BG BAU
Berufsgenossenschaft
der Bauwirtschaft

BAUSTEINE

WORK SAFE – STAY SAFE

BAUSTEINE

WORK SAFE – STAY SAFE

A General

B Equipment

C Processes

D Health protection

E Personal protection equipment

BG BAU
Berufsgenossenschaft der Bauwirtschaft

BAUSTEINE

WORK SAFE – STAY SAFE

The common objective of BG BAU and its members is to prevent accidents and occupational illnesses as well as work-related health hazards.

Health and Safety rules and regulations are not always easy to read and the material tends to be very “dry”. Nonetheless, their content must be put into practice. “Implementing Health and Safety” is ultimately part of day-to-day business. This is where the Bausteine come in. Worded briefly and concisely, they cover all the essentials on hazards and safety measures.

The Bausteine are divided into the following chapters:

A. General
This chapter covers general organisational topics that arise in every business.

B. Equipment
This chapter contains information on machinery, equipment, devices and tools used in building construction and civil engineering, in finishing works and in the cleaning trade.

C. Processes
This chapter covers safe procedures.

D. Health protection
This chapter supplements the other chapters, covering topics concerning work-related health hazards, such as noise, climate, heavy physical workload and stress. It covers the most important information on health protection, specifically for carrying out the risk assessments.

E. Personal protection equipment
This chapter describes the PPE required if technical or organisational measures cannot effectively rule out the possibility of accident and health hazards.

Each Baustein deals with a single prevention topic. If you wish to find out more about a specific topic, you can refer to the resources under “Further information” at the bottom of the Baustein.

Regards,

BG BAU
Berufsgenossenschaft
der Bauwirtschaft

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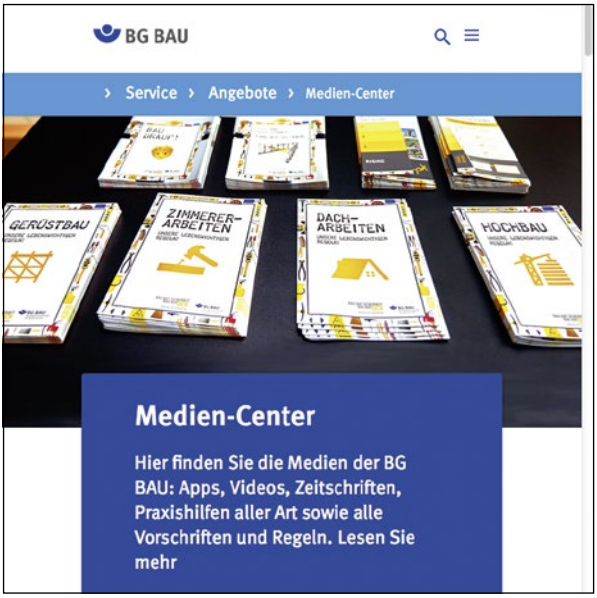
The Bausteine are current as of the time of revision, which is stated on each Baustein.
You can find the latest version of the Bausteine in BG BAU's media centre (www.bgbau.de/Bausteine).

Gender:
All references to persons apply equally to all genders.

Alternative ways to access the Bausteine

Media and practical guides (Internet)

Individual Bausteine can be downloaded in PDF format at **www.bgbau.de/bausteine**.



Rules and regulations

The German statutory accident insurance association (DGUV) has formulated rules and regulations to help businesses and workers to make workplaces safe and healthy.

DGUV regulations (DGUV-V)
Regulations set out safety objectives and make stipulations relating to health and safety. They are legally binding.

DGUV rules (DGUV-R)
The rules are generally recognised health and safety rules. They always reflect the current state of health and safety and the purpose of the rules is to put into practice the stipulations in the regulations.

DGUV information
These summarise specific information and recommendations for particular sectors, work, equipment or target groups.

National laws and ordinances
Occupational Health and Safety Act (ArbSchG): Act on the implementation of health and safety measures to improve safety and health protection of workers at work;
Workplace Ordinance (ArbStättV): Ordinance on workplaces;
Industry Safety Regulation (BetrSichV): Regulation on safety and health protection in the use of work equipment;
Hazardous Substances Ordinance (GefStoffV): Ordinance on protection against hazardous substances, etc.

Technical rules for workplaces (ASR)
The technical rules for workplaces reflect the state of the art in technology, occupational medicine and hygiene as well as other proven findings of occupational research for setting up and operating workplaces.

Technical rules for operational safety (TRBS)
The technical rules for operational safety reflect the state of the art in technology, occupational medicine and hygiene as well as other proven findings of occupational research for the use of work equipment.

Technical rules for hazardous substances (TRGS)
The technical rules for hazardous substances reflect the state of the art in technology, occupational medicine and hygiene as well as other proven scientific findings for work involving hazardous substances, including their classification and labelling.

Technical rules for biological materials (TRBA)
The technical rules for biological materials reflect the state of the art in technology, occupational medicine and hygiene as well as other proven findings of occupational research for work involving biological materials, including their classification.

Equivalence clause
The technical solutions and examples contained in these Bausteine do not exclude other solutions that are at least as safe, which may be found in the technical rules of other member states of the European Union or of other contracting parties to the Agreement on the European Economic Area.

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A General

A General

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Organisation of Health and Safety at Work

A 001

Business operators

are responsible, in particular, for the organisation of health and safety at work and First Aid:

- carry out the risk assessement,
- provide the safety equipment,
- select the employees,
- define the areas of responsibility,
- delegate obligations of business operators,
- appoint Safety Representatives, Safety Officers and First Aiders,
- form a Health and Safety Committee,
- instruct the insured persons,
- monitor all occupational health and safety measures,
- coordinate the work,
- take into consideration the Health and Safety (SiGe) Plan and advice of the coordinator under the construction site regulations (BaustellV).

Departmental management

Departmental management

Medical officer[1)]

- advises the business operator on occupational health aspects of plant and installations; equipment, work materials and processes; personal protection equipment; workplaces and workflows; change of workplace; employment of disabled persons; matters relating to psychology, physiology, ergonomics, hygiene, pattern of work, working hours, organisation of First Aid and on carrying out the risk assessment,
- examines, assesses and advises the employees,
- records and interprets the examination results,
- pays attention that health and safety at work is being observed during workplace inspections.

Safety manager[2)]

- advise the business operator e.g. on safety matters relating to plant and installations; equipment, work materials and processes; personal protection equipment; workplaces and workflows and on carrying out the risk assessment,
- check plant and equipment,
- observe the implementation of health and safety at work and accident prevention, notify measures to remedy defects and investigate the causes of accidents,
- inform employees about accident and health hazards and work towards the safe conduct of all workers in the business.

Supervisors

are responsible within their areas for

- assigning employees,
- carrying out
  - individual safety measures,
  - supervision and checks,
- motivating employees in relation to safety,
- averting danger in individual cases.

Line management

Works Council members

- ensure adherence to health and safety regulations and accident prevention regulations (UVV) issued for the employees' protection,
- take part in plant visits and accident investigations,
- attend meetings of the Health and Safety Committee.

Employees

must

- follow rules and instructions,
- use personal protection equipment,
- remedy defects; if this is not possible, report them.

Safety representative[3)]

support

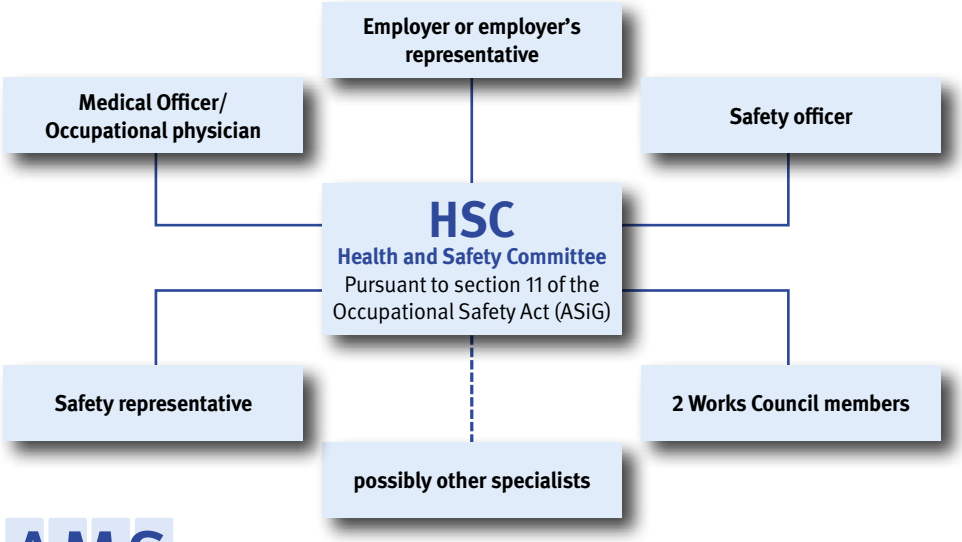
- their immediate supervisors and employees on all health and safety matters,
- regularly check the work area and motivate their colleagues.

[1] **Occupational healthcare** required in all companies with 1+ employees - options:
a) Occupational health and safety service (ASD) of the construction industry's statutory accident insurance association (BG BAU)
b) Medical Officer employed within the business
c) Outsourced Medical Officer

[2] **Occupational service** required in all companies with 1+ employees- options:
a) Occupational health and safety service (ASD) of the construction industry's statutory accident insurance association (BG BAU)
b) Safety Representative appointed within the business
c) Outsourced Safety Representative
Different rules may apply for ‹11 employees or ‹51 employees; e.g. supervision by competence centre or use of an alternative form of supervision.

[3] **Safety Representative** required according to the number of insured persons
for 21–100 insured persons = 1
for 101–200 insured persons = 2
for 201–350 insured persons = 3
for 351–500 insured persons = 4
for 501–750 insured persons = 5
for 751–1,000 insured persons = 6
› 1,000 insured persons = 7

Composition of the Health and Safety Committee (for businesses with ›20 employees)



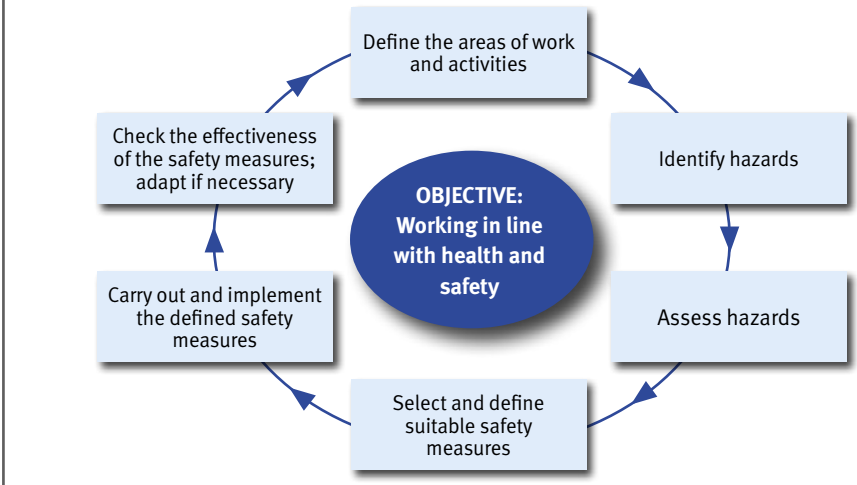
AMS
Arbeitsschutz mit System
BAU

AMS BAU

- The occupational health and safety management system for the construction industry (AMS BAU) enables businesses to systematically build up their health and safety at work organisation.
- The industry-specific concept is based on the National Guidelines on occupational health and safety management systems (NLF).
- AMS BAU comprises a survey, an 11-step instruction manual and practical guides (documents) on implementation.
- At the business operator's request, BG BAU provides free support in the form of
  – advice at the introduction stage,
  – system certification.

Further information:
Occupational Safety Act (ASiG)
DGUV-V1 "Principles of Prevention"
DGUV-V2 "Occupational physicians and OSH professionals"
DGUV-R100-001 "Principles of Prevention"
www.bgbau.de/ams-bau
Chefsache Abr.Nr. 610
"The Safety Officer"
Abr.Nr. 619

Risk assessment – Procedure (steps) ①



Hazards

- To ensure effective and business-specific health and safety measures, an assessment of risk is required. Every business operator is obliged to carry out a hazard assessment.

Procedure ①

- Define/Delineate the areas of work to be assessed, e.g. business organisation, property, construction site, workshop, and the activities to be carried out there.
- Identify hazards ②

– non-specific to property/construction site, e.g. use of electrical equipment that is not regularly tested, employees given insufficient instruction,
– specific to property/construction site (systematic) by trade and activity, e.g. masonry work, earthworks, cleaning work.

- Assess the hazards, e.g. falling, being buried, by assessing and evaluating the risk based on predefined safety objectives, e.g. in regulations and rules and/or by measuring using suitable methods.
- Select and define suitable safety measures where required/necessary, e.g. side protection, sheeting, PPE.
- Carry out and implement the defined safety measures in the work area, e.g. fit side protection, install trench shoring elements, determine person responsible, use personal protection equipment.
- Check the effectiveness of the safety measures in the work area and adapt if necessary.

Completion

- In the case of similar activities or workplaces (e.g. in workshop, office) only assess one activity or one workplace as an example.
- Where working conditions and workflows change (e.g. on a construction site) check whether the example applies and, if necessary, identify and assess further hazards for the construction site in question.
- Instruct the employees on health and safety at work, especially on the hazards associated with their work and measures to prevent them, on the basis of the risk assessment and according to the directives.
- Instruction must be repeated, if necessary, but must take place at least once a year; it must be documented.

Potential hazards 2

Mechanical hazards	Electrical hazards	Noise	Vibration	Hazardous substances	Fire/explosion
• fall • tripping, slipping, falling • getting struck/knocked down • uncontrolled moving parts • parts toppling/falling over • cutting • stabbing	• electric shock • dangerous currents in the body • electrostatic charges	• noise	• hand-arm vibration, e.g. due to demolition hammer • whole-body vibration, e.g. in driver's seat (e.g. fork lift truck)	• asbestos fibres • solvents • isocyanates • acids, alkalis • PAHs, PCBs • benzene • diesel engine emissions • ... in the form of – liquids – gases – fumes – dusts	• when using liquid gas • sparks, e.g. when welding • dust explosions

Biological materials	Physical strains	Climate	Radiation	Mental strains	Organisation
• infections caused by germs, e.g. during sewer works, hospital cleaning • infections caused by viruses, e.g. by failing to follow hygiene rules	• lifting and carrying • unnatural postures	• heat • cold • draught • humidity (precipitation) • ozone	• electromagnetic fields, e.g. proximity to radio masts • infrared/UV radiation, e.g. sunlight, electric arcs when welding • laser radiation, e.g. when measuring	• workflow • working hours • qualification • instruction • responsibility	• workflow • working hours • qualification **Other hazards** • working in positive or negative pressure, in a damp environment, with hot media/surfaces, etc.

Repeat assessment

- in the event of changes in operations,
- in the event of new procedures,
- after accidents and near-misses.

Documentation

- Document in writing the result of the risk assessment, the agreed safety measures and the check.

Support

- Involve Safety Representative, Medical Officer, Safety Officer and/or Works Council in completion of the risk assessment.
- Use BG BAU practical guides (Handlungshilfe) on risk assessment, either on storage device or online.

Further information:
Hazardous Substances Ordinance (GefStoffV)
DGUV-V1 "Principles of Prevention"
DGUV-V38 "Construction Work"
SARS-CoV-2 Health and Safety Protocol
DGUV-R100-001 "Principles of Prevention"

Organisation of First Aid

A 004

Hazards

• Lack of organisation of First Aid results in inadequate or lack of provision of First Aid measures and management of emergency situations.

General

• There are functional, personnel and informational requirements for the organisation of First Aid; advice from the Medical Officer is recommended.

