety measures are mandatory.

Working at heights: from 2.5 meters
From 2.5 meters, safety measures must be taken to protect the workplace and employees. For example, think of:

- setting up a safe scaffolding;
- making work floors;
- the use of roof edge protectors;
- the use of fences, handrails with intermediate handrail and plinth (edge molding);
- the use of fall protection (safety harness).

If you start working at heights, you will receive instruction. You may of course not remove any installed protections.

Weather conditions
If you work on flat or sloping roofs you should always keep a close eye on the weather. You can slip with rain and slippery conditions. A strong gust of wind can be enough to throw you off balance. Many people have already fallen as a result, resulting in serious injuries or even fatalities!

Sloping and flat roofs
The construction of a roof can be dangerous. If it is not strong enough, you can easily fall through. With sloping roofs, use gangways in such a situation.

The gangways are fitted to the roof supports. Roof edge protections should be installed at the edges of sloping roofs and safety nets should be hung under large openings in a roof. Only if these (collective) measures are not possible, you use a safety harness.

Flat roofs
If you work within 4 meters of the edge of a flat roof, or there is a risk of falling off the roof, roof edge protection and/or safety nets (collective protection) are mandatory. If that is not possible, a safety harness is mandatory.

Wall and floor openings
If wall and floor openings are not properly closed, you can make a nasty fall. You can also be hit by an object that falls through a floor or wall opening. You can usually easily prevent these unsafe situations.
Seal the recesses in floors with a sturdy, load-bearing material, which is attached to the substrate. If that is not possible, install proper cordons. Wall openings can be closed off with handrails and fences. In general, if security is not possible, highlight the danger and make sure that people cannot easily get close to it. In addition, it is often necessary to use personal protective equipment.

PRACTISE QUESTION

A number of roof tiles are broken and need to be replaced. How can you best move around on the sloping roof?

a. by using gangways;
b. by sliding a number of pans upwards and thus creating a staircase;
c. by laying a ladder against the roof surface

Answer: a

You will be carrying out work on a roof at a height of 6 meters. Put the measures in the correct order (by priority):

a. Apply roof edge protection
b. Work more than 4 meters from the edge of the roof
c. Use a safety harness with a lanyard

Answer: b, a, c

- ✓ Always check whether guards, handrails and the like are in order
- ✓ Always use the correct PPE
- ✓ Close floor openings if possible
- ✓ Block wall openings with fencing and railings.

- ✗ Do not work without roof edge protection or fall protection
- ✗ Do not work on the roof if it is not load-bearing enough
- ✗ Dangerous situation? Report directly to the supervisor!
- ✗ Bad weather conditions and strong winds can be dangerous.

7.5 Materials for working at heights

There are several ways to work at heights. You can use a ladder, stairs or scaffolding, but also, for example, an aerial work platform or a work basket. Which means your choice depends on the situation and which activities you will be carrying out.

Ladders

In principle, you may only use a ladder to climb to another level or floor. If no other, safer solution is demonstrably possible for technical reasons, you may also use a ladder or staircase to carry out light and short-term work, such as inspection work or replacing a lamp. Make sure you don't have to reach beyond one arm's length. The following operating instructions also apply:

- the ladder is approved and provided with an inspection sticker
- the maximum working/standing height on a ladder is 5 meters;
- the standing time is a maximum of 2 hours;
- push and pull: do not apply more force than 50N (5 kg);
- above wind force 6 you are not allowed to use a ladder;
- place metal ladders 2 meters from live parts.

Set up properly

A ladder stands safely on a hard, solid surface with sufficient free space around it. The ladder must always be sloped, at an angle of 75 degrees. You can check this by standing with your feet against the bottom and grabbing the ladder beams with your arms straight ahead (see illustration). Also make sure that you do not place the ladder backwards or upside down. The sliding part of the ladder should be on top, towards your face. You should not set up ladders that are too big or too heavy on your own. Furthermore, an (access) ladder must protrude at least one meter above the floor where you have to get off. When the ladder is extended, the two ladder parts must sufficiently overlap each other. How much is stated in the manufacturer's terms of use. Never climb a ladder higher than the fifth step from the top, so that four steps are always free. Never place a ladder against a glass pane or window. For this you need a special cross support. Secure the ladder at the bottom against slipping or sliding, at the top against slipping sideways. Keep access to the ladder free of obstacles. Block doors and passageways behind the ladder. Keep the steps and ladder shoes clean.

Do not climb a ladder with slippery or dirty soles. Go up the ladder facing the ladder. Always have three points of contact with the ladder: two feet and one hand or two hands and one foot.

Steel scaffolding

Upright steel scaffolding cannot be moved and is assembled by a specialized scaffold builder and trained, certified scaffolding fitters. Before a scaffold is erected, stability calculation(s) and drawings of the scaffolding are made.

PRACTISE QUESTION

There are various aids for working at height. Indicate which aids you use for the following activities.

1. Cleaning windows;
2. Painting on window frames and facade of an office building without a floor;
3. Replacement of fluorescent lamps on the ceiling in the factory hall;
4. Jointing of the facade of a four-story building;
5. Replacing the outdoor lamp at the front door of the school.

a. Ladder
b. Mobile scaffold
c. Fixed steel

Answer: 1a, 2b, 3b, 4c, 5a

A competent supervisor (scaffolding inspector) is present during the transfer from the assembly company to the client. Special instructions are available for the construction or conversion of the scaffolding. You are not allowed to make any changes to the structure yourself. A number of rules apply to the safe use of scaffolding:

- you must have received instruction or training to be allowed to work on scaffolding;
- no tools or materials should be left on the scaffolding floor;
- Sprinkle floorboards with sand, salt or absorbent material to prevent slipping;
- You are not allowed to work on stairs or a ladder on the scaffolding floor.

The scaffolding card (or scafftag) indicates whether the scaffolding has been inspected and can be safely accessed. The scaffolding may not be loaded more heavily than indicated on the scaffolding map.

Mobile scaffold tower

Mobile scaffold towers are equipped with wheels, making them easy to move. The scaffolding is set up more firmly with stabilizers. They must be securely fastened to prevent slipping. The surface must be hard and flat. If this is not the case, provisions such as rails must be installed. The manufacturer's instructions and regulations indicate how the scaffolding must be erected and used. The following safety precautions apply:

- the wheels must be locked before entering;
- climb the rolling scaffold from the inside;
- the stabilizers must remain as close to the ground as possible when the mobile scaffold is moved;
- no persons or material on the scaffolding while moving;
- only move on flat, hard surfaces;
- keep the work floor tidy to prevent falling and tripping. Material must be raised in a safe manner

What requirements apply when working on scaffolding?

a. You must wear a safety harness.
b. Do not leave any material on the scaffolding floor.
c. Working from the ladder is allowed.
d. A valid scaffolding card must be attached to the scaffolding.

Answer: b, d

- ✓ It is safer if you secure the ladder at the top and bottom
- ✓ Make sure that the ladder's locking hooks are always properly locked
- ✓ Safe scaffolding is provided with a scaffolding card
- ✓ Use all supplied parts and aids from the mobile scaffold tower, including the stabilizers
- ✓ Apply the brakes on all wheels before anyone steps onto the mobile scaffold

- ✗ Never leave a ladder unattended
- ✗ Do not use unsuitable materials and do not carry out repairs yourself
- ✗ Do not move a rolling scaffold if someone is still on it
- ✗ Do not move the mobile scaffold alone; do this with two people
- ✗ Do not place a mobile scaffold on a sloping surface

7.5 Materials for working at heights (continued)

In addition to ladders and (mobile) scaffolding, aerial work platforms and suspended scaffolding are also used for working at height. For special work at height, such as inspection work of high buildings, use can be made of work baskets in a crane.

Aerial work platform

Aerial work platforms are devices with which you can bring people or material upstairs. Aerial work platforms are used, among other things, for steel construction works and maintenance work, in construction and in landscaping. There are different types of aerial work platforms, such as telescopic and scissor lifts, self-propelled aerial work platforms, or aerial work platforms on a trailer, truck or delivery van. Mobile aerial work platforms can also be moved while they are extended. This is not possible with fixed aerial work platforms, because they are supported on the ground (for example scissor lift structures).

Requirements

There are a number of requirements, such as:

- a valid inspection certificate;
- a visible inspection sticker;
- a plate with the maximum loadable weight;
- a user manual;
- clear indications for operation;
- CE mark.

Risks

There are a number of specific risks associated with the use of aerial work platforms:

- you can get trapped between object and platform (especially with scissor lifts);
- the aerial platform may tip over;
- you can fall out of the box/fall off the platform;
- you can cause a collision;
- objects may fall out of the tray;
- there is a risk of electrocution, for example when working in the vicinity of electrical overhead lines of, for example, tram tracks.

To be able to work safely with an aerial work platform you must have had an instruction (demonstrably tested expertise).

Use

A speed limiter is active when the aerial work platform is extended. That is why it is better to retract the aerial work platform first for longer distances and when crossing the road. You may only move an aerial work platform if the main boom is down and the basket is in neutral, with the stabilizers retracted (see also the manufacturer's instructions for use).
You need fall protection in the basket of the aerial platform (safety harness with connecting line).
The connector is attached to an attachment point in the work basket. Furthermore:

- an aerial work platform must be horizontal, also on (slightly) sloping terrain;
- above 25 meters you must use a walkie-talkie;
- when working in a risky environment, a supervisor must be present on the ground.

PRACTISE QUESTION

You and a colleague will clean the facade of a large 28-meter high office building. A suspended scaffolding is available. The suspended scaffolding is operated in a room on the roof. Which safety precautions should you observe?

a. One person must remain with the operator.
b. In the suspended scaffold you must wear a safety harness and bring a walkie-talkie.
c. In the suspended scaffold you have to wear a safety harness and secure the materials with rope.
d. Before starting work, you must check and test the suspended scaffold.
e. Only the suspended scaffold operator must have received training or instruction.

Answer: a, b and d

Suspended scaffolding system

A suspended scaffold is a work platform, attached to the roof or the facade of a building. There are counterweights or a rail system on the roof. This allows the tray to hang at any desired height. For safe use of a suspended platform installation (also called suspended scaffolding), also follow these guidelines:

- cordon off the part of the site under the suspension bridge installation with ribbon or fences;
- test the installation before use;
- always wear a safety harness attached to a special attachment point;
- if there is no or limited eye contact between the operator and people in the suspended platform installation, you must use means of communication;
- never leave a suspended platform installation ready for use and unattended;
- if there are defects, you may not use the suspension bridge installation;
- only specialized personnel may carry out repairs;
- leave the suspension bridge installation in case of malfunctions;
- you may never leave the suspension bridge installation at height;
- never exceed the maximum load.

In order to safely handle a suspended scaffold or suspended scaffolding system, you first need thorough instruction. Only then will you be knowledgeable enough to operate such a device. With some suspended scaffolding, the controls are not in the box itself, but on the roof of the building. In such a situation, the operator may of course not leave if there are still people in the basket!

Work basket

A work basket is a steel container suspended from a crane to bring persons on height. The use of a work basket is only permitted when no other suitable work equipment or working methods are available. for instance; with ladders, scaffolding or aerial platforms to get to the site to do (inspection) work. The operational - manager gives two days in advance report to the NLA. The work tray is only to be used if all legal conditions are met. (additional safety plan, TRA, Specific work permit, etc.)

The work basket itself must:

- be approved; there must be written evidence of this;
- have information on the outside about: permissible workload; own mass, permissible number of people.

Furthermore, the following applies:

- persons in the work basket must wear a safety harness, which is attached to a special attachment point in the work basket;
- there must be good means of communication, so that the crane driver and crew in the work basket can understand each other;
- there must be eye contact between the driver and the crew in the work basket;
- one person in the work basket gives instructions to the crane operator.

What requirements apply to the operation of an aerial work platform?

a. You must set up the aerial platform on a flat surface.
b. Safety harness is mandatory above wind force 6.
c. You must have been instructed.
d. You may only leave the work cage at a height when you are on a leash.

Answer: a, c

- ✓ Provide a flat and solid surface for the aerial platform
- ✓ Always turn the stabilizers off completely
- ✓ Check the aerial platform or suspended scaffold for defects before each use
- ✓ Then also check the operation of the emergency control
- ✓ Above 25 meters height? Use a walkie-talkie or mobile phone!

- ✗ You may not just move an extended aerial platform
- ✗ You are not allowed to leave an aerial work platform, suspended scaffolding or work platform at height
- ✗ Hoisting with an aerial work platform, suspended scaffolding or work platform is prohibited
- ✗ In the event of upcoming thunderstorms and bad weather conditions, it is not permitted to work with an aerial work platform or suspended scaffold.

7.6 Confined spaces

Most workplaces are designed in such a way that you can work well. However, there are also areas that are less pleasant and safe to work in: work areas that are very small, difficult to reach or poorly ventilated. In such spaces there are usually insufficient or no facilities such as light and stairs/landings. In these so-called confined spaces it is quite a job to do your work safely. They are areas of increased danger for all involved.

Characteristics of a confined space can be:

- narrow, small, wet, smooth and there is little room for movement;
- a place that is not usually intended for the residence of persons;
- little or no natural ventilation;
- difficult to access and therefore also difficult escape options;
- poor lighting;
- cables and pipework in unexpected places.

Examples are carrying out work in containers, ship tanks and double bottoms, storage reservoirs or storage tanks, (welding) tents at excavations and pipelines, cellars, or the crawl space of a house. Working in confined spaces entails a number of important risks. You need to take measures to reduce risks. You often also have to deal with special work permits.

Fire and explosion hazard

Because there is little or no ventilation in a confined space, hazardous substances stick around more. As a result, the lower explosive limit (LEL) is reached earlier. Substances 'introduced' can also cause problems. Just think of drying paint (the solvent evaporates) or leftovers of petrol and leaking oxygen lines. Activities such as welding, cutting or grinding can cause sparks which can ignite the dust or fumes present. Leakage of oxygen from pipes or oxygen cylinders can also create additional fire and explosion hazards. This can be prevented by applying hose rupture protection and not placing oxygen and gas cylinders in the confined space.

Choking and poisoning

An oxygen deficiency can occur in a confined space. This can lead to drowsiness, unconsciousness or death. Therefore, it must always be checked whether there is adequate ventilation. In addition to a lack of ventilation, oxygen deficiency can occur because oxygen is extracted from the air, for example through rust (corrosion). Products can also be released into the room, for example due to fermentation of germs and seeds (bacteriological and biological reactions), or the curing of paint or coating. Oxygen can also be displaced by carbon dioxide, nitrogen or other inert gases, which are used, for example, to prevent spoilage of vegetables and fruit. A lack of ventilation can also lead to a concentration of toxic substances. If this concentration exceeds the limit value, it can lead to becoming unwell and poisoning.

PRACTISE QUESTION

You will work in a confined space and must use independent breathing air (compressed air). Which statement is correct?

a. You can always work with breathing air if only one TRA has been done beforehand.
b. You must be medically approved to use independent respiratory protection.
c. You may not use independent respiratory protection in a confined space.

Answer: b

Electrocution

Extra clothing and poor ventilation make you sweat more quickly. A moist body and clothing conduct electricity well. In a confined space, conductive walls can also pose a risk (e.g. in tanks). Therefore, when using electrical equipment in a confined space with conductive walls, you should use a relatively safe voltage (50V~/120V=). If electrical equipment is already present in the room, it must first be properly de-energized.

Moving parts and pipework

Moving parts also pose a risk in a confined space. They must therefore first be taken out of service by an expert and locked. Pipes that are connected to the confined space must also be disconnected or blinded, for example with a plug-in flange.

Preparatory measures

Preparatory measures include cleaning and drying the room as much as possible and measuring the ambient air in the room.

- oxygen percentage no lower than 19% (otherwise you must use independent respiratory protection);
- concentration of toxic substances/vapors must be lower than the limit value of these substances;
- concentration of flammable/explosive substances must be less than 10% LEL.

Furthermore, the following measures must be taken:

- post warning and prohibition signs against unauthorized access;
- there is a valid work permit and written release;
- adequate air exchange/ventilation.

You are going to do cleaning work in a storage tank. Which security measures apply?

a. More than 10% LEL may be measured.
b. Use of power tools with 50V~.
c. Use self-contained respiratory protection with less than 19% oxygen.
d. Manhole guard present during the work.

Answer: b,c,d

The manhole guard or safety guard must be present to observe the situation permanently. This supervisor checks the measurements of the ambient air and communicates with the people in the enclosed space. In an emergency, he alerts the emergency services.
A manhole guard must be demonstrably trained. (see section 1.7)

Extra measures for risk-increasing work

If there are welding and cutting activities in the confined space, combustible materials must be removed or covered as much as possible. A suitable extinguishing agent must always be available and additional extraction of the welding fumes is necessary. Gas and oxygen cylinders should not be placed in the confined space and hoses should be properly checked for leaks.

In addition to independent respiratory protection, additional PPE may also be required, such as a gas suit when there is gas or vapor with a risk of absorption through the skin.

Lifelines are used when working in confined spaces, unless it presents additional danger to the user. For example when the line is becoming tangled and trapping you.

- ✓ Wear adequate personal protective equipment
- ✓ Always work with at least two people
- ✓ One person is a safety guard (manhole guard)
- ✓ Measure first (oxygen, limit values and LEL), then go inside
- ✓ Measurements must be carried out by qualified experts
- ✓ A good communication procedure is required (work permit)
- ✓ A good emergency procedure is needed.

- ✗ Not yet 18 years old? Then you are not allowed to work in confined spaces! The manhole guard must also be 18 or older!
- ✗ Gas/vapor concentration 10% LEL or higher? That is not safe!
- ✗ Is there less than 19% oxygen? Then it is not safe without independent respiratory protection!
- ✗ Is the measured concentration of toxic substances more than the limit value? Then only enter with independent respiratory protection.

Summary

Chapter 4 The workplace

There are several causes of workplace accidents. According to the Working Conditions Act, the employer and employee must jointly ensure a safe working environment. This is not only important for you and your colleagues, but also for the safety of third parties.

For the Occupational Health and Safety legislation, the design of the workplace mainly concerns the health and well-being of the employee. Because by setting ergonomic preconditions for machines, tools and utensils you protect people's health. Environmental factors also play a role in well-being in the workplace. The supervisor is involved in various ways. Not only for his own workplace, the workplace of the employees, but also when drawing up the RI&E and, for example, in the work preparation.

In addition to risks from the work environment, there are also risks as a result of work that puts stress on the body. We speak of physical strain when you are going to lift, pull or push or when you work a lot in a certain position. Physical strain can also arise from the tools or machines you use. In addition to machines, tools and environmental factors, physical strain (exertion, movement, posture) and mental strain are also decisive for a healthy workplace.

There are many workplaces where you cannot just go to work. Examples include working in cellars, a confined space, but also on or near process installations, electrical installations and industrial working environments. First, measures will have to be taken to safeguard the working environment, so that the work can be carried out.

The H&S legislation indicates that a good prevention approach also includes signaling. In the workplace you come across different types of signs, pictograms and signals.

Chapter 5 Personal protective equipment

There are several things you can do to limit the "risks of the job". The best solution is to combat dangers at the source. This is not always possible and therefore various measures are taken, such as shielding the machine or extraction. But whatever measures you take, an accident can always happen. To be protected, you use personal protective equipment, or PPE for short.