Safety measures

• In consideration of the table below, the following First Aid materials and equipment as well as persons must be in place:

– Communication equipment, which can be used to call for help (e.g. telephone, radio),
– First Aid material (e.g. dressings, aids, space blanket as well as medical devices and drugs required according to the hazard assessment),
– First Aid rooms, in which First Aid can be administered or primary medical attention can be given,
– Emergency equipment (e.g. breathing apparatus, cutting tools, descender devices),
– Rescue equipment (e.g. stretcher, rescue sheets),
– First Aider with basic training of 9 sessions, continuing training at regular intervals of 2 years with 9 sessions,
– Emergency Response Officers, who have attended basic training and advanced training for occupational medical service.

• The following must be in place/known to all employees:

– the alarm plan (may just be a telephone line with emergency telephone number),
– emergency exits and escape routes,
– name and location or mobile telephone numbers of the First Aiders or Emergency Response Officers,
– locations of the First Aid kits, rescue equipment, emergency equipment and the First Aid room,
– display “First Aid Manual” with telephone number 112.

• The following information is required when reporting an emergency (Tel. 112):

– Where did the accident occur? (exact street address)
– What happened (fire, electrical accident, etc.)?
– How many patients/casualties?

– What conditions/injuries? (respiratory arrest, heavy bleeding, etc.)?
– Wait for dispatcher's questions! Do not spontaneously hang up; wait until the dispatcher ends the call.

Additional information for service work

• Check whether the First Aid material and equipment in place at the client's can be used.

Additional information on the First Aid room/container

• For >50 employees (including subcontractors) on a construction site, provide a First Aid room/container.

• Install First Aid container in an accessible location and where onward transport of the casualty is assured.
• Choose the position of the room/container so as to eliminate, as far as possible, noise, dust, vibration, gas or fume hazards.
• Size of the
– First Aid room at least 20 m² in area,
– First Aid container at least 12.5 m² in area.
• Fit out First Aid room/container with anteroom or porch and screen to block view from outside.

• First Aid room/container must be adequately
– lit,
– ventilated,
– supplied with running hot and cold water and telephone line.
• Equip First Aid room/container according to the risk assessment
– with suitable inventory,
– with First Aid resources and materials,
– with suitable emergency equipment and rescue equipment.
• Designate First Aid room/container with safety sign E003 "First Aid".

Required personnel and materials:	Number of employees:									
	1 - 0	11	21	31	41	51	101	251	301	601
Communication equipment (telephone, radio), "First Aid" sign, report book as well as emergency and rescue equipment according to risk assessment.										
On construction sites:										
First Aid room/container						●	●	●	●	●
Small First Aid kit* (e.g. DIN 13157)	1									
Large First Aid kit* [1] (e.g. DIN 13169)		1	1	1	1	2	3	6	7	13
First Aider [2]	1	1	2	3	4	5	10	25	30	60
Emergency Response Officer [3]							●	●	●	●
in Verarbeitungsbetrieben / (abweichend in Verwaltungs- und Handelsbetrieben):										
First Aid room [4]							●	●	●	●
Small First Aid kit* (e.g. DIN 13157)	1	1	(1)	(1)	(1)					
Large First Aid kit* [1] (e.g. DIN 13169)			1	1	1	1	2 (1)	3 (1)	4 (2)	7(3)
First Aider [2]	1	1	2 (1)	3 (2)	4 (2)	5 (3)	10 (5)	25 (13)	30 (15)	60(30)
Emergency Response Officer [5]								●	●	●

* Replenish after use (provision routinely!).

[1] Two small First Aid kits = one large First Aid kit.

[2] One First Aider is only required as of 2 employees.

[3] Need not be appointed by agreement with statutory accident insurance association.

[4] Only in the case of particular accident or health hazards.

[5] Only if type, severity and number of accidents require medical personnel.

( ) Figures in brackets apply to administrative and commercial enterprises.

Further information:
Workplace Ordinance (ArbStättV)
DGUV-V1 "Principles of Prevention"
ASR A 4.3 "First Aid Rooms, First Aid Materials and Equipment"
DGUV Information 204-006 "First Aid Manual"
DGUV Information 204-022 "First Aid in the Workplace"
DGUV Information 204-001 "First Aid" (poster)
DGUV Information 204-021 "Recording First Aid Administration (Report Book)"

Safety at Roadworks

A 008

Hazards

- Failure to ensure, or incorrect, safety at roadworks or a lack of or incorrect signage can result in persons e.g. getting struck or knocked down by vehicles.

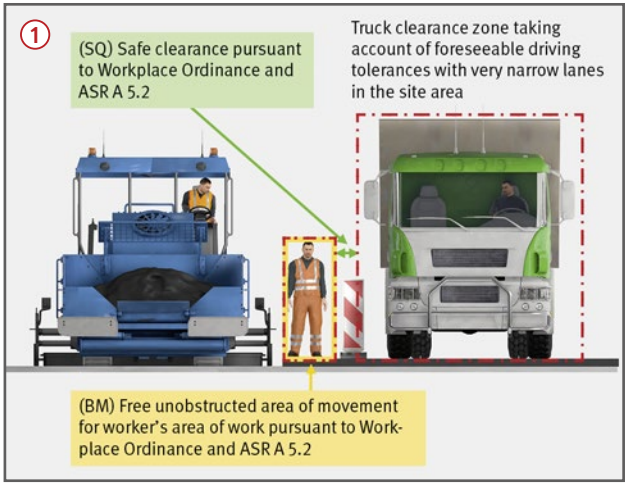
General

- Traffic must be safely directed past the roadworks.
- Roadworks must be planned, organised and completed in such a way to avoid, as far as possible, exposing employees to moving traffic hazards and to keep the residual risk as low as is reasonably possible e.g. by diverting traffic.
- Protect work sites using protective equipment (e.g. mobile road barriers) or traffic guidance equipment (e.g. delineators), as well as sufficient safe clearance from passing (SQ) or oncoming (SL) traffic ②.
- For work carried out within the protection of traffic safety, there must be sufficient room (BM) for safe working ②.

Safety measures

Safe traffic management

- Traffic safety is based on the Road Traffic Regulations (StVO) in conjunction with the "Guidelines for Safety at Roadworks" (RSA-95). These solely concern traffic provisions and expressly do not deal with the protection of workers.



- Before commencing work that affects public road use, obtain from the relevant authority an **order restricting, diverting or prohibiting road use (VAO)** on the nature and extent of site safety. When applying for the VAO, submit a traffic sign plan that
  - takes into consideration the actual local circumstances and the space required for the construction techniques,
  - takes into consideration the safe clearances between traffic area and work areas, machinery and equipment.

- Further important information in the VAO:
  - if necessary, a description of the individual work cycles or phases of construction,
  - actual remaining width of lane sections,
  - period of validity of the VAO: Start and end,
  - speed limits,
  - name, address and telephone number of the person in charge/their representative during and after the period of work.
- The VAO and the approved traffic sign plan must be kept on site.
- Deviations from the VAO are not permitted.
- Speed limits must be applied for if road users or workers in the work area could be endangered:
  - in urban areas, a 30 km/h speed limit is often appropriate,
  - on rural roads, generally 50 km/h,
  - at spots that are particularly narrow or challenging from a traffic management point of view, an even lower speed may be required.
- Check and maintain as required on a case-by-case basis. Prolonged roadworks should generally be checked twice a day; once a day on non-working days and holidays.
- The person in change named in the VAO may delegate checking and maintenance to other persons, but remains responsible.
- The person in charge named in the VAO must have the expertise as required by MVAS.

Protection of workers

- The free unobstructed area at the site of work (BM) ② must be calculated to allow the workers to move unimpeded as they work. The space required by a working person e.g. beside a paver depends on what they are doing and must be determined on a case-by-case basis as part of a risk assessment. The minimum for monitoring, control and operating activities is 0.80 m.
- Have workers work within the protection of mobile road barriers or traffic barriers (e.g. delineators, traffic cones, traffic safety trailers) as well as with safe clearances (SQ and SL) ② pursuant to the Workplace Ordinance (ArbStättV) and ASR A 5.2.
- Safe clearance within the meaning of the ASR A 5.2 is the distance between traffic markers and the traffic-side outer boundaries of work areas or construction site traffic routes. For vehicle restraint systems, side safe clearances (SQ) refer to the traffic-side outer boundary of the vehicle restraint system. For delineators, traffic cones, etc. SQ refers to their centre line ①.
- SL denotes the longitudinal safe clearance from oncoming traffic.
- For values for safe clearances SQ and SL, see ASR A 5.2.
- If the minimum safe clearances under ASR A 5.2 cannot be maintained, measures must be defined as part of a risk assessment that provide at least the same level of health and safety. The following criteria must also be considered, among other things:
  - maximum speed limit of flow of traffic,
  - curvature of the road,
  - lack of possibility for passing flow of traffic to swerve, e.g. due to kerb or traffic going in the opposite direction,
  - lane widths,
  - types of vehicle (trucks, cars, overwidth vehicles),
  - volume of traffic, visibility.

Additional information on visibility clothing and flagmen

- Persons who are posted in the road or beside traffic must wear high-visibility clothing at work. Exception: If the work area is already completely separated from traffic by barriers or site fencing.
- Design of the high-visibility clothing according to EN ISO 20471:
  - at least Class 2. Class 3 is frequently required due to the volume of traffic and the local circumstances.
  - Colour: exclusively fluorescent orange or yellow.
- A flagman can only warn of traffic restrictions or danger spots.
- Traffic management by flagmen is prohibited! Traffic management is reserved exclusively for the police.

Further information:
Workplace Ordinance (ArbStättV)
Construction Site Regulations (BaustellV)
Road Traffic Regulations (StVO)
DGUV-V38 “Construction Work”
DGUV-R 114-016 “Road Use, Road Maintenance”
DGUV Information 212-016 “High-Visibility Clothing”
ASR A 5.2 “Roadworks”
Guidelines for Safety at Roadworks
Additional Technical Terms of Contract and Guidelines for Safety at Roadworks

Artificial Lighting on Construction Sites

A 024

Hazards

- Inadequate lighting can result in trips, slips and falls, other accidents at work and eye strain.

General

- Use artificial lighting to light work sites and routes on construction sites when there is insufficient daylight.
- Adjust the lighting to the particular circumstances and the various operations.
- If particular accident hazards are to be expected if the general lighting goes out, emergency lighting (min. 1 lux) must come on.

Safety measures

Illuminance

- For general lighting, plan and install the lighting equipment so that the levels of illuminance listed in Table 1 are reached at work site and traffic level.
- When planning lighting, bear in mind that the area to be lit generally cannot be taken as a whole, but must be subdivided into subareas due to the fixtures (e.g. walls, scaffolding, etc.) (Table 3).
- For certain work areas and certain work, lighting must be provided according to Table 2.

Selection of lamps and luminaires

- When selecting lamps, ensure that safety colours, e.g. on signage, can be identified as such.
- Ensure uniform lighting of all work sites. Maintain and clean luminaires regularly. Dirt interferes with uniform lighting.
- To ensure good, uniform lighting, preferably use luminaires with a wide beam angle or asymmetrical light distribution.
- To light small areas, choose simple luminaires with halogen or fluorescent lamps. For larger areas, use luminaires for lamps with high light outputs (high-pressure lamps).
- Mounted luminaires must have a rating of at least IP23. For the number of luminaires required depending on the type of lamp, see Table 3.

Arrangement of luminaires

- Arrange the luminaires in such a way that lighting is adequate and uniform. When arranging the luminaires, aim for the following:
  – Position luminaires high up,
  – Use multiple luminaires with a lower output,

– Provide additional lighting for danger areas,
– Suitable incidence of light (avoid casting shadows),
– Prevent glare.

Additional information for particular danger areas

- Highlight particular danger areas on construction sites, e.g. where vehicles and pedestrians cross, with suitable lighting.
- E.g. use a different light colour or have at least double the level of illuminance compared with that in the surrounding area.

1 Levels of illuminance for general lighting

General lighting on construction sites	Mean illuminance E
Building construction	20 Lux
Civil engineering	20 Lux
Steel and metal construction	20 Lux
Rail construction	50 Lux
Tunnel construction	100 Lux
Sanitary facilities and communal spaces	200 Lux
Office spaces	500 Lux

2 Levels of illuminance in subareas for certain work

Work	**Maintained illuminance** of the horizontal illuminance
Working on woodworking machinery	500 Lux
Heavy construction work, e.g. earthworks, general labour and warehouse operations	50 Lux
Medium-fine construction work, e.g. masonry work, formwork, installation work	100 Lux
Fine construction work, e.g. exacting work, surface finishing	200 Lux

3 Levels of illuminance for general lighting

Type of lamp		Number of luminaires per 100 lux								
		Area to be lit in m^2								
		10	20	40	60	100	250	500	1000	2000
		Covered damp-proof luminaires (max. mounting height 4 m)								
3-band fluorescent lamp	58 Watt	2	3	4	6	8	16			
		Spotlight								
Halogen lamp	500 Watt		1	1	2	4	8			
Halogen lamp	1000 Watt				1	2	4	8		
Halogen lamp	2000 Watt					1	2	4	8	
Mercury-vapour HP lamp	250 Watt					2	5	9	18	
Metal-halide HP lamp	250 Watt					2	3	6	10	20
Sodium-vapour HP lamp	250 Watt					1	3	5	10	20
Metal-halide HP lamp	400 Watt						2	4	8	15
Metal-halide HP lamp	2000 Watt								2	4

HP = High-Pressure

Further information:
Workplace Ordinance (ArbStättV)
DGUV-V1 "Principles of Prevention"
DGUV-V38 "Construction Work"
ASRA3.4 "Lighting"
DIN EN 12464-2

Traffic Routes on Construction Sites

A 026

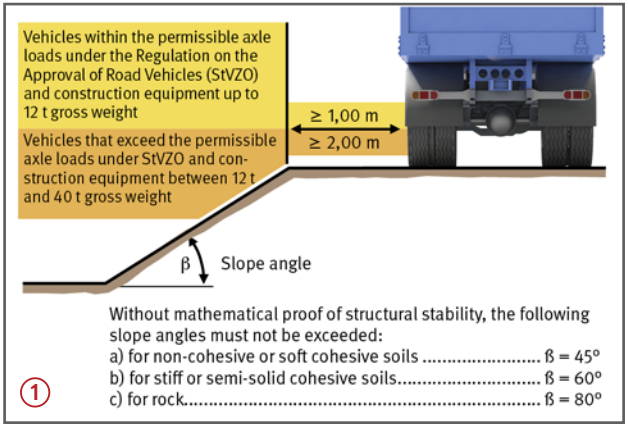
Hazards

- Poorly laid traffic routes with inadequate safety can result in persons tripping, slipping, falling over and falling from a height.

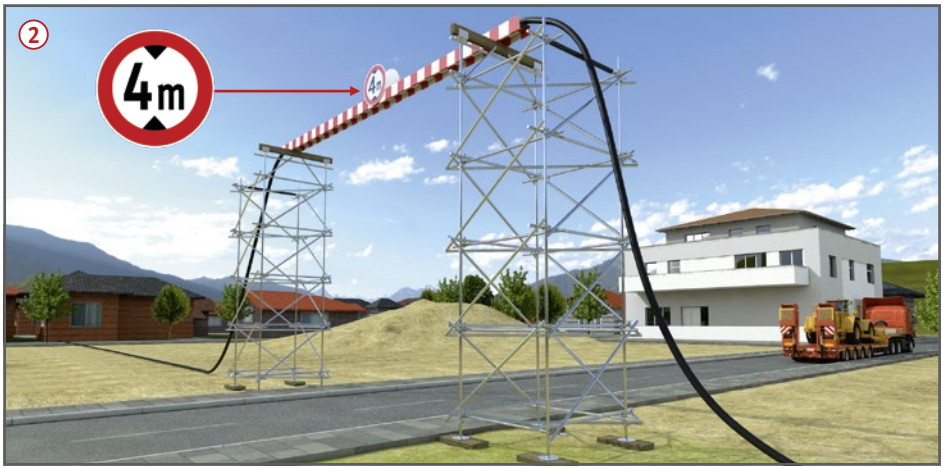
Safety measures

- Put in traffic routes so that workers can move about safely in any weather.
- Use steps or walkways in the case of differences in height.
- Lay traffic routes as level as possible. Avoid trip hazards.
- Use steps as ways up.
- If there is a risk of falling, put in walkways with side protection to bridge excavations, trenches, etc. Depending on the gradient, put in tread strips or stair treads.
- Light traffic routes if there is insufficient daylight.