There are many different PPEs to protect your body. Often you use more than one at a time. In addition to the use of overalls, other PPE are also worn such as safety helmets, gloves, safety shoes and boots.

You really need your eyes at work. So protect them well against the many risks, even if you wear glasses. Various PPEs are available for this, such as safety glasses, safety goggles and safety face shields.

If there is too much noise, you can no longer understand each other. To protect your ears from too much harmful noise, you must wear good hearing protection.

If you have to work at heights, you must of course first make sure that you cannot fall down. Sometimes, however, it is not possible to take enough safety precautions. Then you use fall protection. You also do this in situations such as working in a work basket or hanging scaffolding and, for example, when working above water.

Respiratory protection is necessary when there are harmful substances in the air or when the oxygen content in the air is too low (less than 19%).

Chapter 6 Work equipment

There are many different types of work equipment, each with its own dangers and risks.

Fixed machine tools are machines that are permanently installed in one place. Examples are the pillar drill, grinders and sawing machines. We also count lathes, milling machines and planing machines among the machine tools. You can be injured by rotating or sharp parts. Good instruction on the use of the machine is therefore necessary. You must also use the correct PPE.

Hand tools can be driven in different ways: electric, hydraulic and pneumatic or with a petrol engine. Working with hand tools, whether or not with drive, entails risks. Defective tools, poor maintenance and incorrect use cause many injuries every year; sometimes with lasting consequences. Good workmanship and checking of the tool before use are required to work tidy and safely. In addition, there are various safety requirements, also for "simple" hand tools.

You cannot or may not lift everything. For heavy objects, aids such as hand trucks and forklift trucks are therefore indispensable. And for moving large objects vertically and horizontally, you cannot do without hoisting equipment, such as cranes and hoists. Various hoisting accessories are used in hoisting activities, such as chains, steel cables, hoisting yokes and various loose (fastening) parts that you can assemble as required. But misuse, damage and overloading can lead to dangerous situations. Therefore, hoisting accessories must be inspected regularly. Periodic inspections are also mandatory.

A forklift truck is a very useful tool for moving pallets and for storage in warehouses and on site. Many forklift accidents are caused by fast driving, improper use, too much load on the forks and carelessness. The use of pallet trucks also has the necessary risks. In addition to the necessary safety measures, proper education and training is necessary.

Chapter 7 Specific work conditions

Various dangers can arise with specific work, such as welding, burning and cutting. Major hazards are fire and radiation resulting in eye damage. Due to the risks, a hot work permit is often required for this type of work.

When demolishing buildings or installations, you have to take many risks into account. Demolition work requires good preparation to prevent unforeseen circumstances as much as possible. Demolition work is therefore carried out by companies that specialize in this.

Working at heights is very risky. Many people suffer serious, often permanent injuries from a fall. The H&S legislation is very clear about what should be understood by "high": all the work that must be done from a standing height of more than 2.5 meters. Safety measures are also mandatory when working from a dangerous point, above moving parts or, for example, above the water surface, where there is a risk of falling.

Excavation for pits and trenches is done to lay, add or repair cables or pipes. When digging you have to take into account various dangers/risks. For example, the danger of collapse of a trench or an incorrectly installed machine near a trench or construction pit. A deep excavation is considered a confined space. Deviating positions of cables and pipelines must be reported to the KLIC or the pipeline manager.

There are several ways to work at heights. You can use a ladder, stairs or scaffolding, but also, for example, an aerial work platform or a work basket. Which means your choice depends on the situation and which activities you will be performing. In addition to ladders and (mobile) scaffolding, aerial work platforms and suspended scaffolding/suspended scaffolding systems are also used for working at heights. For special work at heights, such as inspection work of high buildings, use can be made of work baskets in a crane. This is only allowed under very strict conditions.

Most workplaces are designed in such a way that you can work well. However, there are also workspaces that are very small, difficult to access or difficult to ventilate. In such spaces there are often insufficient or no facilities such as light and stairs/landings. In these so-called enclosed spaces, carrying out work is risky.

Questions

1. Safeguarding an installation means that it is made to be pressure-free and voltage-free. To secure the installation, an authorized person must perform the following actions. Put them in the correct order:
   .... the authorized person.
   .... checks whether the installation has been secured.
   .... ensures that the installation is secured against being switched on again by means of a lock.
   .... ensures that the installation is taken out of service.

2. Dirk takes a tour of the company and checks the safety provisions and the associated pictograms. Dirk first checks the fire extinguisher in the hallway, then the emergency exit. He also checks the first aid kit and finally walks to the assembly point. Put the icons below in the correct order of the tour.


.....


.....


.....


.....

3. A large sliding door must be placed at the back of a building. This facade can only go over the roof behind the building. For the operator of the crane, please put the steps below in the correct order:
   .... LMRA.
   .... Stamping of the crane.
   .... Attach the load correctly.
   .... Making an assembly.

4. You are going to check the siding of a building. The building is 6 meters high.
   There are several ways to perform this check. Put in the correct order; start with the safest way.
   .... using an aerial work platform operated by an experienced colleague
   .... from a ladder against the facade
   .... with a mobile scaffold tower

5. In an apartment building you are painting the staircase with your colleagues. You work with a mobile scaffold tower. How can you ensure that residents and visitors of the building walk safely around your mobile scaffold tower? Multiple answers can be correct.
   - O Yellow-black ribbon hanging from the door out to the elevator/stairs access
   - O Apply yellow line to the floor from the door to the stairs/elevator
   - O Place a barrier around the workplace, so that it is separated from the walking route
   - O Apply a white stripe to the floor from the door to the stairs/elevator
   - O You do not have to do anything, because the activities are only temporary
   - O You warn everyone when entering the staircase
   - O If possible: close access and refer to another entrance

6. Hearing protection can prevent noise deafness. But not all hearing protectors offer the same level of protection. Put the protective equipment in the correct order, starting with the most protection.
   .... Wads.
   .... Plugs.
   .... Earmuffs.

7. What is mandatory when using a suspended scaffold installation?
   a. Only operated by personnel with a VCA diploma
   b. The use of a scaffolding card
   c. The use of a safety harness

8. During welding activities, there are also dangers and risks for people in the vicinity of the welding activities. Choose the right measure for the risk.

Risk	**Measure**
A. Blinding of the eyes due to infrared radiation.	Prepare extinguishing media
B. Lung disorders due to inhalation of welding fumes.	Use of flame arrestor
C. Flashback	Keep bystanders away or provide correct PPE
D. Fire	Welding curtain
E. Being hit by welding spatter	Ventilation

9. You must perform maintenance work with an aerial work platform.
   Put the following actions in the correct order, by priority.
   .... check the workplace that it is free of obstacles
   .... setting up the aerial work platform
   .... secure fall protection in the work basket of the aerial platform
   .... Move the aerial work platform to the workplace

10. Connect the signs below with a line to the correct meaning

   a. No drinking water
   b. Face protection mandatory
   c. Danger of high temperatures
   d. Do not touch
   e. Danger of falling
   f. Eye protection mandatory
   g. Danger of oxidizing substances
   h. Respiratory protection mandatory
   i. Authorized access only

Extra questions for VOL-VCA & VIL-VCU

11. What is an example of source control in excavation work?
    a. Placing two ladders in the excavation.
    b. A deep excavation to be regarded as a closed space.
    c. Placing excavated earth at a safe distance.

12. What do you know when you see this sign hanging at the entrance of a site?

    a. Open fire and smoking prohibited.
    b. That you are obliged to bring an extinguishing agent.
    c. That you only have access if you have taken a firefighting course.

13. You will be in charge of a group of new employees. They will work in the company's mechanical woodworking industry. Employees in this workshop have to deal with a lot of noise. What measures must be taken for these employees? Multiple answers can be correct.
    O From a noise level of 80dB(A), the employer offers the possibility of a hearing test
    O From a noise level of 80 dB(A) you make hearing protection available
    O From 85 dB(A) you require everyone to take part in a hearing test
    O From 85 dB(A) you require everyone to wear hearing protection
    O From 90 dB(A) you indicate with signs where hearing damage can occur
    O From 95 dB(A) you make a management plan with measures to combat hearing damage

14. You work for a company that puts cables in the ground. The excavation scheme sets the following requirements for this work
    (Multiple answers may be correct)
    O Digging must be done carefully.
    O You must take safety precautions.
    O An abnormal location of a cable should only be reported if it concerns a new cable.
    O You are obliged to report to the KLIC / Land Registry.

15. The sign below is on the fence around an installation of a large factory. What can you deduce from this?

    a. There is an explosive zone, anti-static clothing is required here.
    b. There is a potentially explosive atmosphere in the installation, but no further requirements are imposed.
    c. There is an explosive zone; there is no work here.

Koninklijke PBNA

Theme C

Managing specific hazards

8 Hazardous Substances

8.1 Risks and safety measures for hazardous substances

Hazardous substances come in various forms. In solid and liquid form, as a gas or mist, as a dust or vapor. The effect that inhaling or absorbing a substance has on you depends on the amount and fineness of the substance that you inhale/absorb. But the temperature, ventilation and the presence of other substances also play a role.

You can recognize hazardous substances by pictograms and labels with instructions on the packaging. You can classify hazardous substances according to the type of danger they entail:

- explosive;
- oxidizing;
- (extremely) flammable;
- (highly) toxic;
- harmful;
- irritating;
- abrasive or corrosive;
- a long-term health hazard;
- environmentally hazardous;
- sensitizing;
- gases under pressure.

Explosive substances explode easily; also without the addition of extra oxygen (for example ammunition, TNT (explosives), gunpowder).

Oxidizing or fire-promoting substances give off oxygen when heated, and therefore react violently with other (flammable) substances, which is very fire-promoting. There is also danger to the skin. Examples are ozone and hydrogen peroxide

(Extremely) flammable substances can burn very easily, even at normal ambient temperatures (21°C) (e.g. petrol, acetone, white spirit).

This pictogram has 3 meanings:
Harmful substances cause fewer symptoms when swallowed, inhaled or in contact with the skin than with toxic substances (e.g. paint, lacquer,).
Irritant substances can cause inflammation in contact with skin, eyes and mucous membranes.
Sensitizing substances can cause allergies.
Examples include certain resins, dyes, some paints, various types of sawdust, metal treatment agents and hair dyes.

Corrosive substances attack the skin, eyes, lungs and clothing on contact (for example acids and lyes (bases)).

PRACTISE QUESTION

Which hazard symbol belongs to the following substances and which safety measure belongs to it?

1. Turpentine
2. Hydrochloric acid
3. Weed killer

a. Use chemical gloves;
b. Do not mix with other products;
c. Ventilate the area well.

A B C

Answer: 1C and c, 2B and a, 3A and b

Long-term health hazard: this includes carcinogenic substances such as asbestos, benzene, vinyl chloride and, for example, diesel smoke (particulate matter).

Environmentally hazardous substances are dangerous to the environment and animals (for example propellants (CFCs), certain pesticides).

(Very) toxic substances have a high risk of symptoms by ingestion, inhalation or contact with the skin, for example carbon monoxide and H2S (inhalation), methanol and benzene (ingestion, contact with skin).

Gases under pressure are, for example, liquefied gases, such as oxygen, gases in cylinders.

A warning is given for *asbestos* via text on a label.

Hazard diamond; label for tanks and barrels (especially in the (petro) chemical industry).

example sign for the transport of hazardous substances.

What should be on the label of packaging containing hazardous substances?

a. What you can use the product for;
b. Who may use the product;
c. Which PPE to wear during use.

answer: c

The Environmentally Hazardous Substances Act stipulates that all small packaging of hazardous substances must bear a clearly visible label with the following basic information about the contents of the packaging:

- the (chemical) name of the substance;
- the hazard symbol/hazard pictogram;
- risk and danger phrases: H-phrases (Hazard);
- preventive measures and safety advice: P-phrases (Precaution);
- the name of the manufacturer/supplier.

The text on the label must be in Dutch. The above information is included in the safety data sheet or Material Safety Data Sheet (MSDS). The manufacturer or supplier must make this information available to the customer or user.

You can also find R and S phrases on older labels. R phrases (Risk) are comparable to the new H phrases. S phrases (Safety) are comparable to the new P phrases.

Transport of hazardous substances

Hazard symbols are also used to transport hazardous substances safely by road, water and inland waterways and rail. These are diamond-shaped hazard symbols (with the corner pointing up). The color depends on the hazards of the substance (category). This category is also related to the danger that can occur during transport (ADR regulations for the transport of dangerous goods).

- ✓ Store hazardous substances as indicated on the packaging or product information sheet
- ✓ Stock records must be kept for hazardous substances
- ✓ Always use the correct PPE.

- ✗ Never work with hazardous substances from packaging where the label is missing
- ✗ The supplier must provide information about the hazards and regulations for processing the substance
- ✗ A user manual in Dutch should be included with the packaging

8 Hazardous Substances

8.1 Risks and safety measures for hazardous substances (continued)

For the safe storage and use of hazardous substances, it is important to be well aware of the dangers of these substances. Safety data sheets provide information about the substance and which safety measures must be taken. Additional information about labeling and, for example, the hazard diamond is also included.

Safety data sheets

Safety data sheets or Material Safety Data Sheets (MSDS) are prepared by the manufacturer or supplier. They must be made available to the customers and users of the product.

The safety data sheet contains information about:

- the composition of the substance;
- the limit values (previously the MAC values);
- the method of admission;
- the immediate dangers;
- first aid, firefighting and spillage clean-up measures
- the labeling for storage and transport
- the method of storage.

Companies often use large barrels and tanks for the storage and transport of hazardous substances. In order to be able to quickly identify the dangers, the barrels or tanks are equipped with a so-called hazard diamond. The hazard diamond comes from an international standard, the NFPA code; National Fire Protection Association. The use of the hazard diamond is not required by law.

Hazard diamond

The hazard diamond has four compartments, each with a different color. Each box indicates the type of hazard and its height (numbers 0 to 4) (see figure).

The meaning of the subjects:

- The left box is blue and we call it the H box; H = health.
  The number indicates the health hazard. A 0 means "no danger", 4 indicates "life-threatening".
- The top box is red and we call it the F box; F = fire.
  The box indicates the fire hazard. A 0 means "non-flammable", 4 indicates "highly flammable".
- The right box is yellow and we call it the R box; R = reactivity.
  The box indicates the reactivity. A 0 means that the substance is stable even in the event of a fire, 4 indicates that the substance can explode even at normal temperature.
- The bottom box is white and indicates details. An empty box indicates that it is allowed to be extinguished with water. If there is a ₩, it is absolutely not allowed to be extinguished with water. The international radioactivity sign warns of the dangers of a radioactive substance.

PRACTISE QUESTION

In which of the situations below can you find the hazard diamond?

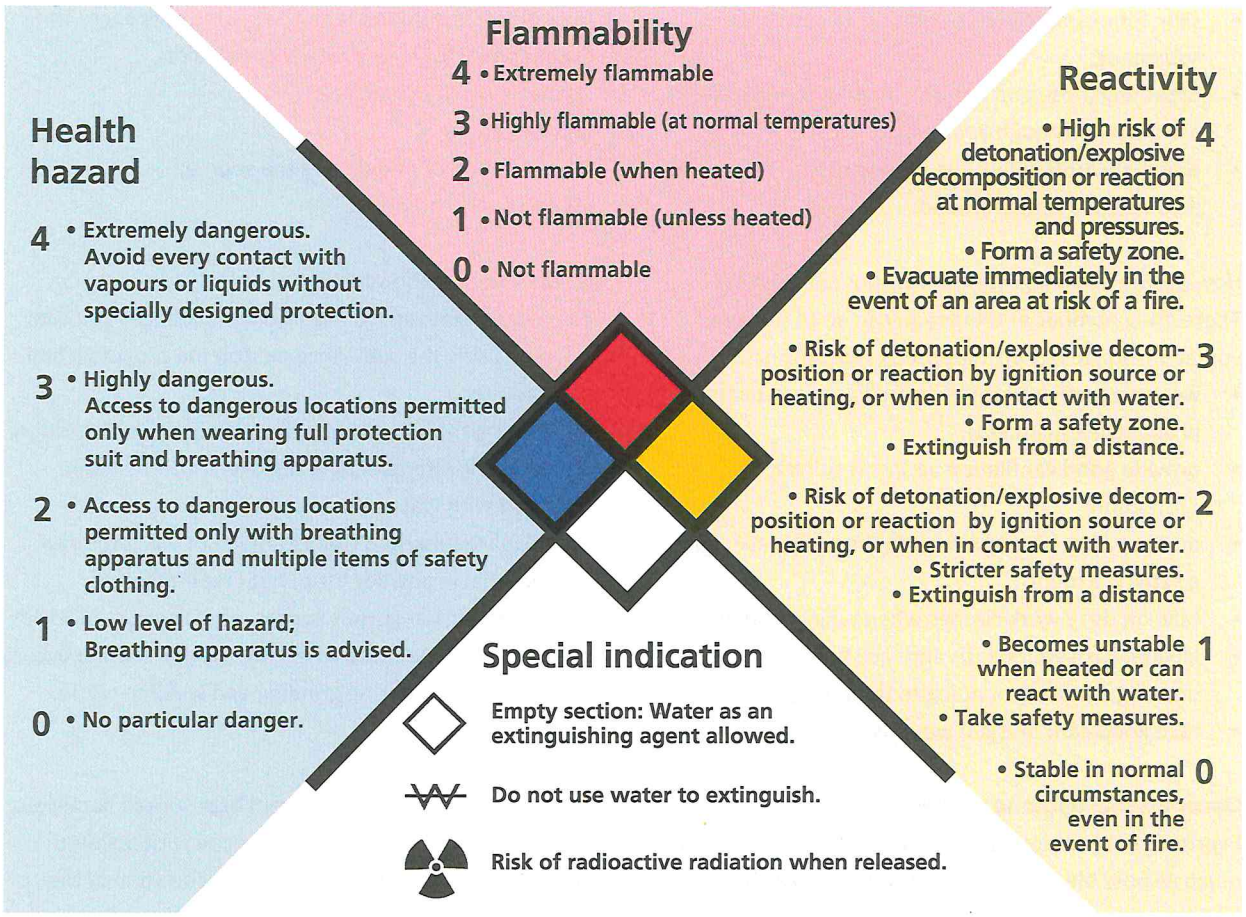
a. On a 200-liter drum with used oil
b. On a bottle (1 liter) of cleaning vinegar.
c. On a storage tank for ethanol.
d. On an underground storage tank for natural gas.
e. On a box of 12 packs (1 kg) of fireworks.

Answer: a, c.

A substance is highly flammable and dangerous to health. What numbers are there in the boxes of the danger diamond?

a. red box: 2, blue box 2, white box
b. red box: 3, blue box 1, yellow box 2
c. red box: 4, blue box 2, yellow box 0

Answer: c



✓ The hazard diamond gives a quick indication of the dangers of the stored substance.

✓ Make sure the hazard diamond is visible and readable.

✗ The hazard diamond is not a substitute for a label on, for example, drums and barrels.

✗ The hazard diamond is not a substitute for the special labels during transport.

8.2 Exposure to or absorption of hazardous substances

Working with hazardous substances is risky. Hazardous substances can be toxic, flammable, intoxicating or explosive. The problem with hazardous substances is that you do not always immediately see or notice that the substances are hazardous. You will notice the consequences immediately with corrosive substances. With other substances, such as asbestos, you only get health problems after years.

How do you ingest hazardous substances?
You can ingest hazardous substances via

- mouth: for example by eating with dirty hands or in a dirty work area;
- skin: for example due to splashes of corrosive substance;
- breathing (nose and mouth): dust, mist and gases are inhaled through your lungs;
- direct absorption into the bloodstream, for example if you have a (small) wound.

How do you avoid ingesting hazardous substances?
There are a number of things you can do to prevent yourself from absorbing hazardous substances:

- wear protective clothing (overalls, gloves, personal protective equipment);
- provide good ventilation and/or respiratory protection;
- do not eat, drink and smoke in the workplace, but in a separate room;
- take off dirty work clothes when taking a break;
- always wash your hands and face before eating, drinking, smoking or going to the toilet;
- take good care of (skin) wounds.

Occupational hygiene strategy
Exposure to hazardous substances must be avoided as much as possible. The Working Conditions Act has a number of measures for this. These are summarized in a four-step plan. The employer must work according to this order, starting with source approach. Only if there are reasonable organizational or technical objections (never economic!) the employer may deviate and opt for a different solution than the source approach. The occupational hygiene strategy consists of:
(1) measures at the source;
(2) ventilation;
(3) separation of people and the source;
(4) personal protection.

(1) Measures at the source
To prevent exposure to hazardous substances you can:

- stop using the substance or stop the process (elimination);
- replace the substance with another (less hazardous) substance (for example replace a solvent-based paint with water-based paint);
- adapt the method (for example not using the raw material in powder form, but in tablet form);
- Extracting dangerous vapors, gases or dust particles directly at the place where the contamination occurs (for example during grinding and welding work).

(2) Ventilation
You can use ventilation to prevent exposure to hazardous substances. Ventilation means that you suck polluted air out and bring in clean air. The concentration of the hazardous substance is diluted by (natural) ventilation.

PRACTISE QUESTION

If you work in a company with hazardous substances, you have to take a number of measures to protect yourself against possible harmful consequences. You wear PPE and also have a personal meter with you. During work you see a vapor released from a pipe. It's a light-colored cloud and you can smell a kind of perfume scent. What will you do?

a. You continue working, you wear sufficient PPE and you have a personal meter, which goes off if it becomes dangerous.
b. You keep your distance and inform the supervisor about the situation.
c. You will look to determine which substance it is and bring a fire extinguisher in case it is a flammable substance.

Answer: b

(3) Separation of people and the source
To prevent exposure to hazardous substances, you can install screens or partitions between the employee and the substance. You can also use a fume hood or safety box.

(4) Personal protection
You can wear personal protective equipment to prevent exposure to hazardous substances. This is the last means of prevention. In practice, however, this appears to be the most used (unfortunately). The protective clothing should be cleaned regularly, and changed and stored in a special changing room.

Another type of PPE is a personal monitor or measuring device that you wear on top of your clothing. The meter detects the presence of various substances and measures the concentrations. An alarm is triggered if the concentrations are too high. You must have been instructed on how to use the meter and what to do if the alarm goes off.

Monitoring and medical research
To be allowed to work with hazardous substances, you must often first get a medical examination. Whether this medical examination is necessary is partly determined by the type of substance(s) that are used, the exposure and the health status of the employee. It is checked whether the employee is and remains suitable for working with such substances. It is periodically reassessed to see if you have no health damage from the substances you work with (periodic medical examination, PMO). How often such a PMO investigation is necessary is partly determined by the type of substance and the exposure.

Put the following measures in the correct order according to the occupational hygiene strategy.

a. Use chemical resistant overalls
b. Pre-packed block of detergent instead of loose powder
c. Mechanical room extraction
d. Paint spraying in spray booth

Answer : b, c, d, a

- ✓ Be aware of hazardous substances and do not underestimate the risk.
- ✓ Wear protective clothing.
- ✓ Pay sufficient attention and time to personal hygiene.

- ✘ Suspect an occupational disease? You have to report to the health and safety service or the company doctor.
- ✘ Do not eat, drink or smoke in the workplace.
- ✘ Never work unprotected with hazardous substances.
- ✘ Hazardous substances and the simultaneous use of medicines can be risky.

8.3 Limit value and perception of (strange) odor

Hazardous substances can poison your body. Sometimes that happens after just one contact and you notice it immediately. More often it is gradual. You can be poisoned because you regularly come into contact with the toxic substance. When dealing with hazardous substances, the term "limit value" (formerly "MAC value") is very important. The limit value is the maximum concentration of a hazardous substance (gas, vapor, mist or dust) that may be present in the air at a workplace.

Poisoning, acute or chronic

We speak of a toxic substance when the intake of a small amount disrupts the normal functioning of your body. When such a substance enters your body, you get nauseous or get a bad headache. In the worst case, it will kill you. There are two types of poisoning: Acute poisoning: you notice it immediately after one contact. An example of this is food poisoning. Chronic poisoning: you only notice the consequences after you have regularly ingested a toxic substance. An example of this is lead poisoning as a result of long-term exposure to lower concentrations of lead-containing substances. Other examples are solvents or heavy metals.

Hazardous substances come in various forms. In solid and liquid form, as gas or mist, as dust or vapor. The effect of inhaling or absorbing a substance on you depends on the amount and fineness of the substance that you ingest. But the temperature, ventilation and the presence of other substances also play a role.

Limit value

Limit values are health-based values and are established in such a way that no damage can occur to the health of an employee or his/her (unborn) children.

The limit applies to people who:

- do not work more than 8 hours a day (normal working day);
- do not work more than 40 hours per week (normal working week);
- are mature and healthy;
- work under normal circumstances and do not do heavy work (normal physical exertion).

TWA-limit value

Time plays an important role in determining the limit value for exposure to a "normal" hazardous substance. Via the 'TWA-limit value' - Time Weighted Average - the maximum acceptable concentration is determined for exposure up to 8 hours per day and no more than 40 hours per week. The mean exposure must be below the TWA. If the concentration is higher than the TWA-limit value, the work time must be shorter. Sometimes the reference period is shorter than 8 hours a day or 40 hours a week. This is then indicated as, for example TWA-15 minutes (for example carbon monoxide).

C-limit value

With substances that are indicated with the letter C (Ceiling, for ceiling value) you must always avoid exceeding that limit. When exposed to a substance with a C-limit value, (the average) time is not important.

PRACTISE QUESTION

Which of the statements below about working with hazardous substances is correct?

a. By not eating in the room where you work, you can prevent absorption into the body.
b. By wiping your clothes and shoes well during work you can limit the limit value of the substance.
c. By using ventilation and carrying out work outdoors, you are less exposed to the substance.

Answer: c

H-limit value

Substances that can easily penetrate the skin include the letter H (for Skin).

With these substances, in addition to measures against inhalation, measures must also be taken to prevent skin contact.

Perception of odor

Perception of odor is <u>not a good indicator</u> for recognizing (the limit value of) a hazardous substance. First of all, some substances smell very nice. As a result, the health hazard is underestimated or not recognized. Secondly, you only smell some substances when they are (far) above the limit value. In that case, you may have already suffered health damage. There are also substances that you smell immediately, but no longer smell in a slightly higher concentration, because that substance has switched off your olfactory nerve. You mistakenly think that the substance is no longer in the ambient air.

An example of this is hydrogen sulfide gas (H2S), which smells like rotten eggs in low concentrations. This gas is common in natural gas extraction, in manure cellars and in sewers. It can also happen that you do not smell a dangerous substance, because the smell of another, non-hazardous substance is dominant. Finally, smell is also person-dependent. Also, don't forget that many dangerous gases and vapors are often colorless and therefore cannot be seen.

Limit values and characteristics of a substance, such as odor perception, are included in the safety data sheet or MSDS.

Put in the correct order. If you are going to work with a hazardous substance you must:

a. know what dangers the substance has;
b. have measurements taken;
c. use the correct PPE;
d. leave the workplace clean.

Answer: a, c, b, d

- ✓ Take regular measurements at the workplace if you work with hazardous substances
- ✓ Do not exceed the limit values.
- ✓ Provide good ventilation

- ✗ You may never exceed the C-limit value
- ✗ Odor perception is not a good indication of hazardous substance presence to recognize or determine concentrations.

8.4 Common Hazardous Substances

To better deal with harmful and toxic substances, we distinguish eight main groups: (1) organic solvents, (2) cyclic compounds, (3) cement, (4) acids and alkalis, (5) heavy metals, (6) carbon monoxide, (7) asbestos and (8) household products.

(1) Organic solvents
Organic solvents are often made from petroleum (e.g. turpentine and solvents in alkyd-based paint and varnish). Inhaling the fumes can give you a headache. In the longer term, even the brain can be affected. They also degrease the skin. The skin pores will therefore be unprotected so that the substances easily enter your body (e.g. white spirit, turpentine).

(2) Cyclic compounds
Examples of cyclic compounds (hydrocarbons) are benzene, toluene, phenol, xylene. In addition to being very toxic, these substances are often carcinogenic (especially benzene). These substances are used in fuel (e.g. petrol), as a raw material for plastics and polyester, and as a solvent in adhesives and coatings. Toluene is also a component in thinner. Both organic solvents and cyclic compounds can damage the brain with regular exposure. A well-known occupational disease is OPS (Organic Psycho Syndrome), also called painter's disease, which includes a form of dementia.

(3) Cement and quartz dust
Cement is officially classified as a "hazardous substance". Cement irritates the respiratory tract, the skin (cement eczema) and is dangerous for your eyes. You can even get chemical burns from intensive skin contact. Quartz is found in sand and, for example, natural stones. Quartz dust is released by grinding, drilling and sawing. Long-term inhalation of these fine and insoluble particles can lead to black lung.

(4) Acids and alkalis
Due to their caustic effect, acids and alkalis can seriously damage the skin and cause burns. Façade cleaners, masons, grouters, painters and tilers in particular use agents that contain acids and alkalis. If you get it on your skin or in your eye, you have rinse immediately with water and then go to the doctor.

(5) Heavy metals
Heavy metals such as lead, tin, mercury and zinc are highly toxic in vapor or powder form. If inhaled, swallowed or they come into contact with your skin, they can cause serious damage.

(6) Carbon monoxide
Carbon monoxide is released during incomplete combustion. Carbon monoxide is odorless and tasteless. It is dangerous because it counteracts oxygen uptake in your blood: your blood absorbs carbon monoxide three hundred times faster than oxygen. If you inhale it,

PRACTISE QUESTION

Which PPE do you use when you start working with the following hazardous substances?

1. Processing coating with organic solvents;
2. Cleaning the facade with a degreasing cleaning agent in a high-pressure cleaner;
3. Painting with water-based paint.

a. respiratory protection
b. safety gloves
c. safety footwear
d. safety face shield

Answer: 1a and b, 2b, c and d, 3b

then you will get a bad headache and feel dizzy and nauseous. A small amount can be deadly. Carbon monoxide is also an explosive substance.

(7) Asbestos

Asbestos was widely used as an insulating agent. Inhaling asbestos fibers is dangerous; you can get asbestosis (black lung), lung cancer or peritoneal cancer. Asbestos must be removed in closed packaging to a designated place. The packaging must have a label with the inscription "A".
This indicates that it contains an asbestos-containing product.

An independent laboratory must determine whether it is asbestos before it is removed.

If material suspected of asbestos is found at a place where work is to be carried out, then:

- work must be stopped immediately;
- the client must ensure that samples are taken by an independent laboratory to determine whether it is asbestos;
- in the case of asbestos, dispose of in accordance with legal regulations.

Partly due to the asbestos problem, asbestos substitutes have been developed, including:

- Slag;
- glass wool;
- rock wool.

Circle what applies.

1. An example of an organic solvent is a. Natural gas / b. turpentine / c. mercury.
2. An example of an irritating household product is a. Dishwasher tablets / b. carbon monoxide / c. methylated spirits.
3. An example of a toxic substance is a. methylated spirits / b. lead / c. Cement

Answer: 1b, 2a, 3b

(8) Household products

You can also come across hazardous substances in the household. Unclogging products, for example, have a caustic effect on your skin and eyes. Simple dishwashing products for a dishwasher, such as soap and dishwashing products, can also cause skin irritation or even serious eye damage.

- ✓ Have asbestos removed by an expert
- ✓ Protect your skin and eyes when you work with alkalis and acids.
- ✓ Provide good ventilation when working with hazardous substances.

- ✘ Ventilation quickly removes substance, but can also cause dust to end up in other unwanted places.
- ✘ Always consult a doctor in case of injury due to hazardous substances.
- ✘ Hazardous substance ingested/inhaled? Take the packaging or product details to the doctor.

8.4 Common hazardous substances (continued)

It often happens that asbestos is found in the workplace. Consider, for example, demolition work, renovation or work on technical installations. It is not always known or clear that asbestos has been processed. Certainly because working with asbestos can cause serious (irreversible) health conditions, such as black lung, asbestosis, asbestos lung cancer and mesothelioma (cancer in the lung and/or peritoneum), it is important to deal with asbestos correctly.

Procedure for the supervisor in case of asbestos in the workplace.

Legal provisions regarding asbestos:

- the new processing and working of asbestos is prohibited;
- waste containing asbestos must be collected and gathered separately;
- where there is a risk of contact with asbestos, a specific label is applied;
- activities to remove asbestos must be reported to the SZW Inspectorate. Often a special, additional demolition permit is required.

Possible locations where asbestos can be found:

- heat insulation on all types of appliances and equipment;
- flanges and bearing seals;
- fire-resistant layers of steel structures and structures of above-ground tanks;
- in and behind walled-in furnaces and boilers and structures of above-ground tanks;
- insulation in electrical equipment;
- in fireproof blankets;
- brake linings;
- sewer pipes;
- sealing material;
- roof and wall cladding;
- carpeting.

A risk assessment is carried out on the basis of an asbestos inventory. It also includes the location and how the asbestos must be removed and how any exposure to fibers can be prevented.

The items containing asbestos below do not have to be removed by a certified asbestos removal company:

- gaskets that can be removed without breaking/cutting;
- solid (bonded) asbestos products, which can be removed without breaking/cutting

These activities may only be carried out by trained employees (Expert Asbestos Remover).

PRACTISE QUESTION

1. Where can asbestos possibly be found?
   a. In roof and wall cladding of recently renovated office buildings.
   b. In sewer pipes and brake linings.
   c. In newly-built homes under central heating systems and wood stoves.

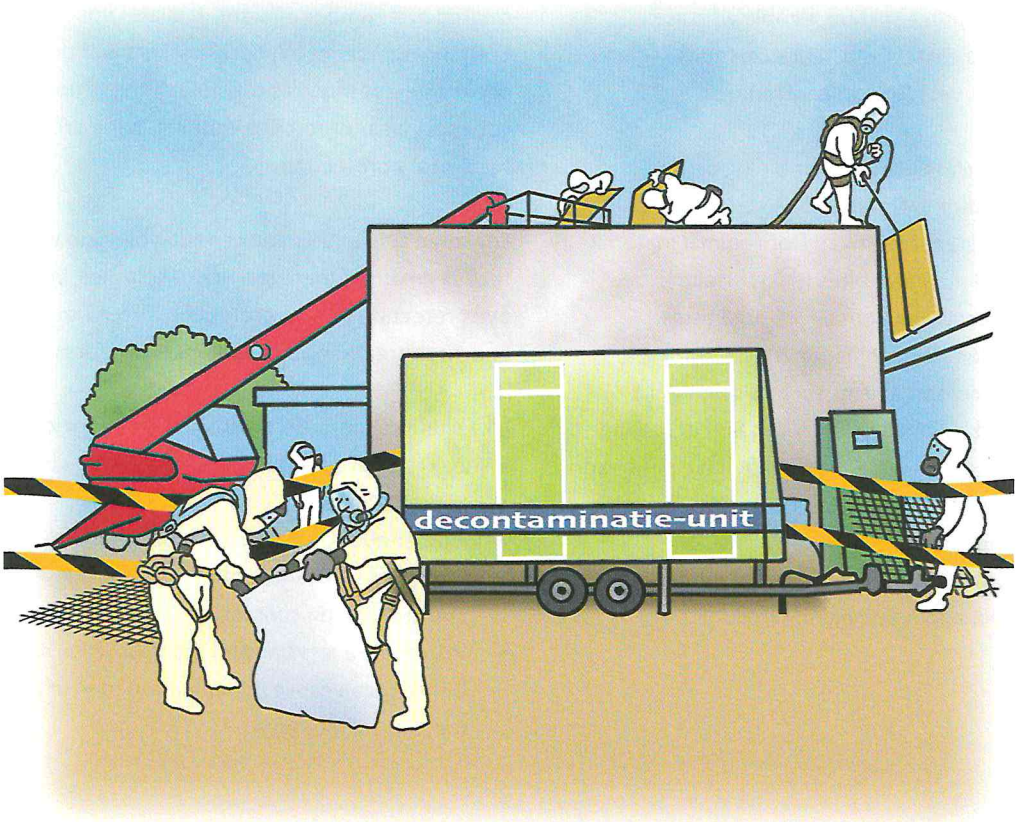
2. What are the health dangers of exposure to asbestos?
   a. Chance of mesothelioma or lung cancer.
   b. Chance of COPD or emphysema.
   c. Chance of black lung and asthma.

Answer: 1b, 2a

During work, material was found that presumably contains asbestos. Indicate the order in which to act:

a. Shut down other activities on site.
b. In the case of asbestos demolition work, have it carried out by an expert in accordance with legal regulations.
c. Do not cut, drill or break material.
d. Have an independent laboratory take samples.

Answer: a, c, d, b



✓ The risk assessment and method for removing asbestos can be found in the asbestos inventory.

✓ An additional demolition permit is required for the removal of asbestos

✘ If asbestos is found, the work must be stopped.

✘ You must not break or strain asbestos.

8.5 Biological substances

Biological substances, which can cause health damage, are common in, among others, the waste processing industry, healthcare, agriculture, the food industry, the pharmaceutical and biotechnical industry and in water purification plants. You also run the risk of health damage when you come into contact with animals, work in sewers and in contaminated soil. You have to think of infections, poisoning, allergies and fungi.

You can get an infection if your body reacts to the substance it ingests (immune response). You can get poisoning, for example, by inhaling a substance, which then enters your bloodstream. This is often caused by secretions. An allergy is when you come into contact with a substance that causes a more than violent reaction in your immune system. People who are hypersensitive to a certain substance can quickly get an allergic reaction at very low concentrations.

There are various classifications for biological substances. Classification by origin:

- biological substances derived from animal material (skin, hair and manure), bites (ticks, insects);
- biological substances from micro-organisms (viruses, bacteria and some fungi);
- pathogenic microorganisms such as salmonella (in foods) and legionella, which you find in cooling towers or in (warm) water pipes that have not been used for a long time;
- fungi in composting;
- biological substances derived from plant material such as wood, paper and plant juices.

Protection against biological substances

People who work with or come into contact with biological substances must protect themselves against this. First of all, it is important to prevent exposure to the source by taking the correct measures, such as a closed system. As a preventive measure, you can also get vaccinated in a number of cases. It is also important to limit both the number of exposed workers and the duration of exposure as much as possible. If this is not possible, you must wear protective clothing, hand protection and respiratory protection.

For some substances you can rub your skin with a protective cream. If there is a risk of splashes, you must use eye protection or face protection. After work and before and after breaks, wash your hands and face.