Safe clearances between vehicles, construction machinery or equipment and non-obstructed excavations and trenches with embankments



- Keep traffic routes and emergency exits clear.
- When planning and building site roads, observe safe clearances to the edges of excavations and trenches ①.
- Keep clearance zone for vehicular traffic free of supply lines ②.
- Headroom less than 4.50 m must be signed (height restriction sign StVO 265) ② ⑤.



Steps

As of a height of 1.00 m, affix side protection, e.g. reusable handrail systems ④.

Walkways

Minimum width: 0.50 m For gradients ›1:5 (approx. 11°): Mount tread strips.
For gradients ›1:1.75 (approx. 30°): Mount stair treads.
Side protection (handrail at height of 1 m, mid rail and toe board) on both sides as of a height of 1.00 m above ground level; install for traffic routes over watercourses of any height.

Additional information

Safety from public traffic

- Cordon off traffic routes on construction sites and demolition sites from public traffic and adjacent properties, e.g. using a site fence, barriers, Jersey walls. Determine signage in consultation with the local traffic police.
- Organise separation of pedestrian and vehicular traffic.
- Sign entrances and exits for delivery vehicles and for the public. Separate entrances and exits are recommended due to the reduced risk of accident.

Routes to elevated or lower work sites

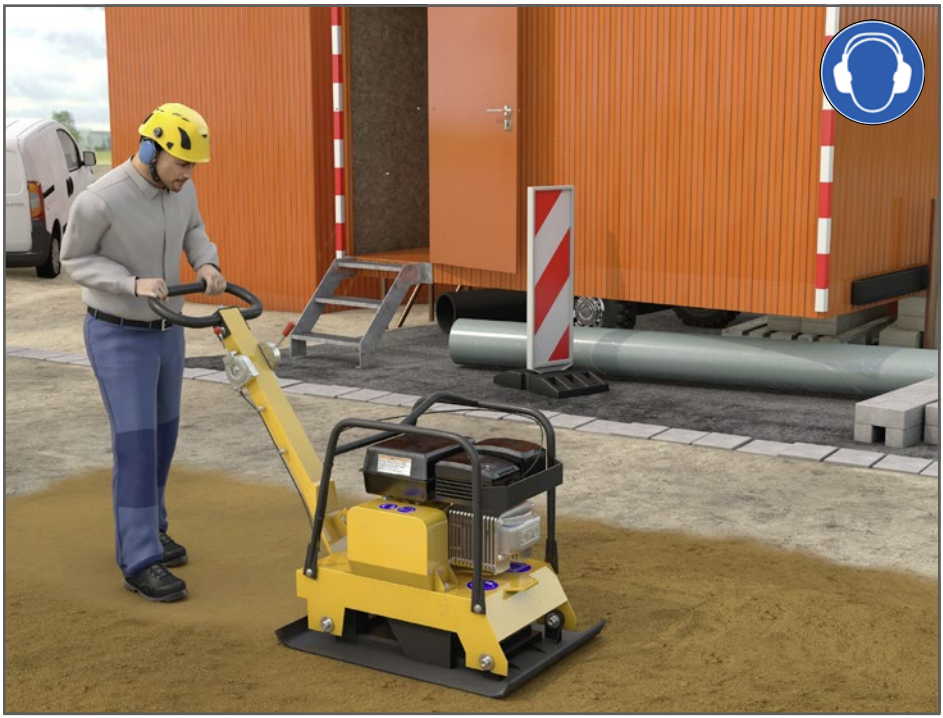
- Lifts, platforms, steps or stair towers ④ are suitable for providing access.
- Only use leaning ladders if no safe equipment can be used as a route based on the risk assessment.

⑤ Headroom (m)	StVO sign 265 with height
4,49 – 4,20	4,0 m
4,19 – 4,10	3,9 m
4,09 – 4,00	3,8 m
3,99 – 3,90	3,7 m
3,89 – 3,80	3,6 m

Further information:
Workplace Ordinance (ArbStättV)
Industry Safety Regulation (BetrSichV)
Road Traffic Regulations (StVO)
DGUV-V38 “Construction Work”
ASR A 1.8 “Traffic Routes”
ASR A 2.1 “Protection against Falls and Falling Objects”
Guidelines for Safety at Roadworks (RSA)
TRBS 2121 “Fall Hazards in the Workplace – General Requirements”
TRBS 2121-2 “Hazards in the Workplace arising from the Use of Ladders”
DGUV-R 101-002 “Steps at Construction Sites”

Noise
on Construction Sites and in Workshops/on Factory Floors

A 030



Hazards

- Noise hazards on the construction site arise from noisy equipment placed in a bad position, noisy construction equipment and machinery, work processes unsuited to the acoustics as well as from work being done by other firms involved in construction.
- Traffic noise emissions at roadworks and rail works increase the noise level.
- In workshops/on factory floors, other noise hazards arise due to the overall noise level being raised by reflections off the boundary surfaces of the room.
- Parallel workplaces or work areas affect their immediate neighbouring workplaces.

General

- Construction sites are temporary mobile workplaces both in the open and in enclosed and semi-enclosed spaces. In workshops/on factory floors there are stationary workplaces that are divided into individual workplaces and/or work areas.
- Processes that require chiselling, cutting, grinding, crushing, drilling, screwdriving, firing, compressing, beating, flame-cutting or blasting must be regarded as being exposed to noise. The sound pressure level depends on the materials being worked on and the processes being used.
- Identical processes produce higher levels of noise in workplaces with reflective boundary surfaces than in the open. Amplifications of up to 8 dB(A) can occur.

Safety measures

• Noise exposure in the workplace/area of work must be identified and evaluated on the basis of a risk assessment, and a noise reduction plan set out if the upper exposure action values are exceeded.

• Technical measures have priority over organisational measures, which in turn should be taken before personal measures.

Technical safety measures

– use of low-noise equipment,
– use of low-noise processes,
– enclosures/cabins for machinery,
– control of acoustics: use of sound-absorbing materials on ceilings and, if necessary, on walls of workshops/factory floors ①.

Organisational safety measures

– signage of noisy areas,
– separate the source of the noise/the noisy workplace/area from the construction site by using mobile noise barriers or mobile enclosures,
– instruct and train workers (working time regulations, workplace coordination, distance from source of noise, maximum length of exposure).

Personal safety measures

– select suitable ear protection.

Additional information

• For noise-control measures in workshops/on factory floors, the state-of-the-art criterion is met if:
– in the octave band centre frequencies of 500 Hz to 4000 Hz, a mean sound absorption coefficient of at least $\alpha = 0.3$ is achieved (suitable for small to medium-sized rooms),
– the sound pressure level decreases by at least 4 dB for each doubling of distance ΔL at a distance between 0.75 and 6 m in the octave band centre frequencies of 500 to 4000 Hz.

• Products or structures with a sound absorption coefficient of $\alpha = 0.9 – 1.0$ in the octave band centre frequencies of 500 Hz to 4000 Hz are considered suitable sound absorbers for ceilings and walls.

• Both sides of mobile or stationary sound barriers should be sound-absorbing and have a sound-absorbing steel plate in the centre to eliminate additional reflections from the sound barriers used.

Occupational healthcare

• Schedule compulsory or offer recommended occupational healthcare appointments according to the results of the risk assessment. Obtain advice of the Medical Officer in relation to this.

Work restrictions

• Pregnant women may not work as of a daily noise level › 80 dB(A).

Further information:
Occupational Health and Safety Act (ArbSchG)
Maternity Protection Act (MSchG)
Regulation Concerning Occupational Health Care (ArbMedVV)
Occupational Health and Safety Regulations Concerning Noise and Vibration (LärmVibrationsArbSchV)
DGUV-V1 “Principles of Prevention”
Technical Rules on LärmVibrationsArbSchV – Noise (TRLV-Lärm)
DGUV-R100-001 “Principles of Prevention”
DGUV-R 112-194 “Use of Ear Protection”
DGUV Information 212-024 “Ear Protection”
DGUV Information 209-023 “Noise in the Workplace”

Hazardous Substances
Basic requirements/measures

A 042

Hazards

- Health hazards can arise from hazardous substances due to inhalation, contact with the skin, the mucous membrane as well as ingestion by mouth.
- There may be other hazards, e.g. fire and explosion hazards. The potential for interactions with other workplaces must be taken into consideration.

Safety measures

- Carry out risk assessment.
- Determine whether substances are hazardous. Check whether less hazardous substances can be used and whether hazards arising from other processes and equipment can be avoided or reduced.
- Information on hazardous substances and mixtures is given in the Safety Data Sheet. If the information provided is insufficient, ask manufacturer.
- If no Safety Data Sheet is available, it can be requested from the supplier.
- Set out safety measures. Take technical safety measures before considering organisational and individual safety measures as well as personal safety measures.
- Draw up instructions for use ①.
- Detailed information and draft instructions for the use of hazardous substances are provided online in WINGIS.
- Adhere to work restrictions and prohibitions, e.g. for young people as well as for pregnant and breastfeeding women.
- On the basis of the instructions for use, instruct workers on the dangers in a form and language they understand before they are assigned to a job, but at least once a year and before use of a new product/process.
- Young people must be instructed at least once every six months.
- Give workers First Aid instruction.
- Do not eat, drink or smoke during work.
- Avoid skin contact.
- When transferring contents into smaller containers, only use shatterproof and durable receptacles, e.g. made of plastic and label them like the original container.
- Avoid splashes when transferring contents (e.g. using siphons or pumps).
- Remove contaminated clothing immediately.
- Work clothing, including footwear, must be kept separate from streetwear, and be cleaned regularly.
- Protect skin: Before work and after breaks, use specific skin protection; after work and before breaks, clean skin correctly; after cleaning and when finished work use skin care products.
- If necessary, wear personal protection equipment, such as chemical resistant gloves, protective clothing, respiratory protection.

Occupational healthcare

- Schedule compulsory or offer recommended occupational healthcare appointments according to the results of the risk assessment. Obtain advice of the Medical Officer in relation to this.

Further information:
Maternity Protection Act (MSchG)
Youth Health and Safety at Work Act (JArbSchG)
Hazardous Substances Ordinance (GefStoffV)
Regulation Concerning Occupational Health Care (ArbMedVV)
Technical Rules for Hazardous Substances
DGUV-V1 "Principles of Prevention"
www.wingis-online.de

①

Instructions for Use No.
Pursuant to section 14 of the Hazardous Substances Ordinance (GefStoffV)

Business:

Date:

PU systems, solvent-free, harmful, sensitising

Painting/skimming/rolling in rooms

GISCODE: PU40

Signal word: Danger

Hazards to humans and the environment

Inhalation or skin contact can be harmful to health. Can cause allergies. Breathing in a large amount as well as skin exposure to a massive concentration can also cause isocyanate asthma. Skin contact can cause a skin allergy. Persons sensitised to isocyanate should not use this product. Irritates the respiratory tract, eyes, skin. Temporary symptoms (headache, dizziness, nausea) are possible. Can cause skin changes, fever, asthma. Do not allow to enter soil, bodies of water or drains!

Safety measures and rules of conduct

Work in well-ventilated areas! Screen off and place sign on the work areas – Do not spend longer than necessary in the area. Do not leave containers standing open! Avoid splashing when filling/transferring/mixing the components. Only put out enough for one coat! Strictly avoid contact with eyes, skin and clothing! Apply barrier cream to make it easier to clean skin afterwards. Remove product residue from the skin using suitable cleaners – do not use solvents! Clean hands thoroughly before taking a break and after finishing work! Use skin care products! Change contaminated clothing! Change clothing after finishing work! Keep streetwear separate from work clothing! Observe work restrictions!

Eye protection: Safety goggles!

Hand protection: Pay particular attention to hand protection, as substances can enter the body through the skin! Butyl rubber gloves. Glove liners are recommended when wearing protective gloves.

Skin protection: Use a non-greasy or low-grease barrier cream on all uncovered body parts

Body protection: Wear protective workwear; wear (disposable) chemical suit/coverall or protective trousers when mixing.

What to do in the event of a hazardous situation

Risk of bursting due to ingress of water into unsealed containers. Soak up with absorbent non-combustible material (e.g. diatomaceous earth, sand), and dispose of material! Clean contaminated surfaces and equipment immediately! In the event of large leaks/spills: Cordon off danger area, remove bystanders, put on personal protection equipment and prevent further leakage! Product is combustible, suitable extinguishing agents: Carbon dioxide, extinguishing powder, foam; for larger fires, also water spray! Risk of bursting and explosion if heated! Spray with water to cool containers in the event of a fire in the vicinity! Always wear personal protection equipment when fighting larger fires! Fires cause dangerous fumes to be given off: carbon monoxide and hydrochloric acid, prussic acid, nitrogen oxides!

Attending physician:

Number to call in case of accident:

First Aid

Whenever First Aid is used: Take care for your own safety and seek medical attention immediately.

Following eye contact: Rinse for 10 minutes under running water while holding eyelids open, or use eye rinse. Always consult an eye doctor!

Following skin contact: Remove heavily contaminated clothing. Clean with plenty of soap and water. Do not use diluents/solvents!

Following inhalation: Move victim to fresh air!

Following ingestion: Do not induce vomiting. Give plenty of water to drink in small sips.

First Aider:

Proper disposal

Use up any remaining product if possible. Mix for curing any individual components that can no longer be used. Do not pour down drain or into dustbin! Dispose of in:

Non-cured remaining product:

Cured remaining product:

Non-dried-out containers:

Dried-out containers:

Transportation of Construction Machinery

A 069

Hazards

- If construction machinery is not loaded and secured correctly, it can tip over or slip during loading and transportation and cause personal injury and property damage.

General

- Plan transportation route and, if the maximum permissible vehicle height of 4 m or the permissible gross weight is exceeded, e.g. for bridges, check route access.

Safety measures

- Only load and unload construction machinery on load-bearing ground. Make sure transportation vehicle is level.
- Determine the weight of the load, e.g. plate or sticker on construction machine.
- Only use suitable means of transport with sufficient load capacity for transportation.
- Before loading, clean any mud, snow and ice off the load bed and off the chassis of the machines to be loaded.

Additional information for vehicles for towing and transportation

- If possible, align the centre of gravity of the load with the longitudinal centre line of the load bed of the transportation vehicle.
- Do not exceed permissible axle load, fifth-wheel load or tongue weight.
- Do not go below the minimum axle load of the steer axle.
- Take vehicle load distribution plan into consideration when loading.

Additional information for the use of lashing equipment

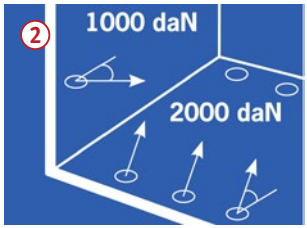
- Determine the dimensions of and select the lashing equipment (wire rope, chains and straps, etc.) according to the weight of the machine to be transported.
- Lashing equipment must be checked
  – for visible defects before each use by the user (e.g. driver),
  – generally once a year by a “qualified person” (e.g. specialist).
- Where using direct lashing, always use four lashings per machine.
- Do not overload the lashing points of the transportation vehicle ②.

Additional information for driving up/down the loading ramp

- Use suitable drive-on ramps ①.
- When loading and unloading, put the machine into the lowest gear and do not change gear while moving (follow the operating manual of the construction machine).
- When driving up/down the ramp there must be nobody beside or behind the ramp (risk of tipping over/rolling off).
- When driving up/down steep ramps and loading devices, use person to direct activity. The person directing must be outside the danger area and be clearly visible to the driver of the construction machine.

Additional information for construction machinery

- Mount construction machine on the load bed, put on parking brake and take further load securing measures, e.g. with lashing straps, lashing chains ③.
- Lock the construction machine’s equipment.



DIN EN 12640 lashing point sticker (minimum size 200/150 mm)

- Before transportation vehicle sets off, engage mechanical slewing brake e.g. in the case of excavators, or articulation lock e.g. in the case of wheel loaders, rollers or dump trucks.
- Close all covers, flaps, windows and doors.