Like chemical hazardous substances, biological substances can have properties such as being corrosive, irritant or harmful.

Remember about substances in general:

- Corrosive substances attack your skin, eyes, lungs and clothing on contact;
- Irritants are less harmful than corrosive substances, but they can cause inflammation to your skin and mucous membranes.

PRACTISE QUESTION

At a workplace such as a waste collection point you can come into contact with various substances. Organic substances such as organic waste and compost are also part of this. Which of the statements below is correct?

a. You must be specially trained and qualified to work with biological substances.
b. Wearing gloves and a dust mask is enough to protect you from biological substances.
c. If you regularly work with biological substances, you must undergo periodic medical check-ups.

Answer: c

- Substances such as resins, colorants, some paints, metal treatment agents and hair dyes are referred to as sensitizing agents. These can cause sensitive skin. They can cause severe allergic reactions in people who already have sensitive skin.
- Harmful substances such as paint, varnish and wood protection products are less dangerous than toxic substances.
- Environmentally hazardous substances, such as certain wastes and pesticides, can be dangerous for humans, animals and nature: the environment.

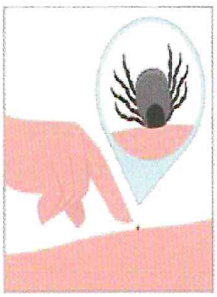
The occupational hygiene strategy also applies when working with biological substances. Put the following measures in the correct order:

a. use of PPE
b. handling of the substance in a closed system
c. avoid contact with the substance
d. limit working time and exposure time

Answer: c, b, d, a

Example of personal protective equipment required when working with biological materials: overall, filter canister mask, latex gloves

Needle box, for safe disposal of used injection needles



Tick bite

Warning sign

- ✓ Regular flushing and checking of the water supply prevents legionella contamination
- ✓ If you work with biological substances, you will receive regular health checks

- ✗ Avoid contact with biological substances.
- ✗ If you work with biological substances, you must use the correct PPE.
- ✗ Substances of natural origin can also be dangerous (manure, compost, fungi, etc.).

8.6 Industrial gas cylinders

Gas cylinders are used for various activities. You can think of welding, cutting and burning, or heating bitumen and marking materials in road construction, for example. Gas cylinders are also widely used in industrial applications, for example in the control of processes or in breathing apparatus.

Industrial gas cylinders

Industrial gas cylinders are pressure containers. The danger of a pressure container is a (physical) explosion. This means that a wall collapses due to the pressure in the enclosed space. Damage and injury can then be caused by:

- mechanical force from the debris of the pressure container;
- mechanical action of the released content (gas or liquid);
- a corrosive or toxic effect of the contents;
- fire hazard of the contents, which can also cause a chemical explosion or fire.

Another danger from pressure containers is leakage, causing the contents to flow into the work area or storage area. For example, if a pressure vessel or gas cylinder has fallen over or the gas cylinder has been damaged, you must report this. An expert will then check the gas cylinder. Given the dangers of gas cylinders, the following measures are very important:

- secure a gas cylinder;
- protect a gas cylinder against adverse weather conditions;
- shield a gas cylinder from sun rays and other heat radiation sources;
- ventilate the storage area sufficiently;
- do not set up batteries with gas cylinders at the workplace;
- keep oxygen cylinders separate from combustible gas cylinders;
- do not store gas cylinders in cellars and wells, but preferably in the open air in designated storage areas; many gases are heavier than air and "hang around";
- place suitable extinguishing agents and water (as a coolant) near the storage area(s).

Color coding of gas cylinders

To be able to judge which gas is present in which cylinder, you need to know the color codes. Each gas has its own color code. In addition to the color coding, you can also determine the authenticity of the content by means of the accompanying label.

The main color codes:

- oxygen - white shoulder;
- nitrogen - black shoulder;
- carbon dioxide - gray shoulder;
- air - light green shoulder;
- acetylene - chestnut brown shoulder.

In addition to gas cylinders, pipes in an installation are also color-coded to indicate which type of substance this pipe contains.

Storage, transport and installations

Hazardous substances are transported by road and water and stored in barrels and in large tanks. To prevent these substances from unintentionally leaving the barrels and tanks, strict requirements for storage and transport apply.

PRACTISE QUESTION

1. How can you tell from a gas cylinder which substance it contains?
   a. By the shape of the cylinder.
   b. By the color code on the cylinder.
   c. By the letter symbol "N" on the cylinder.

2. Where can you find information about the dangers of the substance in the gas cylinder?
   a. On the label.
   b. In the product information sheet.
   c. In the workshop manual.
   d. In the user manual of the equipment to which the cylinders are connected.

Answer: 1b, 2a and b

You can also encounter hazardous substances in industrial installations, such as pipes, filters, manifolds and at valves. To ensure that these hazardous substances cannot escape the installation, the installation must be checked regularly.
You must report every start of a spill so that qualified personnel can correct the spill as quickly as possible. As leakage can never be ruled out completely, as a precaution there must be sufficiently large drip trays under tanks and barrels. Leak-tight walls or a tank wall are placed around large tanks that can accommodate the maximum volume of the tank. Leaked products must of course be cleaned up as soon as possible. This must be done professionally, which is why only trained personnel may carry out repairs and (clean-up) work. The company usually has oversized containers or drums available to put a leaking or damaged drum inside.

Causes and consequences of leaks

A leak can have various causes, such as:

- poor maintenance;
- poorly mounted flanges;
- leaking valves, taps and seals;
- incorrect procedure when pouring or pumping;
- damage (e.g. due to collision with a forklift truck).

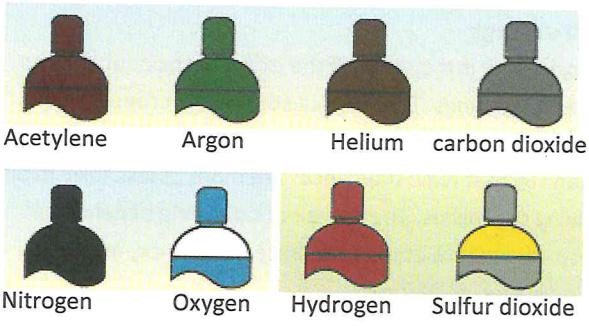
A leak can pose a fire hazard, but also, for example, slipperiness, which can cause you to slip. A leak always leads to production loss, but can also lead to environmental pollution and the spreading of gases or vapors in the breathing air.

Leaks can be prevented by regular checks and the use of the correct packing materials. A preventive measure is the placement of drip trays or collection trays under tanks and pipework in liquid-tight gutters.

Put the actions below in the right order. If you see a pipe leaking at your workstation, you should:

a. repair the pipe (by expert personnel)
b. report the leak to the supervisor
c. place drain tray under the leakage

answer: b, c, a



- ✓ The contents of the gas cylinder can be recognized by the color of the shoulder
- ✓ Full and empty cylinders are stored separately.
- ✓ Cylinders must be properly secured to prevent falls.

- ✘ Leaking oxygen cylinders are very dangerous: increased fire hazard!
- ✘ It is better not to use cylinders without a label.
- ✘ Do not store gas cylinders in a basement.

8.7 Supervision by the supervisor and monitoring

Because the effects of poisoning range from mild complaints such as headaches and sore eyes to more serious complaints such as nausea and becoming unwell, the supervisor will have to study the substances used in the workplace more closely. The most important information can be found in the safety data sheets, but in addition, the processing advice from, for example, the manufacturer is also required to handle the product responsibly.

Toxicology

Toxicology is the study of the effect of toxic substances on living things. This science studies the properties of the substance and the degree of toxicity. In general we can say that toxic substances are more or less toxic to all living organisms. The degree of poisoning depends on:

- the nature of the substance (substance, mist, gas, vapor, solid form);
- the toxicity of the substance;
- the amount of substance per unit time (exposure time);
- the method of absorption or entry into the body;
- the age, sex, height/weight and health/fitness of the victim;
- working conditions (physical exertion, temperature, ventilation, weather conditions);
- the size of exposed skin area and thickness of the skin;
- the presence of other substances.

Effects of dangerous substances on the body can include:

- headaches;
- dizziness;
- balance disorders;
- stomach cramps;
- nausea;
- vomiting;
- palpitations;
- shortness of breath;
- blurred or double vision;
- allergy.

Supervision by the supervisor

When working with hazardous substances, there is an additional need for the supervisor to supervise properly. Not only on the use of hazardous substances and personal protection, but also on order and tidiness in the workplace. Leftovers of substances or material, improperly cleaned tools or personal protective equipment can pose risks. Waste, such as empty packaging, used materials, filter canisters, etc., must also be collected separately and in special containers. Good working agreements and separate waste collection are indispensable for working safely with hazardous substances.

Workplace research

In order to minimize the risks when working with hazardous substances, an exploratory workplace investigation is often carried out. This involves determining potential risks when working with hazardous substances and if necessary drawing up strict rules for handling these substances.

PRACTICE QUESTION

The company where you work as a supervisor works with various hazardous substances. The prevention officer has asked if you would like to participate in an exploratory workplace investigation for your department.

What does such an investigation entail?

a. It is an investigation into the possible risks and the drawing up of rules of conduct.
b. It is an investigation to determine where the hazardous substances should be stored.
c. It is an investigation to determine the best substitutes for the hazardous substances.

Answer: a

During the research, solutions are looked at on the basis of questions such as:

- is there a risk of exposure to a hazardous substance?
- what is the degree of exposure?
- how many people are likely to be exposed to a hazardous substance?

One of the requirements that can be set as a result of an exploratory workplace investigation is monitoring. This means that during work, for a short or longer period, the possible exposure to hazardous substances is measured. The results of these measurements are then assessed and the risk of health damage during this work is estimated on the basis of the limit values. Finally, measures are devised to prevent health damage.

The results of the monitoring are compared with previous studies or established values and data from the supplier or our own research and measurement data. For a number of activities it is mandatory to keep this data due to the risk of health damage after a long period of time (incubation period). For asbestos remediation, this legal retention period for documentation is 40 years.

Medical research

Employees who regularly work with hazardous substances have the option of undergoing a (voluntary) periodic medical examination (PMO).

This specifically examines the potentially harmful consequences of the work for the health of the employee. Such a medical examination is mandatory for certain specific substances (for example, asbestos removal, working with pesticides and working with radiation). This obligation does not only apply under the Working Conditions Act.

Which of the factors below can influence the consequences of a poisoning?

a. age of the victim
b. educational attainment
c. experience and personal recording capacity
d. size of exposed contact area
e. sex
f. presence of other substances

Answer: a, d, e and f

This obligation is also imposed by other legislation, such as the Radiation Protection Decree, the Aviation and Railways Act. When specific personal protective equipment is used, including breathing air protection (compressed air, powerpack, working with over-pressure/underpressure, etc.), a medical examination is also required.

✓ Poisoning can be prevented by monitoring:
- correct processing
- (user manual);
- use proper personal protection;
- personal hygiene

✘ Acute poisoning: poisoning that happens fairly quickly during or immediately after exposure to the hazardous substance (e.g. carbon monoxide poisoning).

✘ Chronic poisoning: poisoning after prolonged and repeated exposure to the dangerous substance (for example, solvents, heavy metals in low doses, asbestos).

9 Electricity and radiation

9.1 Electricity, dangers and risks

Electricity is everywhere. It offers us countless possibilities. But there are also dangers. This section shows what electricity actually is and what risks you run when working with electricity.

What is electricity actually?

When someone says, "There is electricity on that outlet", he means that there is voltage on it. We have electrical voltage of 230 volts (230 V) at home and in the office. In the workshop, where often heavier machines are, we sometimes need more voltage (400 V). We call this low voltage.

High voltage is more than 1000 volts, such as in a transformer house or the overhead lines of the train (a normal track is 1500 V).

Use insulators

To get electric power you do not only have to deal with voltage difference. Material is also needed to conduct electricity. Copper, iron and silver, as well as water, are good conductors and offer little resistance to current passage. Other substances let electricity through much less easily. Consider, for example, plastic, rubber or ceramic. These fabrics have a lot of resistance to electricity passage. We call these insulators. If you work with electricity, it is therefore safer to work with, for example, a rubber mat, rubber gloves, or special rubber shoe soles. You then run less risk. Double-insulated tools are also safer.

There is always a risk when you work with electricity, after all:

- higher voltage = higher current;
- lower resistance = higher current.

The risks of electricity through the human body depend on:

- type of voltage: AC voltage (~) or DC voltage (=) and the voltage level (volts);
- current strength (in milli Amps, mA);
- the time of current passage;
- the path that the current takes through the body;
- the touch surface (the larger the surface, the higher the current);
- the resistance of the substrate (linoleum and a rubber mat have a higher resistance than, for example, a concrete floor).

Risks and damage from electricity

If electrical devices are not in order, are not properly connected or used incorrectly, or if the electrical installation is incorrectly laid, this can cause damage to the environment and people.

You could then receive an electric shock. You should not underestimate the danger of an electric shock. For example, if you are standing on a ladder, a relatively light shock can cause you to be so startled that you can fall off and be seriously injured.

Short-circuit is another cause of damage. A Short-circuit occurs when two parts under different voltages come into direct contact with each other. The sparks and arcs created by a short circuit can cause burns and/or fire. In the event of a short-circuit, DC voltage causes greater arcs than AC voltage.

PRACTISE QUESTION

1. When current passes through the body, the current strength depends on:
   a. the temperature of the environment;
   b. the resistance of the surface you are standing on;
   c. the height of the fuse of the installation.

2. You can see that the insulation of the wire has come loose at the molded plug of the drill. What will you do?
   a. you take the drill to a qualified technician for repair;
   b. you cover the damage with certified insulating tape;
   c. you put a new wire on it.

Answer: 1b, 2a

You can also be hit by flying material in the event of a short-circuit. You can even be thrown away by the pressure wave created by a short circuit.

Safe voltage

DC voltage is (generally) less dangerous than AC voltage. A guideline is that 120 V DC (120V=) and 50VAC (50V~) (under dry conditions) are harmless.

Other causes of damage due to electricity are: defective and inadequate machines, defects in equipment and pipes, bad or missing earth connections and incorrect installation or assembly. Even if you touch something that is under voltage, you can suffer injuries or damage. But the careless use of electrical installations and/or materials is also dangerous. Finally, the combination of electricity and carelessness, lack of oversight and ignorance poses a great risk.

In addition to requirements for tools and equipment, there are also requirements for the employee. As a supervisor, it is good to know which rules apply and when, for example, specific knowledge and competence is required to carry out work on electrical equipment or installations.

Lay person

A lay person is not a person with electrical engineering expertise. The layman is therefore not allowed to work on such installations.

Sufficiently trained person (VOP)

A sufficiently trained person (VOP) may, under certain conditions, perform limited electrical work on electrical installations and equipment. A VOP is someone who has been sufficiently instructed by skilled persons.

Which of the measures below reduce the dangers and risks of electricity?

a. Working in a humid environment.
b. Working with double insulated tools.
c. Use of rubber mats in the workplace.
d. Working on a metal ladder.

Answer: b and c

With this specific knowledge, the VOP is able to prevent hazards that can be caused by electricity. This instruction must be demonstrable by, for example, a personal certificate on which the subjects are indicated. The activities are often simple activities, which have been carefully described. This work should also be monitored regularly.

Competent person (VP)

More in-depth electrical work requires more extensive authorized personnel. In principle, only qualified persons are allowed to work on live electrical installations. They have demonstrable knowledge of these installations. A competent person is someone who has (electro-technical) training and experience, which enables him/her to recognize and prevent hazards that can be caused by electricity.

- ✓ Working with electricity? Always have it carried out by an expert!
- ✓ Always use double insulated tools. ⧈
- ✓ Non-hazardous voltage (under dry conditions):
- ✓ 50 volts AC (50V~)
- ✓ 120 volts DC (120V=)

- ✗ Never work on installations that are not voltage-free and secured.
- ✗ Smaller voltage flow can also be dangerous; shock reaction can make you fall!

9.2 Working safely with electricity

There are numerous safety precautions you can take to prevent accidents involving electricity. In this section you can read which measures the H&S legislation makes mandatory in this context and how we translate the requirements of the H&S legislation into safety measures in the workplace.

Working Conditions Act and working with electricity

When it comes to working safely with electricity, the Working Conditions Act has three basic requirements:

- electrical installations and tools must be safe. This means that electrical tools must always be tested in accordance with NEN EN 50110/ NEN 3140. Approval means that the device is safe and sound from an electrical point of view;
- Work on or near live electrical installations is prohibited;
- Work on or repairs to electrical installations and tools must be carried out by a suitably trained, skilled person. You may never repair electrical installations and tools yourself if they are defective without training.

If you work with electricity, you have to take a number of important safety precautions. Many of the measures below are mandatory and reduce the risk of accidents.

- double insulated (hand) tools;
- personal protective equipment and physical shielding (switch box, appliance casing, e.g. washing machine);
- fuses. If the current flow is too great, due to a fault, the fuse will melt and the circuit will be shut down safely;
- safety ground and residual current device.

Safety earthing

Safety earthing ensures that machines or electrical devices are not unintentionally live. All external and conductive materials of the machine are connected to earth. This can be done, for example, by a ground wire or pin that is connected to the existing ground network.

Residual current device (RCD)

A residual current device detects current leakage flowing to earth. As soon as this leakage current exceeds a certain value (30mA), the residual current device switches off the voltage and the risk of electrocution is prevented.

The residual current device must be tested regularly.

The residual current device does not offer absolute safety.

Overloading, heating up of live parts and short circuits cannot be prevented by using a residual current device.

Proper earthing of scaffolding and pipes

- By installing an earth electrode in the ground, working on scaffolding and, for example, in work and storage containers becomes less dangerous. If there is voltage (for example due to lightning or high voltage lines) on the scaffolding, it will flow directly to earth, so that you will not be live.

PRACTISE QUESTION

A new office building is being worked on at the construction site. A construction power connection box has been installed for the use of the various tools. There are also various stray cupboards on the site to ensure a good distribution. Must the construction power connection box be equipped with a residual current device?

a. Yes, the residual current device must have a protection value of 30mA per outgoing power supply.
b. Yes, the residual current device, just like the house connection, must have a protection value of 16mA.
c. The residual current device is not mandatory if the stray cabinets have a residual current device with sufficient protection rating.

Answer: a

Earthing of scaffolding is mandatory if electrical cables conduits and/or electrical equipment (for example hand tools) on or near the scaffolding are under a unsafe voltage. Earthing of work and storage containers is also mandatory, because these containers often have lighting and electrical tools inside. Earthing the containers allows current to flow to ground if a failure occurs in the power tool or installation.

Another safety measure is the use of low voltage. This means 50 volts AC and 120 volts DC. For applications in swimming pools and hospitals, one works with a very low voltage: 12 volts.

Rules for the use of temporary electrical equipment and hand tools

If you use temporary electrical equipment and/or tools, check it first for damage and abnormalities. If there are any damages, you may not use it. Report the damage or deviation to your manager or a competent person. An undamaged and sound device therefore always protects you in the event that an internal defect occurs.

There are also rules for the use of cable reels and extension cables. These must always be checked for the maximum permissible power before use. You must make sure that the cable is suitable for the power of the connected devices. You should also check reels and cables for damage and overload before use. Overloading can cause heat and fire. This is the reason that you have to unroll cables completely during use.

You want to work on an electrical installation. Put the steps in the correct order.

a. You make the installation safe and voltage-free.
b. You use double insulated tools.
c. You must be competent for the work.
d. You use the right PPE.

Answer: c,d,a, b

✓ Have all electrical tools (including cable reels, etc.) inspected annually (NEN EN 50110 / NEN 3140).

✓ Technical safety is achieved through:
- good electrical installations;
- fuses;
- earths;
- residual current device;
- low voltage.

✓ Personal safety through good PPE (e.g. rubber shoe soles)

✘ Never use defective or damaged tools.

✘ Never use defective or damaged cable reels or extension cables.

✘ Humidity and rain are major risks when working with electricity. Always use special equipment in these cases, such as insulated tools, non-conductive gloves, non-conductive mats and work tents.

✘ Do not make repairs yourself if you are not trained.

✘ Do not replace molded plugs yourself.

9 Electricity and radiation

9.3 Special dangers with electricity

There are several dangers when working with electricity, such as fire and explosion hazards, electrocution, injuries from sparks and arcs, personal injury from electric shock and reaction to electric shock. Static electricity is also a particular hazard.

Static electricity

Static electricity can cause fire and/or explosion. Static electricity is created when two different, poorly conductive substances experience friction between each other. The substances are then electrically charged, which is dangerous in some situations. This can lead to fire or explosion due to arcing. Also sensitive equipment can malfunction due to static discharge. Examples where static electricity can occur are:

- rising gas or vapor bubbles that cause turbulence;
- with paint spraying and similar activities;
- rubbing on plastic;
- (pneumatic) transport of powders and granules in mixers, dosing locks of weighing hoppers;
- pumping fuel from tankers;
- friction from clothing on the skin;
- drive belts;
- with some liquids, when flowing through plastic pipe or when stirring;
- walking on a synthetic floor covering.

You can take measures to prevent accidents with static electricity:

- You must properly earth pipes, tanks and equipment. When earthing, you must connect as much as possible to the existing earth wire network.
- You can limit the flow rate of the substance;
- You can limit the fall height of the substance;
- You can add an anti-static dope (ASA);
- You can add an inert gas (for example nitrogen; this gas lowers the oxygen percentage and does not react with the other substance and does not burn);
- You can increase the humidity (for example with a substance such as wood flour);
- It is best to wear anti-static footwear and clothing.

Sparks and temperature increase

Some other causes of fire and explosion. In addition to static electricity, there are other causes of fire and explosion related to electricity. For example, fire and/or explosion can be caused by sparks from rotating devices and switches. Temperature increases at (parts of) electrical installations can also result in fire, especially when particulate matter or a combustible gas mixture is hanging in that space.

Open voltage as a cause of personal injury

When you work with equipment and machines you run the risk of physical injury. For example, if you come into contact with open tension. Fortunately, many live parts are mounted in switch boxes, shields or enclosures so that they are inaccessible. Consider, for example, the casing of a washing machine or dryer.

PRACTISE QUESTION

1. Static electricity can be generated by:
   a. High amperage;
   b. Friction;
   c. Magnetism.

2. You can combat static electricity by:
   a. Application of residual current protection;
   b. Applying insulation material;
   c. Earthing to existing network.

Answer: 1b, 2c

Live parts have been made inaccessible by surrounding them with non-conductive material that can only be removed by breaking it. Examples of insulation material are: rubber, plastic and ceramic. A housing also protects against the penetration of moisture (for example rain), dust and against impact and falling objects.

Electric welding or cutting as a cause of personal injury.

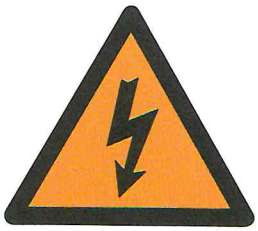
Electric welding or cutting can also be dangerous. During this work, a conscious and controlled short circuit is made with an arc.
The size of the arc depends on the height of the voltage between the parts and the amperage. This can generate a surge and sparks. You can be injured from either. Always wear overalls with the correct degree of protection. The pictograms below must appear on the label.

Etiket in laskleding:

Arcs means protection against thermal effects of electric (flame) arcs.

warning signs

earthing point



electrical voltage

Which statement is correct? Static electricity is:

a. electric voltage generated by human power.
b. electrical voltage outside of normal electricity systems.
c. electrical voltage generated by water power.

Answer: b

✓ Always ensure proper earthing of the substance extraction pipes.

✓ Take measures to prevent accidents with static electricity, such as:
- wearing anti-static footwear and clothing;
- connecting as much as possible to the existing earth wire network;
- limiting the flow rate of the substance
- increasing humidity

✘ The light switch also sparks; so pay attention when you smell a gas smell!!

✘ Pay close attention to electric welding or cutting. The arc can generate sparks or give an electric shock.

✘ You can also be injured by static electricity.

9.4 Radiation

In various places, work is done with radiation or equipment that releases radiation. Working with radiation can pose health risks. Therefore, it is good to know which method applies to activities or situations in which radiation is released.

We distinguish two types of radiation:
- **ionizing radiation;**
- **non-ionizing radiation.**

Ionizing radiation is radiation that is capable of generating electrically charged particles in the irradiated material and thereby changing the structure of that material, for example the cell structure of the human body. Non-ionizing radiation is electromagnetic radiation, the energy of which is not large enough to change material structure.

Radioactive substances are substances that emit ionizing radiation. These are often artificially formed substances (for example plutonium), but sometimes this happens naturally (for example with uranium); we then speak of natural radioactivity.

Ionizing radiation

There are various activities and situations in which ionizing radiation is released or applied. This includes:
- **natural gas extraction, ore and coal processing;**
- **medicine (X-ray, nuclear research/treatment of, for example, cancer), nursing;**
- **nuclear power plants;**
- **detection devices;**
- **material control;**
- **measuring equipment in the process industry.**

The degree of harmful exposure to ionizing radiation depends on:
- **the distance to the radiation source;**
- **the type of radioactive substance.**

Non-ionizing radiation

These are weaker types of radiation than ionizing radiation, which are unable to generate ions. The material that is under the influence of this radiation does not change. Examples of non-ionizing radiation are:
- **microwaves;**
- **ultraviolet radiation;**
- **sunlight;**
- **laser beams;**
- **infrared radiation;**
- **radio waves.**

In a low dose and without long-term exposure, non-ionizing radiation is not dangerous. However, high doses or prolonged exposure can cause injury. The absorbed radiant energy is usually converted into heat, resulting in combustion. Just think of welder's blindness (burns by ultraviolet radiation) or sunburn, for example. In addition, side complaints can arise such as fatigue, headaches and drowsiness.

PRACTISE QUESTION

A radiation expert is present when working with or in the vicinity of ionizing radiation. What are the duties of a radiation expert?

a. Check for contamination of employees, tools and materials.
b. Daily management of the nuclear power plant.
c. Conducting medical examinations after possible infection of employees.

Answer: a

Safety measures when working with radiation or in an environment where radiation is released are:

- staying as far away as possible;
- avoiding contamination with a radioactive material by keeping good hygiene and packaging with radioactive material intact;
- cordoning off the area around the source;
- wearing proper personal protective equipment;
- posting warning signs;
- performing (permanent) measurements.

Employees are obliged to:

- have the personal dose of radiation that has been absorbed measured and determined;
- follow all regulations carefully;
- to undergo a medical examination.

A radiation expert must always be present for activities involving the release of radiation.

What is a radioactive substance?

a. A substance that absorbs and radiates radio waves.
b. A substance that emits ionizing radiation.
c. A substance that absorbs radiation.

Answer: b

✓ Exposure to ionizing radiation can be limited by increasing the distance.

✓ The radiation dose decreases quadratically as the distance increases (distance 2x as large, radiation dose 4x as small).

✗ The harmfulness of ionizing radiation depends on the type of radiation source and the distance from this source.

✗ At high doses, non-ionizing radiation can also cause health problems.

10 Fire and explosion

10.1 Fire and explosion

Everyone has to deal with fire every day. The fireplace and gas stove do not immediately make you think of a fire. These are desired and controlled fires. But fire can also be undesirable. Unwanted fire causes a lot of damage. Not only smoke and water damage, but also indirect damage because important documents are lost or production stops. Fire also causes a lot of injury. Every year people are injured and killed by fire or explosions. Many measures must therefore be taken to prevent fire and limit damage.

How fire starts

Fire is a chemical reaction that requires at least three things:

- a flammable substance;
- oxygen;
- an ignition source/ignition temperature.

The fire triangle (see figure) contains these three elements.
The ignition source can be a flame (open flame), a hot surface, boiling cooking oil, glowing ashes, or a short circuit. But fire can also be caused by welding or machining work, for example. These ignition sources provide the energy (ignition energy) that is needed to ignite or explode substances.

Explosion

Explosion is basically the same as fire. You also need a combustible substance, oxygen and an ignition source. The difference with "normal" fire is that in an explosion all fuel burns at once. A lot of energy is released in the form of a pressure wave. That's the bang from the explosion. An explosion causes a lot of damage and the risk of another fire.

Mixing ratio and catalyst

A fire does not always start with a combustible substance, oxygen and a source of ignition (fire triangle). Some substances only burn when they are well mixed with oxygen from the air. For example, gasoline in the car engine. The mixing ratio therefore also plays a role in the onset of fire. The mixing ratio has been added in the fire square (see figure). In some cases, the addition of another substance helps to initiate combustion. This added substance promotes the reaction. If this substance does not combust itself (chemically does not participate in the reaction), we call it a catalyst. An example is the ash from a cigarette, which acts as a catalyst in the burning of sugar. An example of a substance that actually slows down combustion is extinguishing powder. We call this a negative catalyst. The catalyst has been added to the fire pentagon.

Smoke and heat

A fire also always involves smoke and heat. The influence of smoke on the (immediate) environment is:

- limited visibility;
- potentially toxic or harmful.

Combustion gases can create an additional hazard. There are often still flammable particles in it that ignite due to the rising temperature. Heat can injure your skin

PRACTISE QUESTION

1. What do you need as a minimum to cause a fire?
   a. Combustible substance, ignition energy and oxygen;
   b. Combustible substance, oxygen and a catalyst;
   c. Combustible substance, mixing ratio and ignition energy.

2. How can you put out a fire?
   a. By removing one of the sides of the fire triangle;
   b. By disturbing the mixing ratio
   c. By removing the catalyst.

Answer: 1a, 2a

and, for example, the respiratory tract. Due to great heat you can often not approach a fire, so extinguishing is not possible without proper protection.

Other risks

Other risks related to fire and explosion are fire-promoting substances. These substances release oxygen easily when they are warm. They can start a fire or start burning themselves.
Examples are peroxides, perchlorates and ozone. A leaking oxygen hose or spraying clothing with, for example, compressor air can also promote fire.

Too much oxygen is a common risk with welding. If the oxygen cylinder leaks, the oxygen percentage will be more than 21%. Oxygen itself is not flammable, but the high percentage of oxygen greatly increases the flammability of substances. It is therefore strictly forbidden to vent or blow off pure oxygen.

Some substances react violently with water, for example carbide and magnesium. Potassium and sodium can even explode.

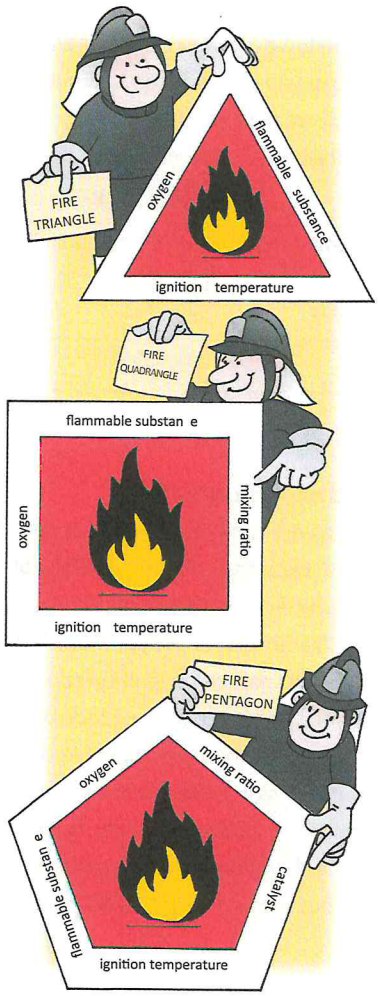
The heat from a fire can explode pressurized tanks and vessels. This can be very dangerous, especially if it contains or has contained flammable material!

Mechanical equipment can also serve as an ignition source. This includes: hot bearings, slipping belts, a running fan, dragging chains or excess grease and lubricant on hot-running parts.

In which of the following situations is there an increased fire risk?

a. A leaking oxygen hose from a welding machine.
b. A ventilated storage area for paint and varnish.
c. A closed container with hydrogen peroxide.
d. An underground storage tank for natural gas.

Answer: a



- ✓ To cause a fire you need:
  - oxygen;
  - a combustible substance;
  - an ignition source.
- ✓ The mixing ratio (and a catalyst) aids the process.
- ✓ Need to extinguish a fire? Remove one side of the fire triangle! (fuel, oxygen or ignition temperature).

- ✘ Never put flammable materials in the sun. The heat from the sun can act as an ignition source.
- ✘ Fire hazards:
  - oxygen content too high (> 21%);
  - fire-promoting substances (perchlorates, peroxides);
  - reaction with water;
  - spontaneous combustion;
  - static electricity;
  - lightning

10.2 Fire and explosion hazardous work environment

You should always try to prevent a fire. There is a risk that fire will spread and become uncontrollable. That is why you must recognize fire-hazardous situations and know how substances behave in the event of a fire. The flash point and the explosion limits are important here. There are also several measures to keep the workplace safe.

Flashpoint

Liquids themselves do not burn. The vapors of liquids all the more. Just think of gasoline. The moment at which a vapor can burn depends on the flashpoint of the liquid. This is the lowest temperature at which the liquid develops so much vapor that it can be ignited in the air present under normal air conditions.
The lower the flashpoint, the more flammable:

Designation	Flash point
Very lightly flammable	< 0 ºC (and boiling point < 35 ºC)
Lightly flammable	0 - 21 ºC
Flammable	21 - 55 ºC
Combustible	> 55 ºC

Explosion and explosion limits

An explosion is a very rapid fire in which a pressure wave is released. Explosive substances are substances that explode easily, even without oxygen present in the substance. Examples are: ammunition, TNT and gunpowder. A small spark as an ignition source is sufficient. Gases and vapors can also explode when the correct mixing ratio between combustible substance and the oxygen in the air is present and there is an ignition source. The ignition source can be a lit cigarette or a welding machine. But it can also be a spark from static electricity. Various (heavy) tools can also cause a spark.

In an environment where there is a risk of explosion, explosion-proof equipment must be used and various specific measures are taken to prevent ignition of an explosive mixture.
The explosion limit has to do with the mixing ratio of oxygen with vapor or gas. The minimum amount of gas or vapor that must be in the air to have an explosion is the Lower Explosion Limit, LEL. If there is not enough air (oxygen), but there is a lot of gas or vapor, no explosion is possible. That limit is the Upper Explosion Limit, UEL. The area between the explosion limits LEL and UEL is called the explosion area.
If you work in an environment where gases or vapors may be present, a (personal) explosion meter is used. It stands on the floor or is worn at chest height and not under clothing. Before use, the meter must be tested and the user must be aware of actions to take in the event of an alarm. In order to be able to work safely in a space, the following applies: the amount of vapor or gas present in the air may not exceed 10% of the LEL.

Explosive environments

Hazardous environments are areas and installations where an explosive mixture can escape or form. For example: gas and oil extraction installations, refineries, storage and transfer stations for combustible materials (gas explosions) and grain silos

PRACTISE QUESTION

1. You are going to work in a chemical company. In the factory, substances are used whose vapor can easily explode. How will it be clear that you are approaching a hazardous area?
   a. This is made clear in the gate instruction;
   b. Yellow warning signs with the letters Ex;
   c. The explosion hazard zone is marked by a yellow-black barrier tape.

2. What safety precautions should you take if you are going to work in this factory?
   a. You must wear an explosion hazard gauge on your clothing;
   b. You need to pack up tools extra carefully to avoid sparking;
   c. You should always keep an extinguishing agent on hand to extinguish a starting fire as quickly as possible.

Answer: 1b, 2a

(substance explosions), but also the chemical industry, landfills, power plants, waste processing companies, wood processing industry, agricultural companies (biogas), metal processing companies, the food and feed industry, pharmaceutical industry and recycling companies.

Substance explosions can occur if there is a high substance density, a high concentration of substance with no more than a few meters of visibility. The substance consists of very fine particles and, for example, a footprint remains visible. Often the substance spreads over the entire room and can ignite by, for example, smoldering nests and turbulence. It is precisely this swirling up of substance that creates a subsequent explosion.

Given the enormous risks, it is strictly forbidden to enter explosive areas without permission and/or work there without permission.
You are not allowed to take materials and resources with you without permission that could be dangerous for the start of fire and explosions. Only explosion-proof tools and explosion-proof means are permitted. For example, if you have to weld in an explosion-hazardous environment, all measures must first be taken to exclude the risk of explosion. Welding is then only allowed with a (hot) work permit. Continuous supervision by a manager is a requirement.
Place a warning sign in areas with an explosion hazard. This sign should be triangular. The background color is yellow. The letters EX will appear in black.

explosion-proof tools or equipment

explosion hazardous area

What do you call the lowest temperature at which a liquid develops so much flammable vapor that it can be ignited with a spark?

a. Auto-ignition temperature
b. Flash point
c. Lower explosion limit

Answer: b

- ✓ Keep ignition sources away from liquids with a low flash point.
- ✓ The lowest flash point applies to mixtures of liquids.
- ✓ You can only work safely in a room with a maximum of 10% LEL.

- ✗ Ventilating or blowing off pure oxygen is life-threatening and therefore prohibited.
- ✗ Smoking and open flames are prohibited when using (highly) flammable substances such as benzene and turpentine.
- ✗ Full tanks, barrels and gas cylinders should never be placed in direct sunlight. The heat can cause them to explode.
- ✗ Was a gas cylinder involved in the fire? Then the gas cylinder must be cooled until the drops no longer dry up, but remain on the cylinder.

10.3 Fire classes and extinguishing agents

Extinguishing a fire involves removing one or more factors from the fire triangle. If one of these factors is gone, the fire will go out.

The fire triangle consists of the following factors:

- Combustible substance or fuel
- Oxygen
- Ignition temperature

Examples are: you remove the flammable substance by, for example, turning off the gas tap. When the flame hits the pan, put the lid on. Then the fire will no longer receive oxygen. You remove the ignition temperature by cooling. Which extinguishing agent works best depends on the combustible substance.

Fire classes.

Before you start putting out the fire, you must determine what exactly is burning. The fire classes are a tool for this.