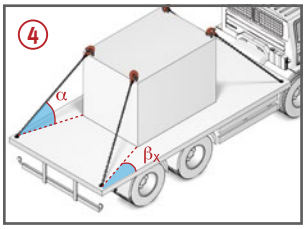
Additional information for transportation by coupling and towing

- When coupling, there must be nobody between the towing vehicle and the construction machine. Exception: The driver of the vehicle to be towed can see the coupling operation.
- Prop up rigid drawbars with support rollers before coupling and uncoupling.
- Only tow vehicles without brakes using rigid tow bars.

- Depending on the load, accommodate vehicle speed to the road and traffic conditions.

Additional information for the journey

- Check lashing equipment during the journey, e.g. at regular intervals, after emergency braking or sudden evasive action and after every break during which the vehicle and the load were unattended.



α = **Vertical lashing angle**
Measured between the top of the load bed and the lashing
β_x = **Horizontal lashing angle**
Measured between the longitudinal outer edge of the load bed and the lashing

- Pay attention to angle ranges when using direct lashing ④, α = 20° to 65° (securing against tipping over and slipping) α ‹ 20° (securing load only against slipping) β_x = 6° to 55°
- Calculate coefficient of friction between load and load bed.
- Refer to the table for the required lashing capacity.

Example: Load: Wheel loader-Weight = **6.0 t**
Coefficient of friction **μ = 0.6** with **fμ = 0.75**
(clean rubber wheels/load bed swept clean)
Coefficient of friction **μ = 0.2**
(dirty rubber wheels/load bed not clean or ice, snow or frost on the load bed).
According to the table: Required lashing capacity per strap **2000 daN** where coefficient of friction μ = 0.6 or **8000 daN** where coefficient of friction μ = 0.2.

To secure the load with 4 lashing straps and a straight-pull lashing capacity (LC) for each of (daN)

Weight of load in t	Coefficient of friction				
	μ = 0.6	μ = 0.6	μ = 0.45	μ = 0.3	μ = 0.2
	mit fμ = 1.0	mit fμ = 0.75			
25.00	4000	8000	13400	25000	–
24.00		6300			
23.00	3000	6000	10000		
22.00				16000	25000
21.00					
20.00					
19.00	2500	5000	8000		
18.00				13400	20000
17.00					
16.00					
15.00	2000	4000	6000		
14.00				10000	16000
13.00					
12.00	1500	3000	5000		
11.00				8000	13400
10.00					
9.00		2500	4000		
8.50				6300	10000
8.00					
7.00	1000	2000	3000	6000	
6.75				5000	8000
6.00					
5.00	750	1500	2500	4000	6000
4.00			2000		5000
3.00	500	1000	1500	2500	4000
2.50		750		2000	3000
2.00			1000		2500
1.70	250	500	750	1500	2000
1.50					
1.25				1000	1500
1.00			500		
0.75		250		750	1000
0.50			250	500	750
0.40					500
0.25				250	

Further information:
Road Traffic Regulations (StVO)
Regulation on the Approval of Road Vehicles (StVZO)
Brochure "Securing Loads on Construction Industry Vehicles"
DIN EN 12195

B Equipment

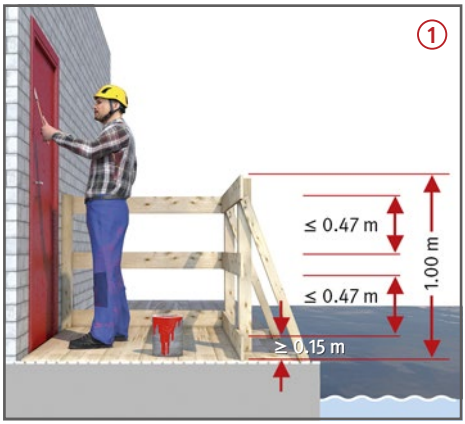
B Equipment

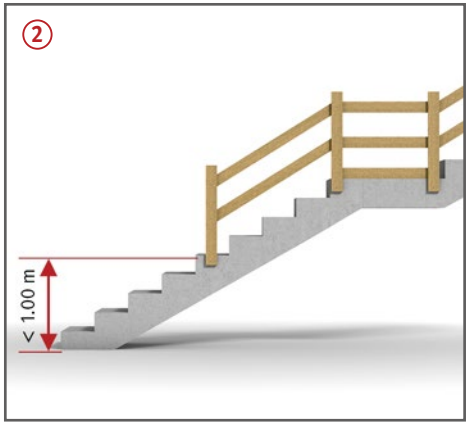
Baustein No.	Baustein title
100	Fall Protection on Construction Sites Guardrails/barriers
107	Edge Protection
111	Scaffolds
113	Façade Scaffolds
131	Leaning Ladders
132	Stepladders, Podium Steps, Platform Ladders
142	Ladder Hoists
164	Rigging Loads Slings
171	Electrical Installations and Equipment on Construction and Job Sites
172	Electrical Installations and Equipment Periodic Inspections
181	Excavators
182	Loaders – Dumpers – Graders
189	Trench Sheeting Equipment
204	Mortar Sprayers and Mortar Delivery Equipment
206	Tools for Drilling, Hammering and Chiselling
211	Forklift Trucks
212	Mobile Elevated Work Platforms

Fall Protection on Construction Sites

Guardrails/barriers

B 100





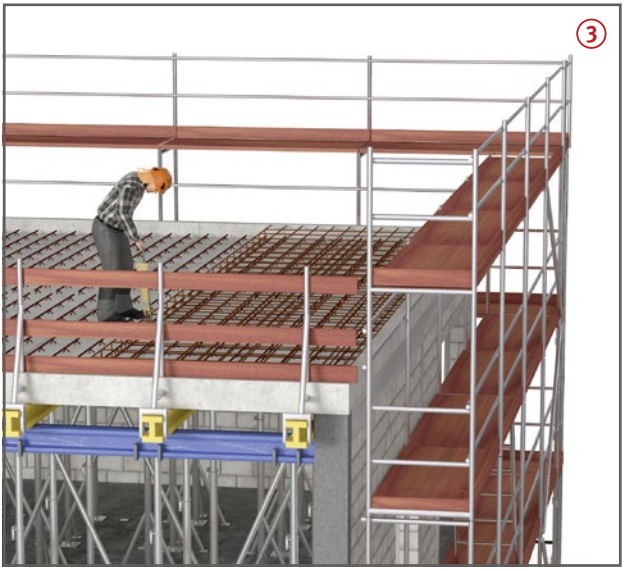
Risks

- There is a risk of falling at a fall height of greater than 1.00 m.
- The use of no or incomplete or the wrong size fall protection as well as lacking safety measures during installation can result in falls from height.

Safety measures

- The business operator must ensure that equipment that prevents falls from heights are available:

1. regardless of the fall height, at work sites and traffic routes by and over water or other solid or liquid substances into which a person can sink ①;
2. in the case of fall heights greater than 1.00 m that do not come under no. 1, on exposed flights of stairs and landings, wall openings and traffic routes ②;
3. in the case of fall heights greater than 2.00 m, at all other work sites ③.

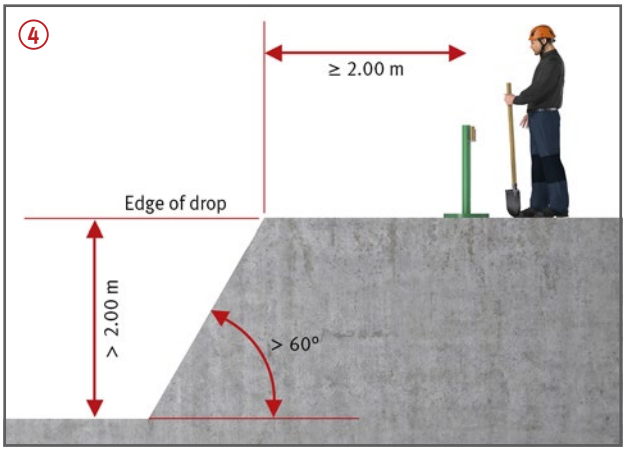


Openings and depressions

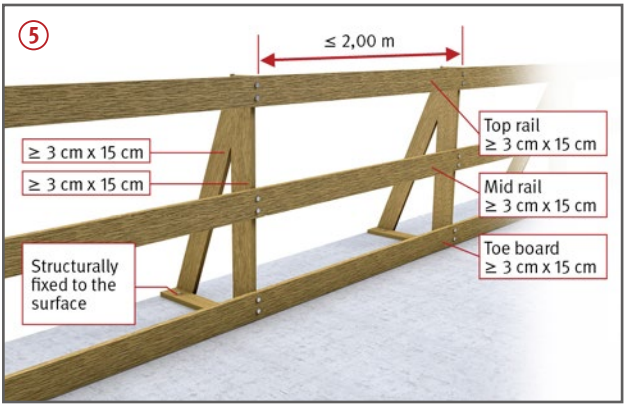
- Straight edge ≤ 3.00 m or area ≤ 9 m².
- Openings and depressions are properly made safe if they are fenced or covered so they can be walked on and the cover cannot move.

Additional information for fall protection

- Fall protection equipment and measures are not required, regardless of the fall height, if:



Exception:
In the case of fall heights of up to 3.00 m, guards are not necessary at work sites and traffic routes on roofs and floor slabs with a slope of up to 22.5° and an area of no more than 50 m² provided the work is carried out by professionally qualified and physically capable insured persons, who have received special instruction and can clearly make out the edge of the drop.



used as top rail and mid rail:
- with a post spacing of up to 2.00 m boards with a minimum cross-section of 15 x 3 cm,
- with a post spacing of up to 3.00 m boards with a minimum cross-section of 20 x 4 cm, or steel tubing Ø 48.3 x 3.2 mm or aluminium tubing Ø 48.3 x 4 mm.
- the height of the boards above the surface must be at least 15 cm. Minimum thickness 3 cm,
- fitness for use is deemed to be verified for wooden guardrail posts that conform to diagram ⑤.

– work sites or traffic routes have a slope of up to 22.5° and are cordoned off at least 2.00 m from the edges with a solid barrier, e.g. railing, chains or rope. Barrier tape is not a solid barrier ④. In addition, smooth surfaces, on which a person could slip under the barrier, must not present a risk,
– the horizontal distance from the edge of the drop for work sites or traffic routes is max. 0.30 m from other sound and sufficiently large surfaces.

• If for work-related reasons – e.g. working directly at the edge of the drop – guards cannot be used, the business operator must ensure that equipment to break falls is available instead (collective fall protection e.g. scaffolds, roof scaffolds, safety nets, screens).

• If guards or collective fall protection cannot be put in place, the operator of the business must ensure that personal fall protection equipment is used as an individual safety measure. The personal fall protection equipment must follow from the risk assessment. In individual cases, the worker's superior with the necessary skills and authority must determine the suitable anchor devices and the rescue concept.

Additional information for guardrail dimensions

• Top rail and mid rail must be prevented from inadvertently becoming loose/detached, the toe board must be secured so it cannot tilt. Without a structural analysis, the following may be

Further information:
Industry Safety Regulation (BetrSichV)
Workplace Ordinance (ArbStättV)
DGUV-V38 "Construction Work"
ASR A 2.1 "Protection against Falls and Falling Objects, Entering Danger Areas"
DGUV Information 201-023 "Safety of Guardrails, Edge Protection and Roof Screens used as Fall Protection for Construction Work"
DIN EN 12811-1:2004-03, DIN EN 13374, DIN 4420-1:2004-03, DIN 4426:2017-01

Edge Protection

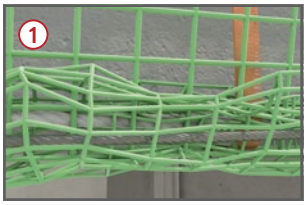
B 107

Risks

- A lack of measures to make safe the outer edges of roofs and buildings can result in falls.

General

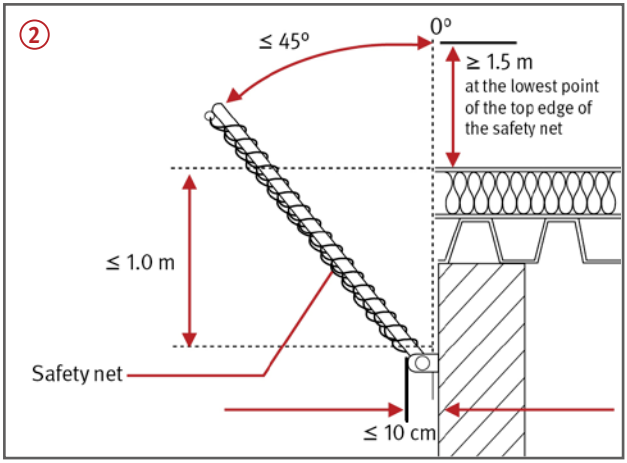
- Edge protection prevents persons from falling off the edges of roofs and floor slabs from surfaces with a slope of ≤ 22.5°.
- Edge protection consists of posts, bases, safety nets and ropes ①, if applicable, and system elements. The edge of the drop is no more than 40 m off the ground.

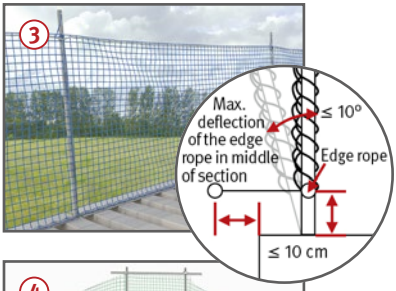


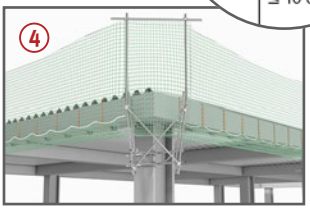
Safety measures

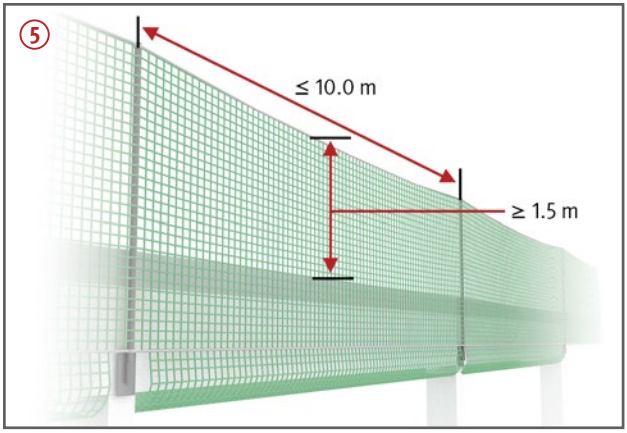
- Only use systems with verified fitness for use (see Principles for Testing Edge Protection).
- Clarify the structural and design-engineering requirements of the points at which the systems are fixed to the structure before installing.
- Install according to the manufacturer's instructions for installation and use. Pay attention to specific instructions for the corners of the building or the end section of the edge protection system ④, ⑥.
- Only carry out installation, alterations and dismantling from special work areas, e.g. elevated work platform, mobile scaffold tower.
- Edge protection posts shall be vertical; tilt angles of up to 45° are possible for structural reasons ②.
- If edge protection is placed on the roof, use edge protection with a tilt angle of ≤ 10° or according to the manufacturer's specification ③.
- Edge protection post spacing should be max. 10 m ⑤.
- Choose the length of the edge protection post so that the distance between the top rope of the safety net at its lowest point is no less than 1.5 m from the edge of the drop ③.
- The lowest point of the hanging safety net below the edge of the drop should be max. 1.0 m.
- Horizontal distance between safety net and structure should be max. 10 cm ③.
- Interconnect the safety nets to leave no gaps › 10 cm.
- Fasten safety net at bottom to components at least every 75 cm (e.g. suspended rope) ⑥.

Safety net rope must be tensioned with additional steel rope at the bottom edge of the edge protection system.