A fire class indicates which substances a fire extinguisher can extinguish. The symbols (see figure) are indicated on each fire extinguisher

Brandklasse	Symbool	Brandstof	Kenmerken	Voorbeelden	Blusmiddel
A		Vaste stoffen	Gloed en vlammen	Hout, papier, textiel, plastic, katoen	Water, schuim, ABC-poeder, blusdeken
B		Vloeistoffen	Vlammen	Benzine, olie, alcohol, verven, rubber	Schuim, BC-poeder, ABC-poeder
C		Gassen	Vlammen	Butaan, propaan en aardgas	CO_2, BC-poeder, ABC-poeder
D		Brandbare metalen	Gloed en vlammen	Magnesium, aluminium, natrium,	D-poeder, (metaalbrand-poeder)
E		Elektrische branden	Vlammen	Schakelkast, TV, PC	CO_2, ABC-poeder
F		Oliën en vetten	Vlammen	Frituurvet	Vetblusser, ABF-blusser

PRACTISE QUESTION

1. During excavation work, a gas pipe was broken and caught fire.
   To which class does this fire belong?
   a. Class A
   b. Class B
   c. Class C

2. Your colleague's clothes have caught fire. How can you best extinguish this fire?
   a. With a carbon dioxide (CO) extinguisher.
   b. With a fire blanket.
   c. With a foam.

Answer: 1c, 2b

Catalysis

Certain products can affect the fire (a reaction of fuel and oxygen).

These products are called catalysts.

A positive catalyst promotes the reaction rate. This will therefore fuel the fire.A negative catalyst slows down the reaction rate. This will slow down the fire.

Extinguishing properties of different extinguishing agents.

- Water: has a cooling capacity and the steam that is created during extinguishing with water is limited in displacing oxygen.
- Foam: shuts off the oxygen supply to the seat of the fire and ensures cooling.
- Sand: shut off the oxygen supply.
- Extinguishing powder: slows down the combustion reaction between the combustible substance and oxygen (negative catalysis) and limits oxygen to a limited extent.
- Carbon dioxide: displaces oxygen and has a limited cooling capacity.
- Fire blanket: is oxygen-impermeable.

Dangers and disadvantages of various extinguishing agents.

Water:

- Causes water damage;
- Is electrically conductive;
- Is sensitive to freezing;
- Causes environmental damage through contaminated fire extinguishing water;
- Can cause violent reactions if it comes into contact with chemicals;
- Is dangerous if used to extinguish a burning liquid (the liquid will explode causing a burst of flame or the fire will spread, as many liquids float on water)

With which of the following extinguishing agents do you have to be aware of the risk of suffocation when using?

a. Water
b. Carbon dioxide (CO2)
c. Powder
d. Steam

Answer: b and d

Foam:

- Gives limited damage;
- Is sensitive to freezing;
- May be electrically conductive

Sand:

- Cakes together quickly and hardens.

Extinguishing powder:

- Has limited cooling;
- Reduces visibility in confined spaces;
- Causes damage;
- Is polluting.

carbon dioxide:

- Can cause frostbite due to the low temperature;
- Can be suffocating because it displaces oxygen

Fire blanket:

- The person trying to extinguish the fire (the extinguisher) must be able to get close to the source of the fire;
- There is a danger to the extinguisher if the fire blanket is not used properly;
- There is a risk of injury and damage if the seat of the fire is not covered properly or completely.

- ✓ You extinguish a fire by: removing fuel, closing oxygen and/or removing heat.
- ✓ There is an extinguishing agent for every fire class.
- ✓ Electricity fires are a separate category. Extinguish with special foam, powder of CO_2.
- ✓ Water extinguishes by cooling, but also by steaming!
- ✓ Water is cheap and available almost everywhere.

- ✗ Never extinguish burning oil with water.
- ✗ Pay attention to re-ignition when extinguishing with powder.
- ✗ Halon is prohibited as an extinguishing agent!
- ✗ CO_2 is oxygen-displacing, but also suffocating for humans.
- ✗ Water as an extinguishing agent also has disadvantages:
  - frost sensitive;
  - electrically conductive;
  - extinguishing water polluting the environment;
  - water damage often exceeds fire damage.

10.4 What to do in case of fire?

When confronted with a fire, do you know what to actually do? Do you also know the dangers of smoke and heat? To respond properly to a fire situation, you need to practice regularly. There is often a humorous reaction to an evacuation alarm. That is not correct. In the previous sections you already saw how great the risks are.

When you discover a fire, do the following:

- think about your own safety first;
- report the fire to the internal emergency number or to 112;
- warn people in the vicinity of the fire;
- close windows and doors;
- get people to safety, help them escape;
- if you must escape, follow the indicated safe escape route;
- only extinguish if you can, but rather leave this to experts!
- check that everyone is safe and report your presence.

At most companies there is a Company Emergency Response Team (CERT) who are specially trained to provide assistance until the expert emergency services arrive.

Do not use an elevator!

Your personal safety is most important. Therefore, use the (emergency) stairwells. These are specially made to enable a fast escape route. Never use the elevator to escape. Because if the electricity turns off, you can get stuck. In addition, the elevator shaft often acts as a chimney for the smoke, which can lead to smoke poisoning.

Always report first

Reporting a fire is very important. Even if it is only a small fire, do not take any chances and report the fire. The following always applies: report first, then extinguish.

Don't get unpleasant surprises if the extinguishing fails. You can report via the internal emergency number to the chief of duty or the control room. Sometimes it is the porter, the reception or the head of the company emergency response team.

Tips for your safety

Smoke and heat are the main enemies in a fire. Smoke is very poisonous and can prevent oxygen uptake in your body. Heat can burn your body and therefore your lungs. Therefore, never enter a burning room without personal protection (fire-retardant clothing and independent respiratory protection).

To be able to escape safely, it is best to stay as low to the ground as possible. The fire attracts new air from the ground and pushes up the toxic smoke. Low to the ground is where the most oxygen is and the temperature the lowest there.

PRACTISE QUESTION

Which statement is correct?

a. When the evacuation signal goes off, you report to the evacuation supervisor and you can go home immediately.
b. During an evacuation, you may only use the elevator if you have difficulty walking.
c. If you attempt to extinguish the fire, you must know whether the extinguishing agent is suitable for extinguishing the fire.
d. If you have a burn, it is best to rub it well with burn ointment.

Answer: c

Burn wounds must be properly cooled. Hold a burn under gently running, lukewarm water for at least 10-20 minutes. The heat cannot penetrate deeper into the skin. Is there no tap nearby? Other cold liquids (drinks) or even ditch water are a good alternative. Pay attention! Too cold water can cause hypothermia. Never put burn ointment on the wound. Due to the greasy ointment, the heat remains in the skin and the doctor cannot treat the wound properly.

Tips for extinguishing and escape

You can only extinguish a small or starting fire if you are not in danger yourself. Make sure you use the right extinguishing agent and aim at the burning object and not the flames. Even though the fire seems to have gone out, it can flare up again. This can happen through afterglow and re-ignition. If it turns out that you cannot handle the extinguishing, stop, go to a safe place and report to your supervisor or coordinator.

You must follow the instructions for escaping/evacuation. In the event of a fire outside a building, it is important that you escape across the wind direction. This is the fastest way to get out of the danger zone of suffocating toxic smoke and gases. In the event of a fire, you must always go to a safe assembly point and report there.

Put in the correct order. If a fire has started you should:

a. alarm;
b. make an attempt to extinguish;
c. warn people in the area;
d. close windows and doors.

Answer: a, c, d, b

- ✓ Get yourself to safety.
- ✓ Report the fire to the internal emergency number or 112.
- ✓ Always follow the instructions of the BVH, even if it is an exercise.
- ✓ Close windows and doors.
- ✓ Burn: water first, the rest will come later; Cool for at least 10-20 minutes with lukewarm water.
- ✓ To a doctor if:
  - smoke has been inhaled;
  - a blister (or blisters together, second degree) are larger than the palm of hand of the victim;
  - if there is black or white burn (third degree).

- ✗ Never use the elevator to escape
- ✗ Do not extinguish if you have never practiced it.
- ✗ Do not go back into a fire unprotected to rescue someone or get personal belongings. Have this done by trained care providers with protective equipment.
- ✗ Never just leave the assembly point. Always report to the evacuation supervisor and follow the instructions from a Company Emergency Response Team member. Help providers so they do not have to search for you unnecessarily.
- ✗ Never extinguish burning oil with water.

10.5 Explosive Work Environment

We have seen that many environments can be explosive. In order to obtain more clarity about the magnitude and seriousness of the risk, a division has been made into zones in which certain substances or products can lead to explosive situations. For example, it can be indicated per zone and per type of substance which safety requirements apply, which precautions must be taken, etc.

Explosive environment

The European directive ATEX 137 (Atmosphere Explosible) requires a safe workplace in relation to potentially explosive areas and obliges zones to be indicated.

Products that define an explosive environment are:

- flammable gases and vapors;
- flammable liquids with a flash point lower than the ambient temperature;
- flammable substance clouds.

Mechanical equipment can develop hot surfaces. These so-called hotspots can arise in the event of malfunction or incorrect use, causing an explosion. That is why mechanical equipment also falls under ATEX requirements. This also applies to hot pipe surfaces.

Zone indications apply to gas and vapor as well as to substances (see also table):

For gas (and vapor) applies:

- zone 0 (very high risk)
- zone 1 (high risk)
- zone 2 (risk).

For substances applies:

- zone 20 (very high risk)
- zone 21 (high risk)
- zone 22 (risk).

Various precautions must be taken in advance in an explosive environment. These measures must be recorded and approved before the work commences and the room is entered. A work permit is drawn up for this at many companies. The things that must be arranged are determining:

- who may enter the zone to carry out the described activities;
- which prescribed personal protective equipment is required (safety shoes and clothing that do not generate static electricity);
- which work equipment and activities will be performed (explosion-proof work equipment and tools);
- what specific regulations and precautions should be taken;
- which written instructions and regulations apply and must be present;
- what appropriate training is required for involved employees.

PRACTISE QUESTION

Explosion meters are used in an explosive atmosphere. Which statement is correct?

a. In case of an alarm from the explosion meter, it is important that the work is completed first.
b. If an explosion meter goes off, the ignition sources must be switched off and you leave the workplace.
c. Depending on the type of explosion meter alarm, notify the client and wait for further instructions.

Answer: b

One of the regulations for working in such an environment is the (continuous) measurement of dangerous concentrations of gas or vapor in the working environment.

To be able to make a good measurement, you have to take into account the possible source of the gas escape and the distance to this source, wind direction and the density of the gas.
When the explosion meter triggers an alarm, leave the room or surrounding area as soon as possible, turn off any ignition sources (only if it is safe to do so) and notify the responsible officer. This also applies when another alarm is triggered (e.g. evacuation signal or clear-area signal).

What is an important point of attention when entering an explosive environment?

a. Limited communication possible due to security measures.
b. Only the manager is allowed to take preventive measures on site.
c. Instructions and control measures must be in writing and available at the workplace.

Answer: c

Hot work attendant

A fire watch or "hot work attendant" is usually present for activities requiring a hot work permit. This person has the following tasks:

- preventive actions to prevent fire;
- supervise the requirements of the hot work permit;
- call emergency services in case of fire;
- Start extinguishing fire until an emergency response team (emergency response team or (company) fire brigade) arrives;
- apply first aid.

The fire watch or "hot work attendant" has been specially trained to perform the above tasks.

Zone 0	an area in which an explosive atmosphere consisting of a mixture of combustible substances in the form of gas, vapour or mist with air is present continuously, for long periods or repeatedly.
Zone 1	an area where an explosive atmosphere, consisting of a mixture of combustible substances in the form of gas, vapour or mist with air, is likely to be occasionally present under normal operation.
Zone 2	a space where the presence of an explosive atmosphere, consisting of a mixture of combustible substances in the form of gas, vapour or mist with air, is unlikely under normal operation and where, if this does occur, the phenomenon occurs shortly.
Zone 20	an area where an explosive atmosphere, in the form of a cloud of combustible substance in air, is present continuously, for long periods or repeatedly.
Zone 21	an area where an explosive atmosphere, in the form of a cloud of combustible substance in air, may occasionally be present during normal operation.
Zone 22	an area where the presence of an explosive atmosphere, in the form of a cloud of combustible substance in air, is unlikely in normal operation and if it does occur, the phenomenon is of short duration.

✓ Explosion hazard in area between lower explosive limit (LEL) and upper explosive limit (UEL).

✓ Explosion area is different for each substance.

✓ In case of an alarm:

- eliminate ignition sources;
- leave the room/environment;
- inform the responsible officer.

Summary

Chapter 8 Hazardous substances

Hazardous substances come in various forms. In solid and liquid form, as gas or mist, as substance or vapor. The effect inhaling or absorbing a substance has on you depends on the amount and fineness of the substance that you ingest. But the temperature, ventilation and the presence of other substances also play a role. To identify hazardous substances, pictograms and labels with directions on the packaging or cylinder are used.

Working with hazardous substances is risky. Hazardous substances can be poisonous, flammable, intoxicating or explosive, but also corrosive, irritant or harmful. The problem with hazardous substances is that you do not always immediately see or notice that the substances are hazardous. Sometimes you notice the consequences immediately (acute), but with other substances you only get health problems after years (chronic). The term "limit value" is very important when dealing with hazardous substances. The limit value is the maximum concentration of a hazardous substance (gas, vapor, mist or substance) that may be present in a workplace. In order to better deal with harmful and toxic substances, we distinguish eight main groups:

(1) organic solvents, (2) cyclic compounds, (3) cement, (4) acids and lyes, (5) heavy metals, (6) carbon monoxide, (7) asbestos and (8) household products. Biological substances, which can cause health damage, are common in the waste processing industry, healthcare, agriculture, the food industry, the pharmaceutical and biotechnical industry and in water purification plants. You also run the risk of health damage through infections, poisoning, allergies and fungi when you come into contact with animals, working in sewers and in contaminated soil.

Working with hazardous substances requires a high degree of safety. In addition to personal safety for the employee, the workplace must also be safe. Certainly when incidental work is done with substances, facilities and safety measures are sometimes lacking. That is why there must be a system of supervision and control.

Chapter 9 Electricity

Electricity is everywhere. It offers us countless possibilities. But there are also dangers. This section shows what electricity actually is and what risks you run when working with electricity.

There are numerous safety precautions you can take to prevent accidents involving electricity. In this section you can read which measures the Working Conditions Act makes mandatory in this context and how we translate the requirements of the Working Conditions Act into safety measures in the workplace.

There are several dangers when working with electricity, such as fire and explosion hazards, electrocution, injuries from sparks and arcs, personal injury from electric shock and reaction to electric shock. Static electricity is also a particular hazard.

In various places, work is done with radiation or equipment that releases radiation. Working with radiation can pose health risks. Therefore, it is good to know which method applies to activities or situations in which radiation is released.

Radiation is divided into two types:

- ionizing radiation;
- non-ionizing radiation.

The degree of harmful exposure to ionizing radiation depends on:

- the distance to the radiation source;
- the type of radioactive substance.

Chapter 10 Fire and explosion

Fire causes a lot of damage. Not only smoke and water damage, but also indirect damage because important documents are lost or production is halted. Fire also causes a lot of injury. Every year people are injured and killed by fire or explosions. Many measures must therefore be taken to prevent fire and limit damage.

There is a risk that fire will spread and become uncontrollable. That is why you must recognize fire-hazardous situations and know how substances behave in the event of a fire. The flash point and the explosion limits are important here. To be able to extinguish a fire, you have to remove one of the three factors from the fire triangle. Which extinguishing agent works best depends on the burning substance. Flammable substances are divided into classes: A (solids), B (liquids), C (gases), D ((light) metals).

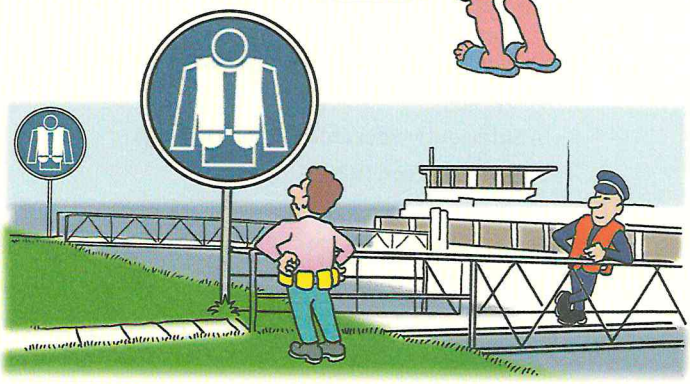
To respond properly to a fire situation, you have to practice regularly. Always follow the instructions of the CERT.

Some substances can be explosive in an environment. In order to obtain more clarity about the magnitude and severity of the risk, a division has been made into zones in which certain substances or products can lead to explosive situations. For example, it can be indicated per zone and per type of substance which safety requirements apply, which precautions must be taken etc.

Zone 0, 1 or 2 applies to gases/vapors.

Zone 20, 21 or 22 applies to substances.

A fire watch or "hot work attendant" is present when work is carried out for which a hot work permit is required.



Questions

1. You regularly work with various (hazardous) substances with the following pictograms. Which pictogram belongs to which substance?


1


2


3.


4.

a. acetic acid
b. dishwasher detergent
c. acetylene
d. weed killer

2. Hazardous substances can have various health risks. Indicate which health risks there are for the substances below.

a. quartz dust;	1. affecting the brain;
b. cement;	2. prevention of oxygen uptake with possible death;
c. carbon monoxide;	3. chemical burns;
d. solvents	4. dust lungs;

3. When working with electricity, there are designations at 3 different levels, namely:
   - A layman;
   - A Sufficiently Educated Person (VOPer);
   - A Skilled Person (VP-er).

   Add one of the above levels to the work that a person is allowed to perform:
   - A ..... may install plugs and replace wall sockets.
   - A ..... is allowed to carry out maintenance on an electrical installation.
   - A ..... may turn a machine on and off.

4. In which activities can biological (hazardous) substances occur?
   a. When inspecting a sewer;
   b. When working with concrete;
   c. When transporting welding gases.

5. What can you say about using your sense of smell to determine if there is a toxic substance? (Multiple answers can be correct.)
   a. Perception of scent is different for everyone;
   b. You can smell dangerous gases and vapors;
   c. You only smell some substances when it is too late;
   d. Warns a person of danger.

6. Which safety precautions should you keep in mind when storing gas cylinders?
   a. Water as a coolant nearby;
   b. Sufficient ventilation;
   c. Placing oxygen cylinders near welding gases.

7. What parts does a fire triangle consist of? (Multiple answers can be correct.)
   - O Ignition energy;
   - O Flash point;
   - O Fuel;
   - O Oxygen;
   - O Explosion limit;
   - O Auto-ignition temperature.

8. What can you use to fight a metal fire (fire class D)?
   a. With carbon dioxide (CO_2);
   b. With water;
   c. With a specific extinguishing powder.

9. How can you prevent electrocution? (Multiple answers can be correct.)
   - O Use of only 120V AC voltage;
   - O A switch box;
   - O Double insulated devices;
   - O Grounding a steel scaffold;
   - O Use of 220V direct current instead of alternating current.

10. As a welder you are welding two steel beams together. Suddenly you see fire all around you. What should you do? Multiple answers can be correct.
    - O Mark the location of the fire
    - O Find the cause of the fire
    - O Pay attention to your own safety
    - O Quickly remove the gas cylinders
    - O Sweep apart the burning material
    - O Escape across from the wind direction

Extra questions for VOL-VCA & VIL-VCU

11. A generator is in the workshop for repair. After maintenance, various parts of the unit must be painted with a special coating in which different solvents have been processed. Put the measures to prevent the absorption of hazardous substances in the correct order. Start with the best measure, etc.

    .... extract the paint fumes directly above the work
    .... loosen the parts and paint in the spray booth
    .... use coating without hazardous solvents
    .... wear respiratory protection.