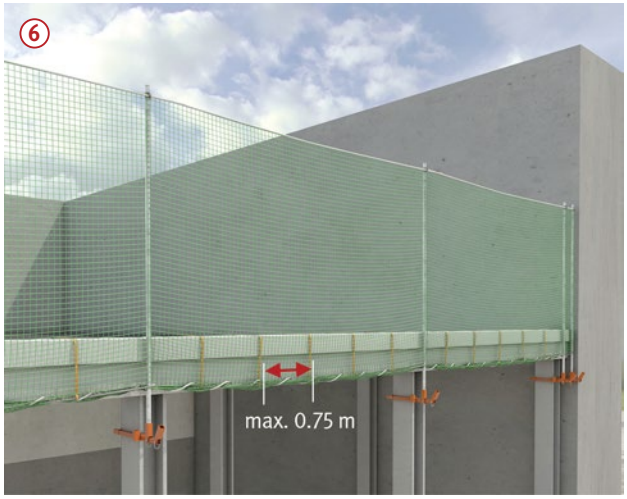




Edge protection below the roof surface with horizontal net.

Inspections

- To check its proper condition, inspection by a competent person working for the contractor after completion and prior to handover to the user (proof – inspection report).
- Every user must have a "qualified person" carry out an inspection for obvious defects and, if necessary, a functional check before use (proof – checklist)



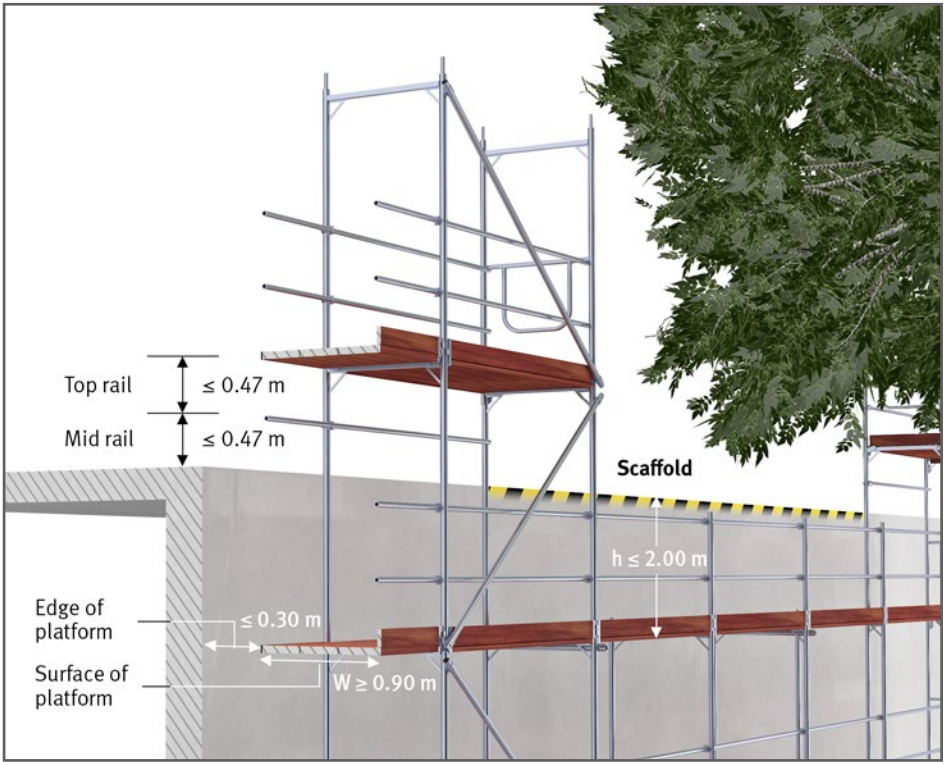
Edge protection fastened to components at bottom.

Double post construction at end post.

Further information:
Workplace Ordinance (ArbStättV)
Industry Safety Regulation (BetrSichV)
DGUV-V38 "Construction Work"
DGUV Information 201-023 "Use of Guardrails and Guardrail Systems as well as Edge Protection as Fall Protection for Construction Work"

Scaffolds

B 111

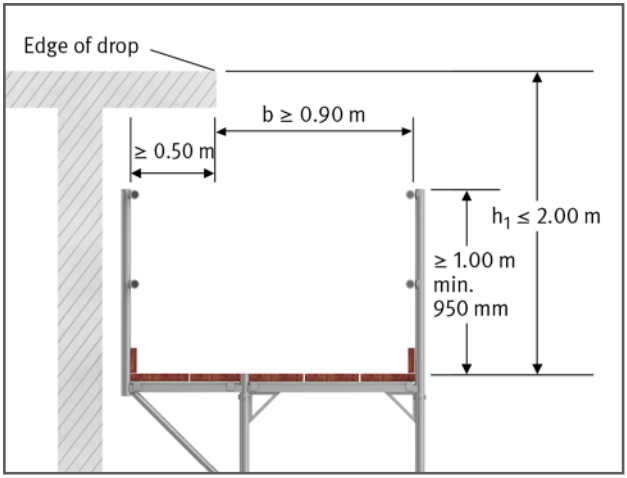


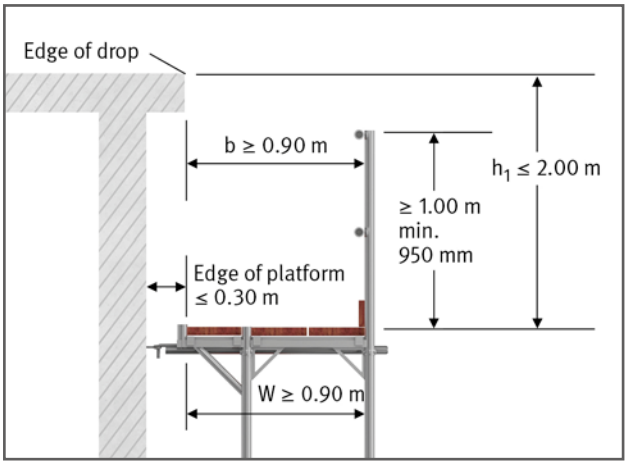
Risks

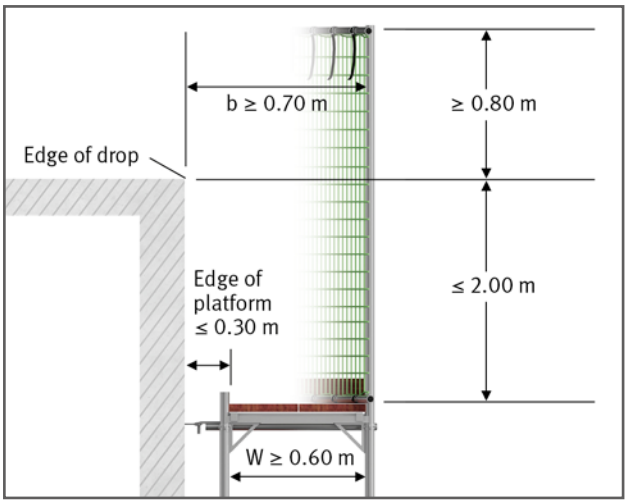
- Incomplete or the wrong size scaffolds as well as lacking safety measures during installation can result in falls from height.

General

- If, when working on surfaces with a slope of no more than 22.5°, there are no guardrails attached to the edge of the drop to make them safe, scaffolds must be used to break falls instead.
- According to the hierarchy of safety measures, scaffolds must only be erected if, for structural reasons or because of the surroundings, it is not possible to put up fall protections (guardrails).







Safety measures

- When using scaffolds, pay attention to the following, among other things:
  - to reduce the risk, minimise the difference in height between the edge of the drop and the scaffold platform as much as possible,
  - The max. difference in height between the edge of the drop and scaffold platform may not be greater than 2.00 m where the width of the fall-breaking surface of the scaffolding is at least 0.90 m,
  - Alternatively, for scaffolds with a screen enclosure, the minimum width of the fall-breaking surface may be 0.60 m. In this case, the top edge of the screen enclosure must be at least 0.80 m above the edge of the drop and the horizontal distance between the edge of the drop and the screen must be at least 0.70 m.
- Do not remove scaffold components.
- Do not store materials on the fall-breaking surface.

Inspections

- Scaffolding contractor: To check its proper condition, inspection by a competent person after completion and prior to handover to the user (proof – inspection report).
- Scaffolding user: The user must have a “qualified person” carry out a visual inspection before use to check that it is safe and free of defects (proof – checklist).

Further information:
Industry Safety Regulation (BetrSichV)
DGUV-V38 “Construction Work”
TRBS 2121-1 “Fall Hazards in the Workplace arising from the Use of Scaffolds”
DIN 4420-1
DIN EN 12811-1

Façade Scaffolds

B 113

Risks

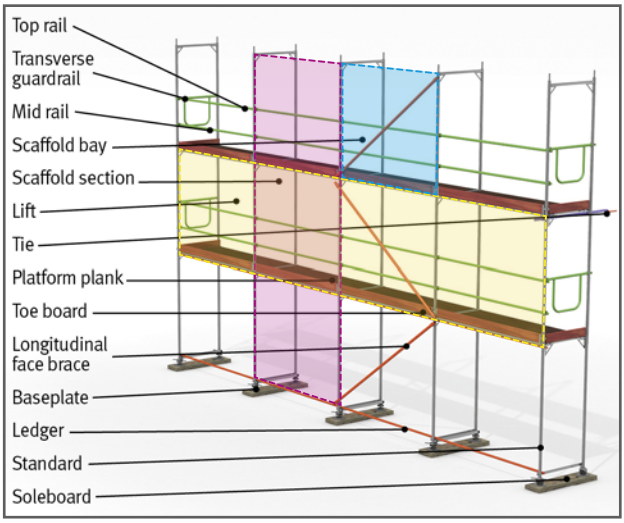
- Incomplete scaffolds as well as unauthorised alterations to the scaffold can result in falls or scaffold collapse.

General

- Façade scaffolds are scaffolds with levels running lengthwise, which stand directly on the ground as frameworks.
- Façade scaffolds must be stable, have safe access and be failure safe (not a risk of falling).
- Fitness for use within the scope of a generally recognised standard configuration is verified if it has e.g. a national technical approval (issued by DIBt) and accompanying instructions for installation and use (IIU).
- Façade scaffolds can be erected e.g. using:

– system scaffolding (e.g. frame, modular scaffolds) made of prefabricated components (standard configuration – national technical approval + IIU),
– tube and fitting scaffolding (standard configuration – DIN 4420-3 and IIU).

- Depending on the work to be carried out, select the load class and width class, and determine standard and transom spacings and platform thickness.
- For setting down loads with the lift, load class 4 is required at a minimum.



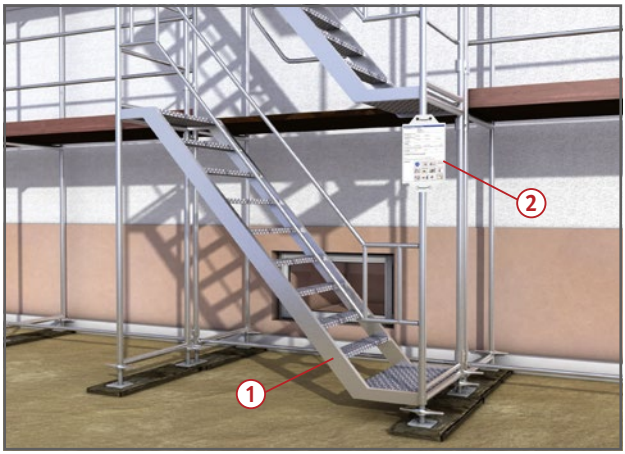
Safety measures

Ground

- Use load-bearing ground as a contact surface for the scaffolding.
- The load-bearing capacity of the ground can be affected by e.g.: shafts, channels, cisterns, insufficiently compacted subsoil, proximity to embankments of excavations and trenches.
- To improve the load-bearing capacity use load-distributing bases.
- Do not use building material, e.g. bricks as a base.
- If the ground is sloping, the load-distributing base should be such that the baseplate can be placed on it horizontal.
- Only use scaffolding with a baseplate as a support; do not stand tubes or frame directly on the ground.

Fixing

- Fix the scaffold as erection progresses to load-bearing components of the façade so as to ensure tensile strength and compressive strength. From the very first scaffold bay, the scaffold must be secured to prevent toppling (see IIU).
- Locate ties close to scaffolding fittings.
- If there is no suitable tying surface or the tying pattern specified in the IIU cannot be adhered to, measures to ensure structural stability must be set out in the instructions for installation.
- If ballasting is necessary, only solid material may be used (e.g. concrete or steel weights); do not use liquid or granular materials in containers.



Access ①

- All workplaces must be accessible via safe accesses. Lifts, platforms, steps or ladders are suitable for providing access. At least one access every 50 m scaffold length (development).
- Access permitted via internal ladders
  – up to a vertical height of 5 m or
  – when working on family dwellings,

  if the risks presented (e.g. transport of large volume of material, closure of climb-through openings) are taken into consideration in the risk assessment.
- If lifts, platforms or steps cannot be used for structural reasons, system-specific internal ladders may be used.

Scaffold platform

- In the standard configuration every lift must be fully decked.
- If scaffolding around the corner of the building, continue the platform around the corner the full width.
- In the case of non-system platforms, provide sufficiently large overlaps at the transoms.
- The platform must not rock, lift or part (secure platform).
- On the inside of the scaffold, the horizontal distance between platform and structure must be no more than 0.30 m.
- Keep hatches in climb-through platform closed after climbing through.

Guardrails

- Guardrails consist of the top rail, mid rail and toe board and must be mounted on the outside and ends of the scaffolding.
- Mount guardrails on the inside of the scaffolding if the horizontal distance between platform and structure is more than 0.30 m. The toe board is not necessary on the inside, if work is being carried out on the façade.
- Secure internal access ladder that is only used as a vertical traffic route with at least two-part guardrails, including the ends.

Signage

- Signage (ideally at access ②) forms part of the inspection and is required for visual inspection; contents:
  – name, address and telephone number of the scaffolding contractor
  – type of scaffolding
  – load and width class
  – details of any restrictions on use
  – warnings
  – date of last inspection
- Scaffolding/areas that are not ready for use must be signed with the prohibition sign “No entry” and access to the danger area must be blocked off.

Inspections

- Scaffolding contractor: To check its proper condition, inspection by a competent person after completion and prior to handover to the user (proof-inspection report).
- Scaffolding user: The user must have a “qualified person” carry out an inspection before use to check that it is safe and free of defects (proof-checklist).

Load classes of work scaffolding

Load class	Evenly distributed load kn/m²
1	0.75
2	1.50
3	2.00
4	3.00
5	4.50
6	6.00

Width class/Width w of the lift in m

W 06	0.6 < w< 0.9
W 09	0.9 < w< 1.2
W 1.2	1.2 < w< 1.5
W 1.5	1.5 < w< 1.8
W 1.8	1.8 < w< 2.1
W 2.1	2.1 < w< 2.4
W 2.4	2.4 < w

Further information:
Industry Safety Regulation (BetrSichV)
DGUV-V38 “Construction Work”
TRBS 2121-1 “Risks of Falling in the Workplace arising from the Use of Scaffolds”
DIN 4420-1 and 3
DIN EN 12811-1

Leaning Ladders

B 131

Risks

- Falls due to e.g. poor ladder stability, mistakes by the ladder user, slipping from a step or rung while climbing or descending, failure to make ladder safe in areas of traffic or the use of a defective ladder.

General

- Before a ladder is provided and used for work at height or as access to raised work sites, a risk assessment must be carried out to determine whether the use of a ladder is necessary or whether there is a safer work equipment for this job.
- The use of ladders must be limited to low risk work and short duration of use.
- Structural conditions that cannot be changed may also result in ladder use.
- If possible, use leaning ladders with steps, stabiliser bars ② and stile extensions ①. Climbing and descending is safer without stepping off the side of the ladder.

Safety measures

- Secure leaning ladders to prevent slipping outwards or sideways, falling over, overturning, slipping off and sinking, e.g. by:
  - tying the top of the ladder,
  - fixing the base of the ladder,
  - using ladder accessories, e.g. stabiliser bars ②, device for securing the top of the ladder ③, feet suited to the ground ④,
  - suspension devices.
- Improve user stability by using stepladders.
- Do not use defective ladders, e.g. broken stiles and rungs/steps of wooden ladders, bent and kinked metal ladders. Do not repair broken stiles and rungs/steps of ladders.
- When storing wooden ladders, protect them against the effects of the weather and temperatures. Do not paint with opaque colours.
- Only lean ladders against safe points. Set up ladder so it extends at least 1.00 m above the exit ⑤ or create/use something else to hold onto.

- Lean ladder at correct angle ④. The correct angle for
  – leaning ladders with steps is 60–70°,
  – leaning ladders with rungs 65–75°.
- Only use ladders wearing suitable footwear, and ensure that dirt on the soles does not affect stepping on the steps or rungs.
- Do not step on the top three rungs/steps.
- Write instructions for use and regularly instruct workers how to use ladders.
- Make ladders in traffic areas safe, e.g. by blocking them off.
- When working in the open, take ambient conditions and weather conditions into consideration (e.g. wind, slippery surface due to snow and ice, items falling or falling over).

Additional information for multi-section leaning ladders

- Only connect or extend ladders to the length specified by the manufacturer.
- In the case of extension ladders, ensure parts move freely and that rung locks engage properly ⑦.

Additional information for window cleaning ladders

- Only connect ladders up to the maximum permitted length.
- Ensure that ladder connectors are safely connected.
- Only rest ladder pads or top block against safe points ⑤.
- Additional information for working on leaning ladders
- For construction work,
  – the worker must not work for longer than 2 hours per shift standing at a height of more than 2.00 m,
  – the weight of the tools and materials to be carried must not exceed 10 kg,
  – the surface area exposed to wind of objects to be carried must not exceed 1 m².
- Temporary work is permitted, standing at a maximum height of 5.00 m.
- Work may not be carried out on leaning ladders if
  – there are additional risks arising from the materials and techniques present or used, e.g. working with acids, alkalis, hot bitumen,
  – the worker needs both hands to operate machines and equipment, e.g. handheld machines, pressure washers.
- The worker must stand with both feet on a step or platform.

Additional information for ladders used for access

- Only use ladders as ways up to work sites if the risk potential is low and for a short duration of use and if the height to be negotiated is ≤ 5.00 m.

Inspections

- Determine the type, scope and intervals of inspections required (risk assessment) and adhere to them, e.g. regular **inspection** by a competent and authorised person.
- Document results (e.g. ladder inspection logbook, checklist, inspection sticker).
- **Check** for visible defects before each use.

Further information:
Industry Safety Regulation (BetrSichV)
DGUV-V38 “Construction Work”
TRBS 2121-2 “Risks in the Workplace arising from the Use of Ladders”
DGUV-R 101-038 “Construction Work”
DIN EN 131
DIN 4567

Stepladders
Podium Steps
Platform Ladders

B 132

Risks

- Falls due to instability of the user on the ladder, poor ladder stability, mistakes by the ladder user, failure to make ladder safe in the path of traffic or the use of a defective ladder.

General

- Before a ladder is provided and used for work at height or as access to raised work sites, a risk assessment must be carried out to determine whether the use of a ladder is necessary or whether there is a safer work equipment for this job. When selecting a ladder, light platform ladders ② and podium steps ① are preferable.
- The use of ladders must be limited to low risk work, a light workload with a low level of difficulty and short duration of use.
- Structural conditions that the business operator cannot change may also result in ladder use.

Safety measures

- The worker must stand with both feet on a step or platform. The permitted length of use is 2 hours/shift for workers standing at a height of ›2 m and no more than 5 m.
- Only use ladders with securely attached and undamaged spreaders ③.
- Walking with the ladder does not constitute proper use; always use ladders in accordance with the manufacturer's instructions for use.
- Do not use opaque colours to paint wooden ladders.
- Do not use defective ladders, e.g. broken or cracked stiles and steps, bent or kinked metal ladders.
- Do not repair broken or cracked stiles, guardrails and steps.
- When storing wooden ladders, protect them against the effects of the weather and temperatures.
- Provide sufficiently high ladders.

- Set up ladders so they are stable and cannot sink or fall over. Ensure spreader is working ③.
- Improve user stability by using stepladders and platform ladders.
- Do not use folding ladders like leaning ladders.
- Only use stepladders with stile extensions on steps and sloping surfaces ④.
- Fix stile extension as directed by the manufacturer using ladder clamps or brackets. For spacing of fixing, see instructions for mounting.
- Do not step off stepladders onto other workplaces and traffic routes.
- Do not step on the top two steps of stepladders; stepping onto/standing on the top tread is only permitted in the case of ladders with a platform or a podium with a handrail or enclosure ⑤.
- Make ladders in the path of traffic safe, e.g. by blocking them off.
- Instruct workers how to use ladders before first-time use and then at regular intervals.

Additional information for multi-section stepladders

- Do not step onto stepladder unless tension- and compression-resistant spreaders are working ⑥.
- Only connect or extend ladders to the length specified by the manufacturer.
- In the case of extension ladders, ensure parts move freely and that rung locks engage fully.
- In the case of stepladders with attached extension ladder, do not step on the top four steps ⑦.

Additional information for podium steps

- Only set up podium steps on even ground.
- Close the gate after stepping onto the platform.
- Set up and support height-adjustable podium steps as directed by the manufacturer ①.

Inspections

- Determine the type, scope and intervals of inspections required (risk assessment) and adhere to them, e.g. regular **inspection** by a competent and authorised person.
- Document results (e.g. ladder inspection logbook, checklist, inspection sticker).
- **Check** for visible defects and that it is working properly before each use.

Further information:
Industry Safety Regulation (BetrSichV)
DGUV-V38 “Construction Work”
TRBS 2121-2 “Risks in the Workplace Arising from the Use of Ladders”
DGUV-R 101-038 “Construction Work”
DIN EN 131

Ladder Hoists

B 142

Risks

- Missing safety measures while setting up and taking down the ladder hoist as well as inadequate fall protection at the elevated loading points could result in falls.
- In addition, falling objects could cause injuries.

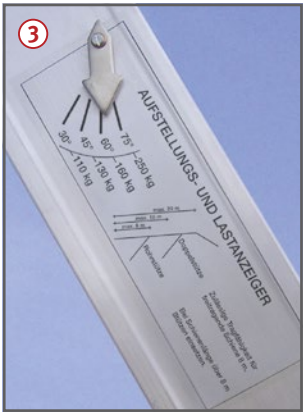
Safety measures

Setting up

- Set up hoist according to the instructions for use so that it is stable: Take the weight off the chassis by unscrewing the stabiliser legs ① and placing the frame ② level. Immobilise ladder hoists without a chassis in position.
- Do not exceed maximum load on load indicator ③.
- Support gently sloped guideways according to the instructions for use.

Operation

- Only use a special power point to connect the hoist to the electricity supply, e.g. construction site power distributor with residual-current device (RCD).
- Only use suitable load-handling accessories, e.g. platform ④, tipper bucket ⑤, bucket carriers. Load-handling accessories for loose loads, e.g. roof tiles must be enclosed; maximum opening width 5 cm x 5 cm.
- Avoid rope slackening.
- It is prohibited to carry persons with the load or the load-handling accessories as well as to use the guideway as a ladder.



Loading point at top of hoist

- If the top of the hoist is higher than 2.00 m, fall protection must be put in place.
- If the guideway goes up to the roof, there must only be a gap in the roof screen in place for the load-carrying accessory to pass through ⑥.
- If the hoist is not in use, the gap in the roof screen must be closed. It is better to run the path of the hoist over the roof screen without creating a gap.

Loading point at bottom of hoist

- Cordon off the area around the loading point at the bottom of the hoist (exception: access).

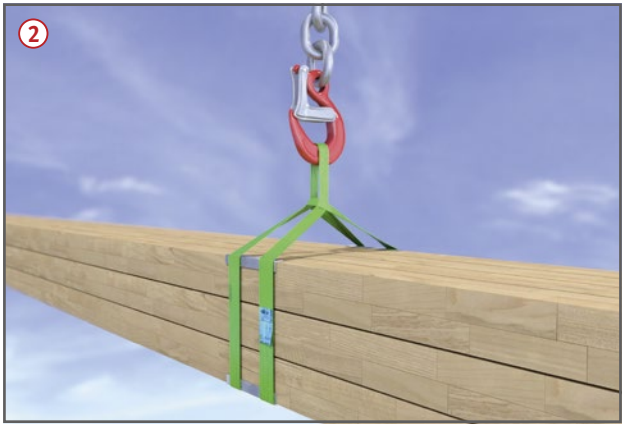
Inspections

- Determine the type, scope and intervals of inspections required (risk assessment) and adhere to them, e.g.:
  – before putting ladder hoist into use at the place of operation (set-up) by a competent person,
  – as necessary according to the operating conditions; at least once a year by a “qualified person for inspection” (e.g. expert).
- Document the results of the regular inspection by the “qualified person for inspection”.

Further information:
Industry Safety Regulation (BetrSichV)
DGUV-R 100-500 “Operation of Equipment”

Rigging Loads
Slings

B 164



Risks

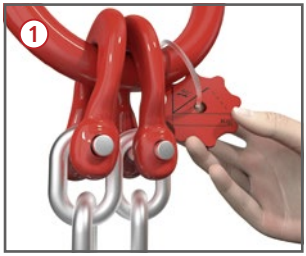
- Incorrect rigging, carelessness when lifting or setting down loads as well as damaged or undersized slings can cause accidents.

General

- Use slings as intended and store safely.
- Do not load slings (wire rope, chain, textile slings) above the permitted capacity.
- Choose wire rope, chain and textile slings according to the size and shape of the load, the gripping points, the lifting devices, the type and method of rigging, the inclination angle and the weather conditions. The capacity must be stated on tags or stickers at least for the max. inclination angle of 60° ①.
- In the case of multiple-leg hitches, only two legs are taken as load-bearing unless spreaders are used.

Safety measures

- Loads may only be attached by instructed workers.
- Do not rig rod-shaped loads in single slings. Use lifting beams.
- Rig loads in a choker hitch ②. Rigging in a choker hitch is only permitted in the case of large loads if it is not possible for the slings to slide together and for the load to move.
- Do not transport loads by hooking under the loop.
- Only use slings with safety hooks ③. Immediately discard bent hooks.
- Only transport small, loose items in load-handling accessories and do not have the load extending over the edge.
- Prevent the load from swinging to and fro by positioning the crane hook over the centre of the load.
- Possibly guide long items with ropes.
- When lifting the load, do not stand between the load and fixed objects (walls, machinery, stacks, etc.).



- Do not pass or stand under suspended loads.
- Do not lift loads higher than is necessary to transport them.
- Hang up empty and unloaded hooks. Store slings safely and properly.
- Do not knot and twist wire rope, chain and textile slings; do not pull them over sharp edges. Use corner protectors or sleeves.
- Do not detach slings until the load has been safely set down.
- Wear helmet.
- Do not carry persons with the load.
- Communication between crane operator and rigger only via hand signals or walkie-talkie.

Additional information for rigging using ropes

- Do not go below the minimum diameter for rope slings:
  – wire rope: 8 mm
  – natural or synthetic fibre rope: 16 mm
- Do not kink rope at ferrules.
- Only use standardised rope and rope end terminations. Wire rope clips are only permitted for guy rope ④.

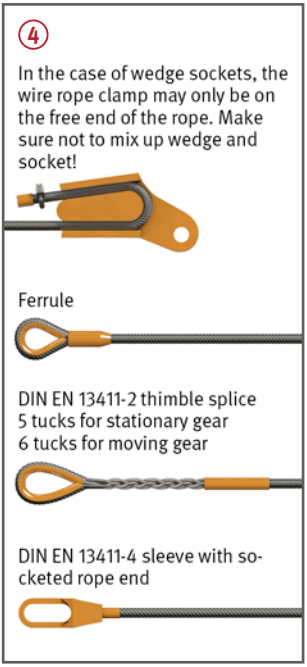
Additional information for rigging using chains

- Only use tested short-link chains.
- Straighten out chains before rigging. Individual chain links must move freely.
- Do not perform temporary field repairs on chains using bolts and the like.

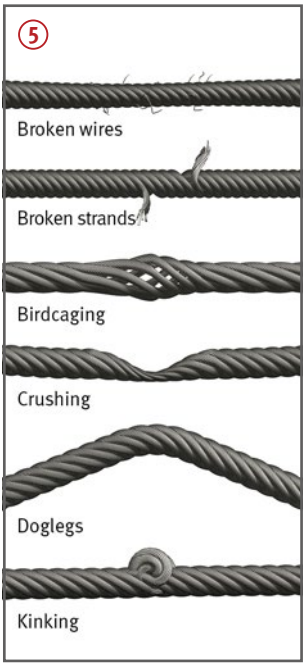
Additional information for rigging using textile slings

- Only use light-stable and dimensionally stable textile slings made of synthetic fibres. Polyethylene textile slings are not permitted.
- Do not pull textile slings over rough surfaces.
- Dispose of single-use webbing after use (transport chain) and do not use it again.

④



⑤



Inspections

- Have **slings** inspected depending on the conditions of use, but at least once a year, by a "qualified person for inspection" (e.g. expert). Record the inspection results.
- Immediately discard **rope** with broken strands, birdcaging, doglegs, basket deformation, signs of corrosion, increases or decreases in rope diameter, clusters of broken wires etc., and do not use it again ⑤, Table 1.
- Immediately discard **chains** that have been pulled tight and chains with a broken or superficially cracked link, decreases in diameter, corrosion pitting etc., and do not use them again.
- Do not use **chains** again if
  – stretching of more than 5% of the chain or link is measured,
  – a decrease in the nominal size at any point of more than 10 % is found.

1 Criteria for removal from service of wire ropes with visible wire breaks

Type of rope	Number of visible wire breaks when the discard criteria are met over a length of		
	3d	6d	30d
Stranded rope	3 adjacent wires in a strand	6	14
Cable-laid rope	10	15	40

Further information:
Industry Safety Regulation (BetrSichV)
DGUV-R 109-005 "Use of Wire Rope Slings"
DGUV-R 109-017 "Use of Load Lifting Devices and Slings in Lifting Operations"
DGUV Information 201-030 "Information on Rope and Chains as Slings in Construction"
DGUV Information 209-021 "Load Tables for Slings"
DGUV Information 209-061 "Use of Textile Slings and Synthetic Roundslings"

Electrical Installations and Equipment on Construction and Job Sites

B 171

Risks

- There is a risk of electric shock when handling electrical installations and equipment.

General

Installation and maintenance

- Electrical installations and equipment may only be installed, modified and maintained by qualified electricians or under their direction and supervision. This also goes for simple activities, such as repairing a socket or connecting cable.

Safety measures

Safe connection points

- Electrical equipment must be supplied with electricity from special connection points. The following are examples of special connection points:
  - construction site power distributor,
  - branch circuits of fixed electrical installations for the construction site,
  - transformers,
  - Type A and B power generating modules.
- Building installations, e.g. at the client, generally do not provide safe connection points.

Connection points for small construction sites/building installations

- Safe connection points may also be realised with Portable Residual Current Devices “PRCD-S”. These devices have enhanced protection and earth monitoring. The PRCD-S automatically monitors the upstream network for faults when switched on. The PRCD-S does not switch on if the building installation/socket is faulty. Working on a faulty socket is forbidden and poses a danger to life.

Construction site power distributor/sockets

- The connecting cable upstream of the measuring device in the fixed cabinet may be no more than 30 m long and may not contain any detachable interconnections.
- The connecting cable upstream of the cabinet must be specially protected against exposure to mechanical stresses.
- The qualified electrician decides whether it is necessary to earth a construction site power distributor. An earth rod is required in the TT system, near electrified railways and, if necessary, at the transition from TN-C to TN-CS.
- Construction site power distributors are rated IP44.
- Construction site power distributors with sockets must have a switching mechanism that locks in the OFF position to disconnect the feed.
- RCD protection must be fitted for circuits with sockets.
- RCD protection must be fitted for three-phase sockets (red).
- RCDs with a rated residual current ≤ 30 must be fitted for sockets ≤ 32 A.
- RCDs with a rated residual current ≤ 500 mA may be fitted for sockets › 32 A.
- If equipment is permanently connected (or via special connectors), the qualified electrician must verify compliance with disconnection conditions.
  – Downstream circuits must not include any sockets.
  – Hand-held electrical equipment must be protected with RCDs even if permanently connected.
- IT systems may only be operated with isolation monitoring and RCDs.
- Other safety measures:
  – Safety Extra Low Voltage (SELV),
  – protective isolation (isolation transformer).