12. Which of the statements below are correct when working with power tools?
    a. AC voltage is more dangerous than DC voltage: YES / NO
    b. Dry working conditions are more dangerous than wet working conditions: YES / NO
    c. Earthed tools are safer than double insulated tools: YES / NO:

13. Which properties belong to the following extinguishing agents? Connect them with an arrow.

Extinguishing agent:	**Operation:**
Carbon dioxide	Inhibits the combustion reaction between combustible material and oxygen
Foam	Displaces oxygen, limited cooling capacity
Extinguishing powder	Shuts off the oxygen supply to the heat of the fire

14. Who may carry out work on electrical installations under supervision?
    a. A Sufficiently Educated Person
    b. A Layman
    c. A Skilled Person

15. As a supervisor of a welding company you are involved in the construction of new process pipes at a customer. The welds are checked for quality by X-ray.
    What are you going to arrange for the safety of your employees? (Multiple answers can be correct.)
    a. That every employee within the cordoned-off work area wears a personal dosimeter
    b. That a radiation expert is present during the measurements
    c. That good respiratory protection is provided (P3)
    d. That the surrounding area is cordoned off

Koninklijke PBNA

Theme D

Managing incidents and emergencies

11 Accidents

11.1 What to do in the event of an incident?

If there is an incident, you must report it as soon as possible. Depending on what has happened, the company emergency plan goes into effect and the emergency response organization is activated.

Accidents and near-accidents
An accident is an unwanted event that results in damage and/or injury. If an accident occurs during work, we speak of an industrial accident. A near-accident resembles an accident, except that there is no damage and/or injury, but under slightly different circumstances this could have been the case. For example, if a carpenter drops a hammer that just skims past your head and (luckily) falls on your safety shoe. If a (near) accident occurs, immediate measures must be taken, such as calling for help, stopping work where necessary and marking the situation.

Incident
We speak of an incident in both an accident and a near-accident. An incident is an unwanted event with or without damage or injury.

Act quickly and thoroughly
Despite all preventive measures and safety regulations, an accident can occur. It is important that you report the accident quickly via the internal emergency number or via 112. You can alert the Company Emergency Response Team (CERT) via the internal emergency number. At 112 you will receive help from the police, fire brigade and ambulance.

A good report
If you make a report:

- state your name, the name of the company or department;
- provide an accurate description of the location of the accident;
- report the number of victims and the nature of the injuries.

Details such as approach routes, assistance from experts and the presence of witnesses are also important to report. Report to the management at the scene of the accident (for example the head of company emergency response team) that the alarm has been triggered. So it is clear that help is coming.

Always report
You must report all incidents to the supervisor or the company's safety expert as soon as possible. (This also applies if no assistance is necessary.) If necessary, you must accompany the victim of the accident to the first aid post or medical service. Stop the work and only start working again when you have permission to do so again. If necessary, mark the location of the accident or take measures to prevent a recurrence.
You must always follow internal instructions from, for example, emergency response officers.

PRACTISE QUESTION

You work together with a colleague on the construction site. You cut open a pack of insulation material with a sharp knife. Suddenly the knife slips away, resulting in a serious wound on your arm! What should you do?

a. This is a (near-)accident; there is no need to report.
b. This is an accident; you must report it to the supervisor.
c. All incidents must be reported so that the NLA can investigate.

Answer: b

Accidents must be reported and recorded. There will also be an investigation to determine what exactly happened. If necessary, measures are determined on the basis of this investigation. These measures are laid down in an action plan. It also indicates who is responsible for the measures to be taken.

In addition to accidents, near misses, unsafe actions and situations are also recorded. By recording this data, the company can draw lessons from these undesirable events and take measures to prevent this in the future. Therefore, it is important that near misses, unsafe actions and situations are reported to the manager.

Accidents and the NLA

The employer must report a serious accident to the NLA. The NLA must be informed immediately:

- in case of fatal accidents;
- in case of accidents with serious and/or permanent injuries;
- in case an employee is admitted to hospital and stays there.

You see an accident happening. Put in the correct order how to act in the event of an accident.

a. take immediate measures to prevent recurrence.
b. escort victims to the medical service.
c. report an accident immediately to the supervisor.
d. follow internal instructions.

Answer: c, a, b, d

A correct report:

- ✓ name and telephone number;
- ✓ location (where is it?);
- ✓ situation (what happened?);
- ✓ number of victims and type of injury;
- ✓ what did you already do, assistance, extinguishing?

- ✘ Do not conceal any (near-)accident(s).
- ✘ Don't put yourself or others at risk. Not even during the assistance.
- ✘ Do not change the scene of the accident unless you can save lives with your actions.
- ✘ Do not get in the way of emergency responders or CERTs. Let them do their job undisturbed.
- ✘ Don't do things you don't understand (for example CPR).

11.2 Accident investigation and registration of incidents

The registration of (near) accidents and incidents is very important. Not only because it contributes to improving the working conditions policy, but also because it is a legal obligation in the case of serious and/or fatal accidents. The supervisor is often involved.

Registration
According to the VCA checklist, the employer must register all incidents. In addition to accidents with or without personal injury, environmental incidents, damage, fire and explosions are also recorded in a registration form.

Accident investigation
The purpose of an accident investigation is to determine which factors were the cause of the accident. The accident investigation provides recommendations and action points to prevent a repeat of the same accident. In addition to the legal requirements, the research results are important to learn for the future and for better aligning the company's policy.

Accident investigation components
An accident investigation comprises the following components:

- investigation at the scene of the accident;
- collecting facts and data that led to the accident;
- interviewing those involved and witnesses;
- analysis of research results;
- final report with recommendations and action points to prevent repetition.

Points of attention for the investigation at the scene of the accident are:

- perform as soon as possible;
- make sketches, drawings and photos;
- check existing documents;
- special circumstances, such as the weather.

Points of attention for collecting data that led to the accident:

- take samples at the scene of the accident;
- keep the collected material in a suitable place;
- record how and where the data was obtained.

Points of attention with regard to interviewing data subjects:

- determine who should be interviewed;
- interview each victim and, if possible, all witnesses;
- avoid influencing witness information;
- look for causes and not for culprits;
- record witness statements;
- inform the witnesses of your findings after the investigation.

Points of attention for final report:

- description of the facts and data;
- analysis of the facts and data;
- targeted recommendations to prevent recurrence.

PRACTISE QUESTION

Why is incident registration and investigation important?

a. To gain insight into the causes of absenteeism.
b. To learn from incidents and to be able to take measures.
c. In order to be able to form a file, it can be submitted to the annual VCA audit

Answer: b

Eligibility for Permanent Invalidity Benefit (Restrictions) Act

The purpose of this law is to improve the chances of reintegration of sick employees inside or outside the company. The temporary employment agency has obligations under this Act:

- drawing up an action plan for the reintegration of the sick employee
- if the temporary employment agency is negligent with regard to the action plan, the wage payment obligation can be extended by one year

When a temporary agency worker has had an accident, the hirer immediately reports this to the temporary work agency. The hirer is responsible for the accident investigation. As a material employer, the hirer is also obliged to report work accidents of temporary agency workers to the NLA if it concerns a reportable accident.

Which of the following matters can be part of an accident investigation?

a. work permit
b. work instructions and assignment description
c. job description of the victim
d. final report with recommendations
e. interviews with the management

Answer: a, b, d

✓ Registration of: accidents, near-accidents and environmental incidents.

✓ Accident investigation: to learn and better coordinate policy

✘ Waiting too long to interview witnesses.

✘ Near-accidents and environmental incidents must also be recorded!

12 Emergency situations

12.1 Emergency situations

Examples of emergency situations are fires or explosions, the uncontrolled release of hazardous substances, exposure to "biological agents" (bacteria, viruses, fungi, yeasts and parasites) or radioactive radiation. But you can also think of a threat of an emergency due to severe weather, natural disasters, social unrest, (threat of) a terrorist attack and the loss of infrastructure.

Acting in an emergency

An emergency situation can mean accidents with injuries to one or more people, but also damage and loss of production. If an emergency arises, you must report it as soon as possible. First and only when possible, you help potential victims, taking into account your own safety. Measures and actions are also needed to ensure that the emergency does not worsen and is brought to an end. To report an emergency, follow the known instructions carefully. This specifies who to communicate with first and which emergency number to call. When reporting, state what is going on, where you are, what assistance is required immediately, whether there are victims and how many.

Emergency organization and company emergency plan

In emergency situations, the emergency organization of the company comes into effect. This organization takes the lead in dealing with the emergency (calamity). Everyone in the company must then follow the instructions of the personnel of the emergency organization. All employees, but also visitors, must be aware of the company emergency plan. The company emergency plan describes available emergency facilities and manpower within the own company and of other organizations, such as availability of emergency response officers, medical service, doctor, hospital, company and/or government fire brigade, etc.

The following information is included in the business emergency plan:

- site plan and evacuation plan;
- warning agents to be used;
- type of alarm (e.g. evacuation alarm, gas alarm, fire alarm, etc.);
- instructions and information about evacuation drills;
- location resources available;
- how to act in the event of an emergency;
- how accidents and emergencies should be reported;
- how internal and external emergency services are warned.

Phases in response to an emergency

Emergency response can be divided into three phases. First of all, there is the notification (phase 1). A report can be made in various ways, such as by telephone, via walkie-talkie or, for example, by someone making a report to the control room or security. Depending on the notification, different actions may be required. These actions and measures (phase 2) can be:

- evacuation;
- intervention (extinguishing, securing, cleaning up product);
- rescue of persons;
- assistance (first aid).

PRACTISE QUESTION

You are working in a building. The evacuation alarm sounds and you hear a message via the intercom that says that everyone must go to the assembly point. Put the actions below in the correct order..

a You go to the nearest assembly point.
b You report to the emergency response officer.
c You wait for further instructions.
d You stop your work.
e You close windows and doors.

Answer: d, e, a, b, c

Phase 3 is the termination of the emergency. All involved must know that the emergency has ended. It must also be recorded who is allowed to do this and how this is done. Usually by a special sound signal. When the emergency is over, normal operating conditions are restored.
Work permits are no longer valid during an emergency. After the emergency has ended, you must have the work permit signed again or you must apply for a new work permit.

Every company is obliged to practice an evacuation at least once a year. Everyone present must cooperate in this. When the evacuation signal sounds, go to the nearest assembly point. This also applies to an exercise. When you arrive at the meeting point, you will wait for further instructions.

Which of the items below should be included in the company contingency plan?

a. Attendance registration of the emergency response team members.
b. Map of the site.
c. Duties of emergency officers.
d. Types of alarms and end signal.

Answer: b and d

What to do in case of...

Fire:		
1		**Call 112** or smash the glass of hand detector 
2		**Provide information about the fire** who are you, where is the fire taking place, what's on fire, number of victims
3		**Use, if possible, fire extinguisher**
4		**Close doors and windows, calmly leave the hazardous place, do not use an elevator**
5		**Go outside or to the front desk, follow the instructions of the firefighters**

Accidents:		
1		**Call 112**
2		**Provide information about the fire** who are you, type of accident, situation and number of victims, place of accident

In the event of an accident;

- ✓ report first;
- ✓ acting and taking measures (intervention);
- ✓ secure the situation and prevent aggravation;
- ✓ termination by the head of emergency organization.

- ✗ Do not change the location of the accident for the sake of the investigation.
- ✗ Wait for instructions from the CERT before leaving the assembly area

12.2 Company emergency response team (CERT)

Based on the company emergency plan, the employer has the obligation to organize a company emergency response team for the company. What the company emergency response organization looks like depends strongly on the activities of the company, the type of work and the risks based on the Risk Inventory and Evaluation (RI&E).

According to the Working Conditions Act, every employer is obliged to take effective measures with regard to company emergency response. This implies that:

- it must be organized in every company/institution;
- emergency response for the company concerned is guaranteed;
- there must be enough people educated and trained as emergency response officers;
- it concerns a fixed range of duties.

Tasks of the company emergency response worker are:

- providing first aid;
- fighting a starting fire;
- in emergency situations evacuating employees and other persons in the company.

This also often includes tasks such as:

- communication with emergency services such as EMTs, fire brigade and police;
- preventive work to prevent incidents, damage and victims.

Minimum requirements have been set for first aid, such as trained first aid workers and the availability of first aid equipment.

The company emergency response team must be educated and trained. There are special courses for this with accompanying refresher lessons. In addition, there are regular exercises. This is important for:

- preparing staff for emergencies;
- testing the (internal) company emergency plan;
- testing whether personnel are adequately prepared for emergencies.

An evacuation drill must be held at least once a year. Everyone must participate, including visitors, temporary agency workers, contractors and other attendees.

PRACTISE QUESTION

During the annual refresher day, the company emergency response team members are trained for their tasks. One of the components is the evacuation exercise in the office building. Who should participate in this annual evacuation drill

a. company emergency response team members
b. the head of emergency response team
c. visitors
d. the neighboring businesses
e. staff members
f. all suppliers
g. temporary agency workers and trainees

Answer: a, b, c, e, g

Tasks of the company emergency response team are:

a. extinguishing a starting fire
b. conduct accident investigation
c. organize evacuation drills
d. check first aid supplies
e. providing first aid

Answer: a and e

- ✓ Conduct an annual evacuation drill.
- ✓ Company emergency response team receives special training and refresher lessons for their tasks.
- ✓ The size of the emergency response organization is determined based on the RI&E.

- ✗ You are not allowed to continue to work during the evacuation exercise; you have to go to the assembly point
- ✗ There must be enough company emergency response team members; during vacation or absence due to illness there must be replacement.

Summary

Chapter 11 What to do in the event of an incident?

If there is an incident, you must report it as soon as possible. In case of fire or accident, always call the internal emergency number or (if there is none) 112 first! Depending on what happened, the company emergency plan goes into effect and the company emergency response organization is activated.

We speak of an incident in both an accident and a near-accident. You must report all accidents and near-accidents as soon as possible to the supervisor or the company's safety expert. Preventive measures can then be taken so that such an incident can be prevented in the future.

If you report to the internal emergency number or 112:

- state your name, the name of the company or department;
- provide an accurate description of the location of the accident;
- report any number of victims and the nature of the injuries.

The registration of (near) accidents and incidents is very important. Environmental incidents are also registered according to VCA. After an accident or incident, an investigation is carried out. The supervisor is often involved in this.

The purpose of an accident investigation is to determine which factors were the cause of the accident. The research results are especially important for learning for the future and for better aligning the company's policy.

Chapter 12 Emergency situations

Examples of emergency situations are fire or explosion, the uncontrolled release of hazardous substances, exposure to "biological agents" (bacteria, viruses, fungi, yeasts and parasites) or radioactive radiation. But you can also think of a threat of an emergency situation due to severe weather, natural disasters, social unrest, (threat of) a terrorist attack and the loss of infrastructure

Emergency response can be divided into

- notification (phase 1)
- actions and measures (phase 2)
- termination (phase 3)

The company emergency plan describes available emergency facilities and manpower within the company.

All employees, temporary agency workers and employees of contractors must be aware of the company emergency plan.

Based on the company emergency plan, the employer has the obligation to organize a company emergency response team for the company. What the company emergency response organization looks like depends strongly on the activities of the company, the type of work and the risks based on the Risk Inventory and Evaluation (RI&E)

Questions

1. A colleague has just had an accident and is injured. Fortunately, he is not seriously injured. Put the following actions in the correct order.
   .... Follow internal instructions.
   .... If necessary, take immediate measures to prevent immediate recurrence.
   .... Report an accident to the immediate supervisor.
   .... Escort the victim to the medical service.

2. You carry out maintenance work on a machine at a customer. You have a telephone conversation with a colleague about a problem. At that moment you will hear a loud bang. A gas cylinder with a flammable substance has exploded.
   Put your actions in the correct order after the explosion.
   .... Stop communication with a colleague;
   .... Stop working;
   .... Report to the assembly point;
   .... follow internal instructions.

3. An accident investigation is carried out after an accident/incident. Why?
   a. To properly inform the NLA;
   b. To prevent recurrence of accidents;
   c. To help the Health and Safety Service with its work.

4. What does "near-accident" mean?
   a. Undesirable event with only minor injuries as a result;
   b. Undesirable event without damage or injury that could have resulted in a serious accident;
   c. Desired event with limited damage.

5. What is a characteristic of an emergency?
   a. This is caused by, for example, accidents and severe weather.
   b. You cannot prepare for it.
   c. You must call in the NLA.

Extra questions for VOL-VCA & VIL-VCU

6. What are the different stages in emergency management and response?
   a. The first report, the actions and measures, and finally the termination.
   b. The first report, placing cordons around the incident, warn emergency services.
   c. Initial notification, taking measures and termination by sound signal.

7. Who is responsible for the accident investigation in an occupational accident involving a temporary agency worker?
   a. The hirer
   b. The temporary work agency
   c. The inspector of the NLA

8. You have been hired for installation work in a petrochemical company. You are on the premises of the client. The evacuation signal goes off. It is an exercise.
   For each statement, indicate how you should act: "Do" or "Don't do".
   a. Only follow directions from your colleagues. Do / Don't do
   b. Follow the instructions of the company emergency response team Do / Don't do
   c. Immediately stop work Do / Don't do
   d. Just keep on working, you know it is an exercise Do / Don't do
   e. Go and see what else is happening Do / Don't do
   f. Go to the assembly point Do / Don't do

9. What is an important task of the company emergency response team?
   a. Providing first aid.
   b. Providing evacuation exercise.
   c. Providing personal protection during incidents.