Electrical lines

- Rubber cables H07RN-F or the equivalent (H07BQ-F) must be used for flexible lines.
- Type H05RN-F connecting cables are also permitted up to 4 m in length for hand-held power tools.
- Lines exposed to particular mechanical stresses must be laid so as to protect them, e.g. under solid covers.
- Cable reels must have double isolation. All contact areas must consist of insulating material. They must have overheating protection. The sockets must be splashproof.

Lighting

- Construction lighting must at least have protection against spraying water. Lights should be suitable for heavy-duty operation.
- Hand-held/ground lamps, excluding those for safety extra-low voltage, must have double isolation and protection against water jets.

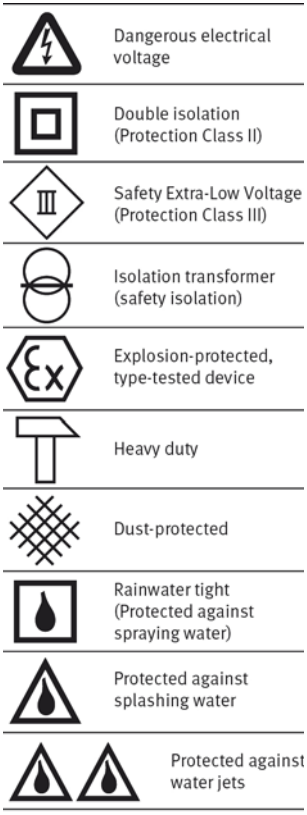
Installation material

- Only the following types of plug connectors with housing made of insulating material are permitted:
  – plug connectors, two-pin with earth contact,
  – CEE plug connectors, five-pin.
- Switches and plug connectors must be at least splashproof and be of sufficient mechanical strength.

Inspections

- Electrical installations and equipment must be inspected
  – after installation, modification and maintenance,
  – regularly, according to the inspection intervals.

Symbols on electrical equipment



Further information:
Industry Safety Regulation (BetrSichV)
DGUV-V3 “Electrical Installations and Equipment”
DGUV Information 203-004 “Use of Electrical Equipment in Cases of Increased Electrical Risks”
DGUV Information 203-005 “Selecting and Operating Portable Electrical Equipment”
DGUV Information 203-006 “Selecting and Operating Electrical Installations and Equipment on Construction and Job Sites”
Electrotechnical rules (DIN VDE provisions)

Electrical Installations and Equipment

Periodic Inspections

B 172

Risks

- There is a risk of electric shock when handling electrical installations and equipment.

General

Inspection intervals

- Carry out inspections and checks regularly, with the aim of detecting faults in time.
- The business operator must set the inspection intervals according to the specific conditions of use on site and taking the state-of-the-art into consideration.
- When setting the inspection intervals, the business operator may go by the intervals laid down in DGUV-V3, which are time-tested and are proven safe under normal and average stresses in the field.
- Depending on the conditions of use, the inspection intervals may be shorter if there are particular risks, e.g. due to extreme environmental factors.
- Inspection intervals are not optional. There must be a functional/technical reason to extend the inspection intervals. For example, if equipment is only used very rarely.
- Have construction power supply installations inspected by qualified electricians. Qualified electricians should check on a monthly basis that RCDs are working.
- The function of RCDs in the construction site power distributor should be checked, and a visual inspection for obvious defects carried out, every working day by specially briefed personnel who do not have to be electricians.

Examples of periodic inspections according to specifics of operation

Conditions of use	Examples/Construction site	Interval
Equipment, very heavy duty	Grinding metals	Weekly or daily
Equipment, heavy duty	Wet grinding of non-conductive materials, core drilling, steel construction, construction of tunnels and galleries	3 months
Equipment, normal duty	Building construction, interior work, general civil engineering, electrics, woodwork; plumbing, air conditioning and heating installation	6 months
Equipment, very seldom used	Maintenance personnel	1 year

Inspections

- The business operator must organise the set-up for inspection.
- The “qualified person for inspection” is permitted to carry out inspections.
- Experienced qualified electricians are familiar with the duties involved in inspection and the associated risks, procedures and standards. They generally meet the requirements.
- The inspections must be documented. This includes: Place; date; installation/equipment; inspector; type, principles, scope and result of inspection.
- The inspection results must be kept at least until the next inspection. Full documentation of all measurements is state-of-the-art and beneficial.
- There should also be a visible record of inspection on site, e.g. tags, stickers or bands on the equipment or in the construction site power distributor.
- The “qualified person for inspection” acts without instruction and on their own responsibility with regard to the inspection. The “qualified person for inspection” decides on the delegation of inspection duties.

Further information:
Industry Safety Regulation (BetrSichV)
DGUV-V3 “Electrical Installations and Equipment”
TRBS1201 “Inspections and Checks of Equipment and Installations that Require Monitoring”
TRBS1203 “Qualified Persons for Inspection”
DGUV Information 203-005 “Selecting and Operating Portable Electrical Equipment According to Conditions of Use”
DGUV Information 203-006 “Selecting and Operating Electrical Installations and Equipment on Construction and Job Sites”
DGUV Information 203-071 “Periodic Inspections of Electrical Installations and Equipment (Information for the Business Operator)”
Electrotechnical rules
(DIN VDE provisions)

Excavators

B 181

Risks

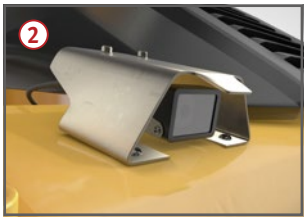
- Persons inside the danger area could get run over and crushed.
- Failure to choose the right excavator and attachments and use them as intended could result in workers getting injured.
- Insufficient excavator stability poses a risk of it overturning.

General

- Before excavators are used for the first time, the business operator must
  – instruct the machine operator,
  – (in writing recommended)
  – brief the machine operator on risks and required safety measures when using excavators; the briefing must be documented,
  – make available and communicate intelligibly to the machine operator the rules, regulations and information required for the use of excavators (instructions for use, manufacturer's operator's manual).
- The machine operator must provide the business operator proof of qualification to operate and maintain excavators.
  (a qualification recognised in the construction industry is e.g. the ZUMBau qualification).
- The briefing must be repeated at regular intervals.
- Wear high-visibility clothing when working near excavators.
- The machine operator must:
  – be at least 18 years old,
  – be reliable and suitable,
  – be familiar with the instructions for use and keep them readily available at their seat or at the place of use,
  – use the excavator as intended and
  – report any identified defects to the supervisor.

Safety measures

- When finished work, apply brakes or wheel chocks and set down attachment, including during breaks and before leaving the machine.
- There must be nobody within the driving area or rotation (danger area) ①.
- Do not step under the raised attachment or load.
  The machine operator must not carry out any work with the excavator if there is anybody inside the danger area.
  Exceptions can be made if:
  – this is unavoidable for operational reasons and
  – the business operator has set out measures based on a risk assessment (instructions for use). These must be in line with the state-of-the-art.
- Check the visibility as part of the risk assessment:
  – The driver must be able to see workers in the relevant working position (e.g. kneeling or bent over) working at a distance of one metre away from the machine. If not, special safety measures must be taken for these machines.
- Such safety measures may be:
  – technical: additional equipment to improve visibility e.g. camera/monitor systems ②. Monitors or mirrors must be mounted in the driver's front view (max. 180° range),
  – Until technical measures have been taken, the following are suitable interim measures: use of banksmen or flagmen, cordoning off the danger area.



- If persons are in danger, the machine operator must stop the hazardous movement and give a warning.
- For persons in the vicinity of the excavator:
  – adhere to the measures set out,
  – before entering the danger area, make contact with the machine operator,
  – agree method of working with each other.
- When changing attachments with quick change system, the driver must check that it is correctly locked.
- When excavating, standardised rollover safety and a safety belt is required. The belt must be put on during operation.
- To prevent risks of crushing, ensure a safe clearance of at least 0.50 m ① between moving parts of the excavator and fixtures in the surrounding area.
- Before beginning excavation work, determine the type and location of incoming and outgoing lines.
- Ensure safe clearance from the edges of trenches.
- For excavations with embankments and trenches, the following safe clearances apply:
  – Up to 12.0 t gross weight
  – ≥ 1.00 m,
  – Between 12.0 t and 40 t gross weight ≥ 2.00 m.
- Ensure safe clearance from overhead power lines.
- Instruct all workers on what to do in the event of contact with power lines ③.
- When carrying out servicing, re-fitting and maintenance work, secure attachments, e.g. backhoe, to prevent accidental movement.

Additional information for excavators for hoisting applications

- Do not carry the load over persons.
- Guide the attached loads with guide ropes/guide poles.
- Persons guiding the load and riggers must be within the machine operator's field of view outside the path of travel.
- Hydraulic excavators must be equipped with an overload warning system and hose burst safety feature.
- The overload warning system must be switched on for hoisting applications.
- **Hydraulic excavators** with a maximum working load of less than 1,000 kg or an overturning moment of less than 40,000 Nm may be used for hoisting applications without overload warning systems or hose burst safety features if the manufacturer has designated this as intended use.
- **Cable excavators** must have the following safety features:
  – devices to prevent the load from inadvertently running backwards,
  – limit switches for hoist and boom hoist,
  – rated load limiter.

③

Additional information for excavators for demolition work

- Protect cab against falling objects, e.g. using standardised protective structures (roof top and windscreen guard).
- Only use demolition equipment with sufficient vertical reach.
- Determine the load-bearing capacity of the surface, e.g. when working on floor slabs.
- Maintain safe clearance between equipment and structural elements to be demolished.

Inspections

- Determine the type, scope and intervals of inspections required (risk assessment) and adhere to them, e.g.:
  – The excavator operator must check safety features and excavator for visible defects before each start of shift; report any identified defects to the supervisor,
  – A "qualified person for inspection" must carry out inspection before the machine is put into service for the first time and as necessary, at least once a year.
- Document the results.

Occupational healthcare

- Schedule compulsory or offer recommended occupational healthcare appointments ac-cording to the results of the risk assessment. Obtain advice of the Medical Officer in relation to this.

Further information:
Industry Safety Regulation (BetrSichV)
DGUV-V38 "Construction Work"
DGUV-R 100-500 "Operation of Equipment"
DGUV-R 101-604 "Civil Engineering Industry"
DGUV Information 201-029 "Work Platforms on Hydraulic Excavators and Loaders"
DGUV Information 203-017 "Safety Measures for Earthworks Near Underground Cables and Pipes"
DIN 4124 DIN EN 474 www.zumbau.org

Loaders
Dumpers
Graders

B 182

Risks

- Persons inside the danger area could get run over and crushed.
- Insufficient loader, dumper and grader stability poses a risk of it overturning.

General

- Before loaders, dumpers and graders are used for the first time, the business operator must:

– instruct the machine operator, (in writing recommended)
– brief the machine operator on risks and required safety measures when using these machines; the briefing must be documented,
– make available and communicate intelligibly to the machine operator the rules, regulations and information required for the use of these machines (instructions for use, manufacturer's operator's manual).

- The machine operator must provide the business operator proof of qualification to operate and maintain excavators. (a qualification recognised in the construction industry is e.g. the ZUMBau qualification).
- The briefing must be repeated at regular intervals.
- Wear high-visibility clothing when working near these machines ②.
- The machine operator must:

– be at least 18 years old,
– be reliable and suitable,
– be familiar with the instructions for use and keep them readily available at their seat or at the place of use,
– use these machines as intended and
– report any identified defects to the supervisor.

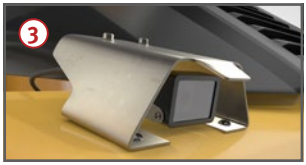
- When finished work, apply brakes or wheel chocks and set down attachment (in the case of loaders).

Safety measures

- There must be nobody within the driving area(danger area).
- Do not step under the raised attachment ① (e.g. shovel, dumper body, grader) or load.
- The machine operator must not carry out any work with these machines if there is anybody inside the danger area.

Exceptions can be made if:

– this is unavoidable for operational reasons and
– the business operator has set out measures based on a risk assessment (instructions for use). These must be in line with the state-of-the-art.



- Check the visibility as part of the risk assessment:
  - The driver must be able to see workers in the relevant working position (e.g. kneeling or bent over) working at a distance of one metre away from the machine. If not, special safety machines must be taken for these machines.
- Such safety measures may be:
  - technical: additional equipment to improve visibility e.g. camera/monitor systems ③. Monitors or mirrors must be mounted in the driver's front view (max. 180° range),
  - Until technical measures have been taken, the following are suitable interim measures: use of persons to direct operator, flagmen, cordoning off the danger area.
- If persons are in danger, the machine operator must stop the hazardous movement and give a warning.
- For persons in the vicinity of the earth-moving machine:
  - adhere to the measures set out,
  - before entering the danger area, make contact with the machine operator,
  - agree method of working with each other.
- For these machines, standardised rollover safety and a safety belt is generally required. This belt must be put on during operation.
- If falling objects pose a risk, machines with standardised roof top guard must be used.
- Travel on the machine is only permitted in the driver's and passenger's seats provided for this purpose. Safety belts provided must be put on.
- Adhere to safe clearances around embankments and trench walls.
- Make fixed tipping points safe using wheel stops.
- Ensure safe clearance from overhead power lines.
- When changing attachments with quick change system, the driver must check that it is correctly locked.

Additional information for the operation of loaders

- When loaders are travelling, keep the attachment low over the ground.
- If loaders are used for excavating in front of an excavation wall, the height of the wall must not exceed the vertical height of the attachment by more than 1.00 m.
- If demolition work is carried out with loaders, the type of loader must be suitable for the method of demolition:
  - The vertical height of the attachment must be at least the same as the height of the structural element or structure to be demolished.
- Determine the load-bearing capacity of the surface, e.g. when working on floor slabs.
- Ensure safe clearance between equipment and structural elements to be demolished.

Additional information for servicing, re-fitting and maintenance work

- When carrying out servicing, re-fitting and maintenance work, secure attachments of earth-moving machines to prevent accidental movement, e.g. using axle stands, sleeves over cylinders ④.
- In the case of articulated machines, the articulated joint must be immobilised.

Inspections

- Determine the type, scope and intervals of inspections required (risk assessment) and adhere to them, e.g.:
  - The machine operator must check safety features and machine for visible defects before each start of shift; report any identified defects to the supervisor,
  - A "qualified person for inspection" must carry out inspection before the machine is put into service for the first time and as necessary, at least once a year.
- Document the results.

Occupational healthcare

- Schedule compulsory or offer recommended occupational healthcare appointments ac-cording to the results of the risk assessment. Obtain advice of the Medical Officer in relation to this.

Further information:
Industry Safety Regulation (BetrSichV)
DGUV-V38 "Construction Work"
DGUV-V29 "Quarries, Pits and Tips"
DGUV-R 100-500 "Operation of Equipment"
DGUV-R 101-604 "Civil Engineering Industry"
DGUV Information 201-029 "Work Platforms on Hydraulic Excavators and Loaders"
DGUV Information 203-017 "Earthworks Near Underground Cables and Pipes"
DIN 4124
DIN EN 474
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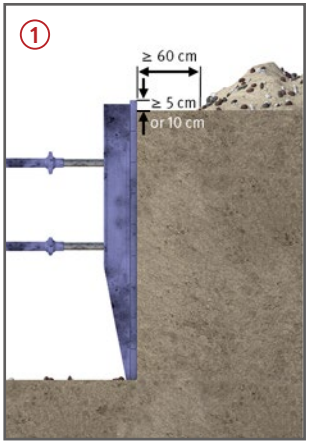
Trench Sheeting Equipment

B 189



Risks

- Trenches that are not properly sheeted could result in persons getting buried.