10. What is the function of registering near-accidents and incidents according to VCA?
    a. For the information of the NLA and the certifying body.
    b. It is required by law to notify employees of all incidents that occur.
    c. It is to learn lessons and to prevent incidents in the future

Appendix 1

List of abbreviations

Dutch abbreviation	Explanation
ADR	Accord Européen Relatif au Transport International des marchandises dange-reuses par route
AFFF	Aqueous Film Forming Foam
ARBO	Working Conditions [Occupational Health & Safety]
ASA	Antistatic dope
ATEX	ATmosphères EXplosibles
BHV	Company Emergency Response Team
B-VCA	Basic Safety SCC (B-SCC)
CDR	Centraal diploma Register
CE	Conformité Européenne
CE-markering	CE marking
dB(A)	Sound pressure level in decibel
EHBO	First Aid
GPO	Targeted Periodic Examination (GPO)
H-zinnen	Hazard (sentence)
I	Current (Ampère)
IR	Infrared
KLIC	Cables and Pipelines Information Centre (KLIC)
LEL	Lower Explosion Limit
LMRA	Last Minute Risk Analysis (LMRA)
MSDS	Material Safety Data Sheet
NCvB	Dutch Center for Occupational diseases
NFPA-code	National Fire Protection Association
NLA	Nederlandse Arbeidsinspectie
OPS	Organic Psycho Syndrome
P-zinnen	Precaution (sentence)
PMO	Periodic Medical Examination
PBM's	Personal protective equipment (PPE)
PPM	Parts Per Million
R-zinnen	Risk (sentence)
R	Resistance (Ohm)
RI&E	Risk Assessment & Evaluation (RA&E)
RSI	Repetitive Strain Injury
SOG	SSVV [Cooperation for Safety Foundation] Course Guide
S-zinnen	Safety (sentence)
TCVT	Foundation Supervision Certification Vertical Transport)
TGG	Time Weighted Average (TWA)
TRA	Task Risk Analysis (TRA)
U	Electrical voltage
UEL	Upper Explosion Limit
UV	Ultra violet
V & G-wetgeving	H&S legislation

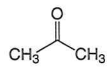
VCO	Safety, Health and Environment Checklist for Principals (SCP)
VCU	Safety, Health and Environment Checklist for Temporary Employment Agencies (SCT)
VIL-VCU	Safety for Intermediaries and Supervisors SCT (SIS-SCT)
VOL-VCA	Safety for Operational Supervisors SCC (SOS-SCC)
VOP	Sufficiently trained person (VOP)
VP	Competent person (VP)
V&G	Health & Safety (Veiligheid & gezondheid)

Appendix 2

MSDS acetone

Synoniemen:
dimethylketon
DMK
propaan-2-on
2-propanon

Kaartnummer: C-0001



ACETON

CAS-nummer: [67-64-1] EG-nummer: 200-662-2 Brutoformule: C_3H_6O

FYSISCHE EIGENSCHAPPEN

Kookpunt, °C	56
Smeltpunt, °C	–95
Vlampunt, °C	–20
Zelfontbrandingstemperatuur, °C	464
Explosiegrenzen, volume% in lucht	2,1 - 13
Minimum ontstekingsenergie, mJ	1,15
Soortelijke geleiding, pS/m	$4{,}9*10^5$
Dampspanning in mbar bij 20°C	247
Dampspanning in mbar bij 50°C	*814*
Relatieve dichtheid bij 20°C van verzadigd damp/luchtmengsel (lucht = 1)	1,2
Relatieve dichtheid (water = 1)	0,8
Oplosbaarheid in water	volledig
Log P octanol/water	–0,2
Bioconcentratiefactor (BCF)	1
Relatieve molecuulmassa	58,1
Omrekenfactor: 1 mg/m^3 =	0,413 ppm

ETIKETTERING

CLP Etiket (REACH Registratie & CLP Annex VI)
Signaalwoord: GEVAAR
H: 225-319-336-EUH066

GHS02 GHS07

Transportindeling (ADR)

UN-nummer	1090
GEVI	33
ERIC	3-09

3

NFPA

GRENSWAARDEN

Wettelijk	1210 mg/m^3
Wettelijk (15 min.)	2420 mg/m^3
DNEL-inhalatie-lange termijn-systemische effecten	1210 mg/m^3
DNEL-inhalatie-korte termijn-systemische effecten	--
DNEL-huid-lange termijn-systemische effecten	186 mg/kg/dag
DNEL-huid-korte termijn-systemische effecten	--

Interventiewaarden (1 uur)	
VRW	480 mg/m^3
AGW	7800 mg/m^3
LBW	14000 mg/m^3
AEGL 1	480 mg/m^3
AEGL 2	7700 mg/m^3
AEGL 3	14000 mg/m^3

BELANGRIJKE GEGEVENS

KLEURLOZE VLOEISTOF MET TYPERENDE GEUR
De damp is zwaarder dan lucht en verspreidt zich over de grond met kans op ontsteking op afstand. Reageert heftig met oxidatiemiddelen onder vorming van peroxiden *met kans op brand en explosie*. Tast rubber en vele kunststoffen aan.

Geurwaarneming: De geur alleen geeft onvoldoende informatie over het acute gezondheidsrisico.
Blootstelling: Een voor de gezondheid gevaarlijke concentratie in de lucht kan door verdamping van deze stof bij ca. 20°C vrij snel worden bereikt; bij vernevelen nog sneller. De stof kan worden opgenomen in het lichaam door inademing van de damp, via de huid en na inslikken.
Eenmalige of kortdurende blootstelling: De stof werkt irriterend op de huid. De stof werkt sterk irriterend op de ogen. De damp van de stof werkt irriterend op de ogen en de bovenste luchtwegen. De vloeistof ontvet de huid. De stof kan inwerken op het centrale zenuwstelsel. Blootstelling kan verlaging van het bewustzijn veroorzaken. In ernstige gevallen kans op bewusteloosheid en dodelijke afloop.
Herhaalde en/of langdurende blootstelling: De vloeistof kan een droge of gebarsten huid veroorzaken. De stof kan zich ophopen in het lichaam.
CMR: Van deze stof zijn de gegevens onvoldoende om een uitspraak te doen over de CMR-effecten bij de mens.
Biomonitoring: Is mogelijk (zie register 'Biologische Monitoring').

DIRECTE GEVAREN	PREVENTIE	MAATREGELEN
Brand: zeer brandgevaarlijk.	geen open vuur, geen vonken en niet roken.	**Blusstoffen:** schuim, zeer veel water, poeder, koolzuur.
Explosie: damp met lucht explosief, kans op explosie door reactie met sterke oxidatiemiddelen.	gesloten apparatuur, ventilatie, explosieveilige elektrische apparatuur en verlichting, aarden, bij vullen, aftappen of verwerken geen perslucht toepassen.	bij brand: tanks/vaten koel houden d.m.v. waterstralen.

NOODSITUATIE: Explosiegevaar! Acuut gezondheidsgevaar! Bij grotere hoeveelheden: gevarenzone ONMIDDELLIJK ontruimen en (laten) afzetten. Deskundige waarschuwen!

SYMPTOMEN	PERSOONLIJKE BESCHERMING	EERSTE HULP
	VORMING VAN NEVEL VOORKOMEN!	
Inademen: prikkeling, droge mond en keel, hoofdpijn, duizeligheid, coördinatiestoornissen, misselijkheid, braken, sufheid, bewusteloosheid.	ruimtelijke afzuiging, plaatselijke afzuiging, adembescherming (filtertype AX).	frisse lucht, rust en onmiddellijk arts raadplegen.
Huid: prikkeling, droge huid, ruwe huid.	handschoenen (butylrubber).	verontreinigde kleding uittrekken, minimaal 20 min. spoelen met veel water of douchen.
Ogen: *damp en vloeistof:* roodheid en pijn, branderig gevoel, slecht zien; *vloeistof:* hoornvliesbeschadiging.	veiligheidsbril, oogbescherming in combinatie met adembescherming.	minimaal 15 min. spoelen met water (evt. contactlenzen verwijderen), dan naar oogarts brengen.
Inslikken: prikkeling van lippen, mond en keel, branderig gevoel achter het borstbeen, zie verder 'Inademen'.		mond laten spoelen (uitspugen!), rust, GEEN braken opwekken en onmiddellijk arts raadplegen.

Voor aanwijzingen over verdere behandeling zo nodig het NVIC (+31(0)30-274 88 88) of het Belgisch Antigifcentrum (+32(0)70-245.245) bellen.

MILIEU, OPRUIMING EN OPSLAG

Opruimen gemorst product: Deskundige waarschuwen. Draag handschoenen, laarzen en verse luchtkap/ademluchtmasker. Extra ventilatie. *Gemorst product* indammen en afdekken met schuim, vervolgens zorgvuldig opzuigen (explosieveilig). *Restant* opnemen in inert absorptiemiddel en dit zorgvuldig verzamelen en opslaan in vaten (hermetisch afsluiten). *Eventuele laatste resten* verwijderen met water. *Spoelwater* afvoeren naar riool.
Opslag: Brandveilig, gescheiden van oxidatiemiddelen, goed gesloten, koel.

Grenswaarden (PNECs - watermilieu)

PNEC zoet water	11 mg/l
PNEC zeewater	1,1 mg/l
PNEC intermitterende emissie	21 mg/l

Opmerkingen: Gebruik stevige houder bij intern transport van breekbare verpakkingen.

Example of MSDS in Dutch language

Appendix 3

Work permits and additional permits

The requirements for the VCA exams refer to 3 positions involved in work permits, namely the permit issuer, the permit holder and the operational employees. During the exams, questions can be asked about the duties of these 3 positions.
The permit applicant also plays an important role in the widely used Deltalinqs system. That is why you will find below a description of the tasks and responsibilities of these functions from the Deltalinqs system:

People involved in a Deltalinqs work permit With a work permit and the additional work permit three officers are involved:

1. the permit applicant;
2. the permit issuer;
3. the permit holder.

In addition, operational employees also have duties.

1. Applicant

The applicant writes out the work order. They also indicate which activities must be carried out and at which location. The applicant also indicates which tools or machines are required for the work. The applicant must provide the following information:

- clear description of the work, the method and the materials and resources to be used;
- location designation, such as a room, installation part, pipe or valve number, etc.
- who will carry out the work (company or, for example, technical service employee)
- the planned start and end date or duration of the work and the conditions for renewal of the work permit.

2. Permit issuer

The issuer of the work permit is responsible for safety on the site or the installation where the work is carried out. The issuer of the permit has the following obligations:

- checking the exemption of the installation
- discussing the nature of the work, the conditions and the measures that must be taken with the work permit holder before signing the work permit;
- signing the work permit;
- ensuring that necessary measurements have been taken if needed
- ensuring coordination and agreements between the collaborating parties.

3. Permit holder

The holder is the manager of the operational employees. It is the holder's duty to:

- sign the work permit;
- explain to the operational employees;
- ensure that the work permit is present at the workplace.

The holder also ensures that the activities are carried out in accordance with the conditions on the work permit. He also checks whether the necessary measurements have been carried out and signed off on the work permit.

Operational employees

The operational employees have the following duties. They should:

- be informed of the contents of the work permit;
- adhere to the conditions for the work, as described in the work permit;
- adhere to the security measures stated on the work permit;
- only work with a valid work permit and take the period of validity into account.

Appendix 4

Signaling and marking

Prohibition signs

Fire, open flame and smoking are prohibited

Eating and drinking prohibited

Prohibited for pedestrians

Do not extinguish with water

Prohibited for unauthorized people

Prohibited for transport vehicles

Prohibited for persons with pacemakers

(Mobile) telephones prohibited

Smoking prohibited

No drinking water

Do not touch

Mandatory signs

Respiratory protection mandatory

Hearing protection mandatory

Face protection mandatory

Eye protection mandatory

Hand protection mandatory

Safety footwear mandatory

Safety clothing mandatory

Safety helmet mandatory

Individual safety harness mandatory

Markers and ribbons

Yellow-black marking is used to indicate:
- narrow passage;
- objects to which someone can bump (e.g. low passage, crane block)
- areas with hazardous substances

Red-white marking: warning for dangerous situations

Warning symbols


Flammable substances or high temperature


General danger


Oxidizing substances


Laser beams


Non-ionizing radiation


Radioactive substance or ionizin


High temperatures


Low temperatures


Biological hazard


Hazardous area


Explosive substances


Magnetic field


Toxic substances


Harmful or Irritant substances


Hanging load

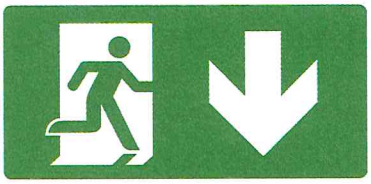

Tripping hazard


Fall hazard due to height difference


Danger of electrical voltage

Safety features


Exit


Emergency exit


Direction to follow

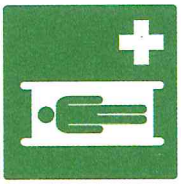

First aid


Evacuation site


Telephone (rescue and first aid)


Emergency shower


Eyewash


Stretcher

AED (CPR)

Firefighting equipment


Fire hose


Fire extinguisher


(Fire)ladder


Fire blanket


Emergency telephone for fire alarm


Fire detector


Way to firefighting equipment

B-VCA / VOL-VCA / VIL-VCU (Engels)

B-SCC / SOS-SCC / SIS –SCT

Answers questions Theme A to D

Answers questions theme A

1. c
2. b
3. 3. The correct order is:
    1. *Adjusting production processes so that less (hazardous) substances are used.*
    2. *Installing filters.*
    3. *Separating waste.*
    4. *Good housekeeping.*
4. *a*
5. *b and c*
6. *a and d*
7. *a*
8. *b*
9. *The correct order is:*
    1. *Look around, are there any dangers?*
    2. *Think carefully about the risks.*
    3. *Assess the risks.*
    4. *Manage the risks, take measures.*
10. *The correct answers are:*
    - *Good housekeeping*
    - *Layout of your workplace (e.g. scaffolding)*
    - *Sealing holes in floors and walls*
    - *Working on flat, non-slippery floors*
    - *Using good and appropriate safety shoes*

Answers VOL VCA theme A

11. The correct answers are:
    - Name and duties of the prevention officer
    - What is a PMO and how is it arranged?
    - How do we discuss safety in the company?
    - What is an RI&E and what tasks does each employee have?
12. a
13. Points of attention that belong to the workplace inspection are:
    a. Pictograms at the entrance to the construction site
    b. Wearing PPE
    c. Inspection with two people
    d. Following regulations
    e. Providing reasons for good safety aspects
14. Risk = chance x effect
15. The correct answers are:
    - When stated in the licensing system
    - When you are going to change the work order or method
    - When the weather is very wintry: snow and ice

Answers questions theme B

1. The correct order is:
   1. Ensures that the installation is taken out of service.
   2. Ensures that the installation is secured against being switched on again.
   3. Checks whether the installation has been secured.
2. The correct order is:
   1.  2.  3.  4. 
3. The correct order is:
   1. LMRA.
   2. Stamping the crane.
   3. Making assembly.
   4. Attaching the load correctly.
4. The correct order is:
   1. Using an aerial work platform operated by an experienced colleague.
   2. With a mobile scaffolding tower.
   3. From a ladder against the facade.
5.
   - Place a barrier around the workplace, so that it is separated from the walking route
   - If possible: close access and refer to another entrance
6. The correct order is:
   1. Earmuffs.
   2. Plugs.
   3. Wads.
7. c
8.

Risk	*Measure*
Blinding of the eyes due to infrared radiation	Welding curtain
Lung disorders due to inhalation of welding fumes	Ventilation
Flash back	Use of flame arrestor
Fire	Prepare extinguishing agents
Getting hit by welding spatter	Keep bystanders away or provide correct PPE

9. The right order is:
   1. Check the workplace if it is free of obstacles
   2. Secure fall protection in the bucket of the aerial work platform
   3. Move the aerial work platform to the workplace
   4. Setting up the aerial work platform
10. *a1, b6, c7,* d3, *e8, f5, g9, h4, i2*

Answers VOL VCA theme B

11. c
12. a
13. The right answers are:
    - From a noise level of 80dB(A) you offer the possibility of hearing tests.
    - Hearing protection is available from a noise level of 80 dB(A).
    - From 85 dB(A) you require everyone to wear hearing protection.
14. The right answers are:
    - Digging must be done carefully.
    - You must take safety precautions.
    - You are obliged to report to the KLIC/Land Registry.
15. a

Answers questions theme c

1. 1a, 2c, 3d, 4b
2. a4, b3, c2, d1
3. The right answers are:
   - A **Sufficiently Instructed Person** (VOP) may install plugs and replace wall sockets.
   - A **Skilled Person** (VP-er) is allowed to carry out maintenance on an electrical installation.
   - A **Lay man** may turn a machine on and off.
4. a
5. a and c
6. b
7. ignition energy, fuel and oxygen
8. c
9. - A switch box
   - Double insulated appliance
   - Earthing a steel scaffold
10. - Pay attention to your own safety
    - Escape across the wind direction

Answers VOL VCA theme C

11. The right order is:
    1. Use coating without hazardous solvents
    2. Extract the paint fumes directly above the work
    3. Loosen and paint the parts in the spray booth
    4. Wear respiratory protection
12. yes, no, no
13.

Extinguishing agent:	operation:
Carbon Dioxide	Displaces oxygen, limited cooling capacity
Foam	Shut off the oxygen supply to the seat of the fire
Extinguishing powder	Inhibits the combustion reaction between combustible material and oxygen

14. a
15. a, b and d

Answers questions theme D

1. The right order is:
   1. Report an accident to the immediate supervisor.
   2. If necessary, take immediate measures to prevent immediate recurrence.
   3. Escort the victim to the medical service.
   4. Follow internal instructions.
2. The right order is:
   1. Stop working.
   2. Stop communication with a colleague.
   3. Follow internal instructions.
   4. Report to the assembly point.
3. b
4. b
5. a

Answers VOL VCA theme D

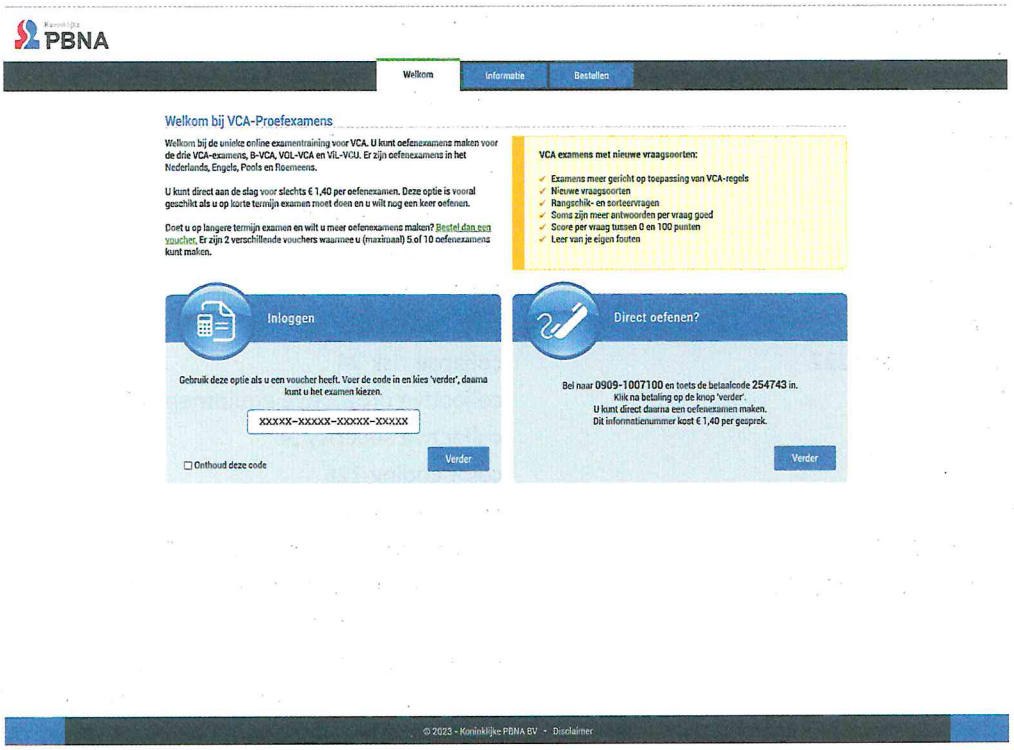
6. a
7. a
8. a. don't do
   b. do
   c. do
   d. don't do
   e. don't do
   f. do
9. a
10. c

VCA test exam

At www.vca-proefexamens.nl you can take a test exam for B-VCA, VOL-VCA or VIL-VCU. They are test exams with questions that are comparable to the real exam questions.
This test exam is not a substitute for a training, but a supplement to a VCA training, which you can follow as group training, eLearning or via self-study. You learn to deal with the different question types and after each test exam you see which subjects you should pay extra attention to.

To do a test exam:

1. Go to www.vca-proefexamens.nl
2. Enter the following code in the red marked field:
   PBNA1-PBNA2-PBNA3-PBNA4
3. And choose the exam you want to practice: B-VCA, VOL-VCA or VIL-VCU



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You can practice more often with a voucher code. You can buy these at:

1. your training institute
2. via http://www.vca-proefexamens.nl/bestellen

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