General

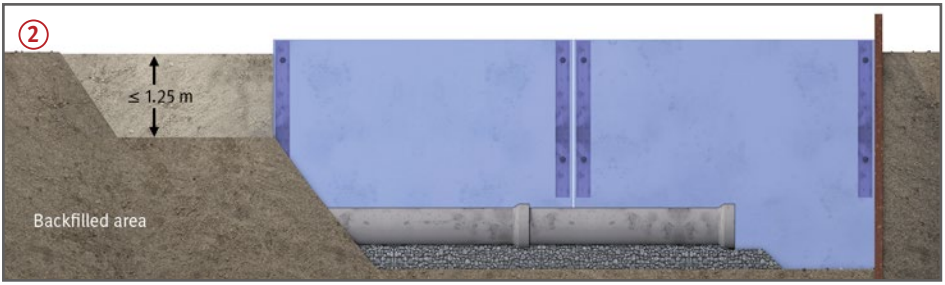
- There are different types of trench sheeting equipment
  - centre-supported sheeting
  - end-supported sheeting
  - slide-rail sheeting,
  - slide-rail sheeting with support frame, piling frame sheeting, drag boxes.

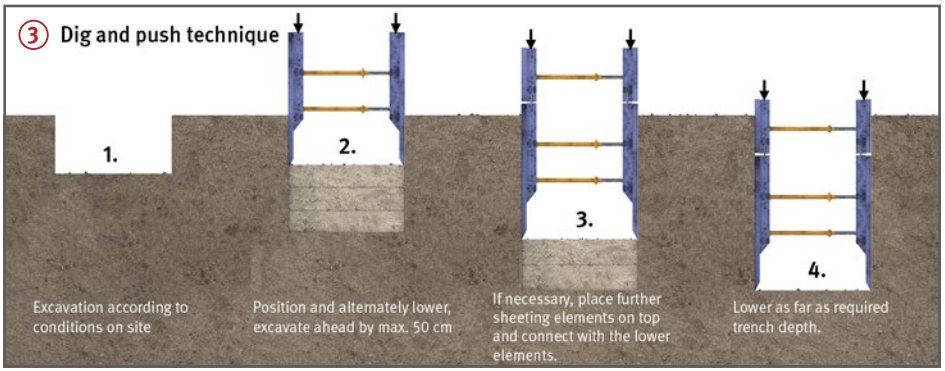
Before beginning excavation work, check for the presence of underground wires/cables/pipelines or installations.

- The working area and minimum trench widths must be adhered to.
- The projection above ground level for
  - trench depths ≤ 2.0 m must be at least 5 cm (1),
  - trench depths ≥ 2.0 m must be at least 10 cm (1).
- At the top edge, a strip 0.60 m wide must be kept clear on both sides (1).
- Where wires/cables/pipelines cross the trench, the resulting gap must be made safe, e.g. with wooden planks.

Safety measures

- Only use sheeting equipment that has been certified by a test, inspection and certification body.
- Follow the manufacturer's manual.
- Determine load, e.g. exerted by soil pressure, construction equipment, buildings, structural installations.
- The sheeting must be able to take the applied loads.
- The sheeting must reach down to the bottom of the trench. In the case of soils that are at least stiff and solid, and at stages of construction that are finished in a matter of days, the sheeting may finish up to 0.5 m above the bottom of the trench in the absence of any other factors and if no soil pressure from structural loads is to be withstood.
- If trench sheeting equipment is stacked, e.g. using top boxes, connect individual parts at all designated points (follow manufacturer's instructions).
- Solidly backfill holes straight away.
- Only use centre-supported sheeting equipment for trenches up to 4 m deep, and endand frame-supported sheeting equipment for trenches up to 6 m deep. The manual may specify further restrictions.
- Choose sheeting lengths so that subsequent works in the





unsheeted area are carried out at a maximum depth of 1.25 m. The end face of the trench must be sheeted, e.g. using a steel panel ②.

- Sheeting equipment must only be used singly if both end faces are sheeted, e.g. in the case of manhole lining or cable/pipeline repair.
- The sheeting must be dismantled as backfilling proceeds.
- In the case of unstable soils or adjacent traffic loads, sheeting must be completed using the dig and push technique ③.
- The excavation must be a maximum of 0.50 m deeper than the bottom edge of the sheeting equipment.
- Limit the length of excavated, unsheeted sections of trench to the length of one sheeting element.
- Only set sheeting equipment down on solid ground and, if necessary, secure to prevent it from falling over.
- Do not use centre-supported sheeting elements singly and do not use the dig and push technique.
- Excavators which are used to transport sheeting equipment and hoist it into the trench must be equipped for hoisting applications.

Additional information for bridges – access

- In the case of trenches with a width of ›0.80 m, bridges ④ are required; the bridges must be at least 0.50 m wide.
- In the case of trenches with a depth of ›1.00 m, both sides of the bridges must have three-rail guardrails.
- In the case of trenches with a depth of ›1.25 m, steps or ladders ⑤ must be used for access.

Additional information for trench depths ›2.0 m

- As of a trench depth of 2.0 m, install fall protection ⑥. If applicable, fall protection need not be installed if work is being done on that section of trench (e.g. during excavation, installation of sheeting, laying cables/pipes).

Additional information on traffic safety

- Take traffic safety measures if digging trenches near traffic on public roads or such work affects road use. Consult with the relevant authorities.

Inspections

- Determine the type, scope and intervals of inspections required (risk assessment) and adhere to them, e.g.: each working day by the pipe layer/machine operator, as necessary, at least once a year by a “qualified person for inspection”. Document the results of regular inspections.

Further information:
Workplace Ordinance (ArbStättV)
DGUV-V38 “Construction Work”
RSA Guidelines for Safety at Roadworks
DIN 4124
DIN EN 1610
DIN EN 13331-1

Mortar Sprayers and Mortar Delivery Equipment

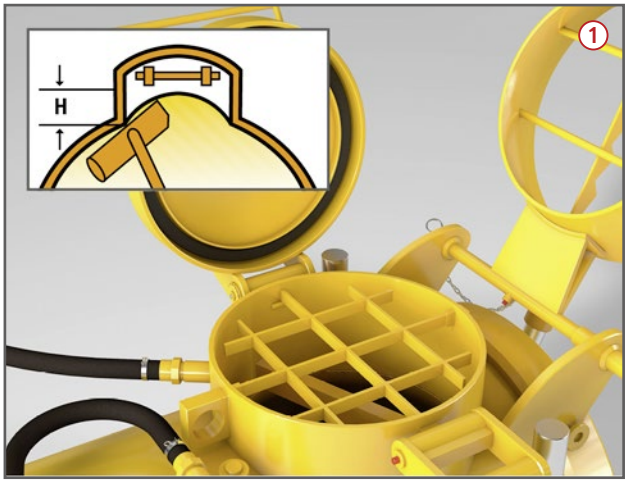
B 204

Risks

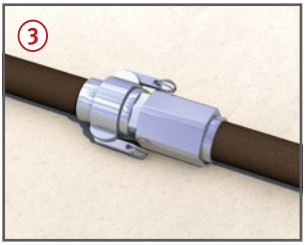
- Uncovered fill openings and uncontrolled mortar discharge due to blockages could cause injury.
- High noise levels can cause hearing damage.

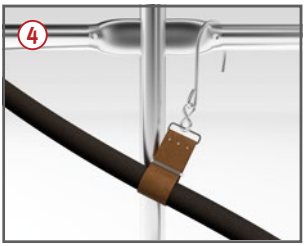
Safety measures

- Moving machine parts must be covered to prevent contact; close cover before starting up.
- Fill openings and outlets must be covered with grates ①, ②. In the case of retrofits, adhere to safe clearances (Table).
- If the grate is opened, the agitator and feed screw must stop, and restart must be disabled ①, ②. The alternative safety measure – a screwed-down grate – is only possible for hopper tanks solely for use with dry material.
- Set up machines so they are stable. Combustion motor exhaust must not enter the workers' work area. Extend exhaust pipes if necessary.
- Brief and instruct the operator based on the instructions for use in conjunction with the manufacturer's operator's manual.
- Only operate electric machines using a special connection point with a safety device, e.g. construction site power distributor with RCD.



- Hoses, pipes and couplings must not be damaged, and must be marked and compatible with the machine.
- Only connect delivery lines (hoses and pipes) with well-cleaned safety couplings. Do not forget gaskets ③.





Safe clearances for grates over fill openings		
Type of machine	**Grates**	
	b	**H**
Pump-type machines for delivery and spraying	60	120
Pneumatic-type machines for delivery and spraying	70	120

b = largest mesh space of grate in mm,
H = smallest cover clearance from the pinch point between mixer/agitator and mixing vessel/hopper tank wall in mm.

- Delivery lines
  – must be routed and laid so as to avoid damage e.g. from being driven over and blockages. Do not pull hoses over sharp edges or kink them. The bending radius of pipelines must be ›6 times the diameter of the line,
  – must only be secured to structural components that can take the forces that arise during operation. Use hose hooks ④.
- The delivery system (air chamber, delivery lines) must be depressurised before tapping and opening it, e.g. using a pressure gauge on the machine's pressure outlet.
- Do not remove the grate until the feed screw/agitator has come to a complete stop and restart is disabled, e.g. in the event of blockages and for cleaning.
- Clear blockages according to the operator's manual; if necessary, reduce pressure in the delivery line by pumping backwards. Cover safety couplings with tear-resistant film before opening them. Persons may only stand where they cannot get hit by discharging mortar.
- Wear safety goggles when spraying and when clearing blockages ⑤.
- Use ear protection if the noise rating is greater than 85 dB(A).
- Protect skin: Before work apply specific skin protection; after use, clean skin correctly; after cleaning apply skin care products carefully.

Inspections

- Determine the type, scope and intervals of inspections required (risk assessment) and adhere to them, e.g.:
  – check for visible defects before each shift,
  – as necessary, at least once a year by a "qualified person for inspection" (e.g. expert),
  – compressed air reservoir (air chamber) by an expert. Inspection intervals acc. to manufacturer's specifications.
- Document the results of regular inspections.

Further information:
Industry Safety Regulation (BetrSichV)
Regulation Concerning Occupational Health Care (ArbMedVV)
DGUV-V38 "Construction Work"
DGUV-R 112-194 "Use of Ear Protection"

Tools for Drilling, Hammering and Chiselling

B 206

Risks

- Unprotected parts of the machine and flying chunks of material could cause injury.
- The production of harmful dust could cause respiratory problems.

Safety measures

- If possible, only use low recoil and sound-damped tools ①.
- Replace blunt chisel bits or broken tools.
- Protect flexible connecting cables to prevent mechanical damage.
- Secure hose connections (couplings) on pneumatic tools to prevent them inadvertently becoming loose/detached, e.g. use quick release couplings.
- Depressurise pneumatic lines before disconnecting them.
- Always choose a safe place to stand. Do not carry out any breakout work from ladders and elevated work platforms.
- Use additional handles ②.
- Locate concealed wires and cables using magnetic and cable detector.
- Only activate trigger lock when working with drilling rigs.
- Do not put down tool until it has come to a complete stop.

- Use ear protection ③.
- Use eye protection if flying chunks present a risk ④.
- If dust is produced, use tools with dust extraction and/or place the hose pipe of air filtration system where the dust is produced ⑤.
- If the limit values cannot be met by taking technical measures, suitable respiratory protection must be worn e.g. half masks, powered air-purifying respirator helmet (with P2 or P3 particle filter).

Information on mineral dust

- In principle, work in low-dust conditions.
- If necessary, use air filtration in addition.
- Use dust extractor drills ⑥ for better dust extraction.
- When doing breakout work, partition (e.g. using wall dust barriers/doorway dust guards) can prevent dust from spreading into adjacent areas as well as boost the effect of air filtration.

Occupational healthcare

- Schedule compulsory or offer recommended occupational healthcare appointments according to the results of the risk assessment. Obtain advice of the Medical Officer in relation to this.

Further information:
Industry Safety Regulation (BetrSichV)
TRGS 559 “Mineral Dust”
Occupational Health and Safety Regulations Concerning Noise and Vibration (LärmVibrationsArbSchV)
Regulation Concerning Occupational Health Care (ArbMedVV)

Forklift Trucks

B 211

Risks

- Incorrectly lifted load, forklift truck overloading and inadequate driver training often result in serious accidents.

Safety measures

- Load the load tight against the mast and evenly distribute the load on both fork arms. Secure load so that it cannot move ①.
- When loading, pay attention to the load capacity chart.
- Only use trained forklift truck drivers who have been instructed in writing by the business operator and who are at least 18 years old.
- Draw up instructions for use. These must include details on:
  – conditions of use,
  – which routes the forklift is permitted to travel on,
  – storage, storage areas, stacking,
  – if applicable, carrying passengers,
  – if applicable, use of attachments, trailers, work platforms.
- Forklift trucks must travel with the load lifted clear of the ground (‹50 cm)②.
- When travelling up and down slopes, the load must be on the uphill side ③.
- Driver restraint systems, e.g. lap belt, door bars and cab door, must be used.
- Only carry passengers if permitted and if passenger seats are installed (see instructions for use or internal rules) ④.
- Apply the parking brake to prevent inadvertent movement, and prevent unauthorised use by removing the key.
- Only operate the forklift truck from the driver's seat.
- Do not pass or stand under lifted load.
- When driving on loading ramps, pay attention to load capacity and width. Secure loading ramps so that they cannot move ⑤.
- Fork must be propped up when carrying out maintenance work underneath it.

• If equipment designed for lifting persons cannot be used, an exception can be made for work of short duration. In this case, a work platform with back protection grille may be used, provided that suitable measures are taken to ensure safety and adequate monitoring.
• The back protection grille ⑥ must be at least 1.80 m in height and prevent persons reaching through. The work platform is a tight fit, e.g. when sliding onto the fork arms make it extra secure against sliding off by securing with a pin. The load capacity of the forklift truck must be at least five times the combined weight of the work platform and load ⑦.
• Pay attention to emission control when operating forklift trucks with a combustion engine indoors, e.g. use catalytic converters or exhaust filters.

Additional information

Industrial trucks used on public roads

• If they have a maximum speed of more than 20 km/h, a registration plate is required. For types with a maximum design speed of more than 6 km/h, the driver must hold a driver's licence. The licence class required depends on the design fully laden weight of the forklift or the maximum speed.
• If they have a maximum speed of more than 25 km/h, pneumatic tyres are required.
• The brake system must consist of two independent brakes.
• If driven on public roads, other requirements under the Vehicle Registration Regulation (Fahrzeug-Zulassungsverordnung – FZV) must be met.
• Vehicle lighting must be built-in and operational; including: headlights, direction indicator, perimeter lamp, rear reflectors, reversing lights, tail light, flashing light and number plate light.
• In the case of forklift trucks with a design fully laden weight greater than 4 t, carry wheel chock along.
• Cover forklift arms with a red-and-white-striped shield, or fold them up.

LPG industrial trucks (forklift trucks)

• Do not attach LPG bottles to the vehicle using fixtures with sharp edges.
• LPG bottles, pipes, valves and hoses must not project over the perimeter of the forklift truck.
• Protect LPG bottles, pipes, valves and hoses to prevent them from overheating (against direct sunlight).
• Do not change LPG bottles in garages.
• Only park forklift trucks in ventilated areas above ground level and maintain the required safety zones. There must not be any cellar openings, pits, gullies or drain inlets, etc. within 3.00 m.
• When finished work, close the cylinder valve.
• Adjust LPG propulsion so that the level of pollutants in the exhaust is as low as possible.
• Secure the air and fuel mixture adjuster to prevent inadvertent adjustment, e.g. by sealing it.
• When changing the hoses in the fuel system, make sure only to use approved hoses.
• Special provisions apply to the operation of LPG forklift trucks underground.

Inspections

• Determine the type, scope and intervals of periodic inspections (risk assessment) and adhere to them, e.g.:
– once a year by a "qualified person for inspection" (e.g. expert),
– Have the level of pollutants in the exhaust of LPG forklifts measured at least every six months by a "qualified person for inspection" and reduce it to the lowest possible level.
• Document the results.

Occupational healthcare

• Schedule compulsory or offer recommended occupational healthcare appointments according to the results of the risk assessment. Obtain advice of the Medical Officer in relation to this.

Further information:
Industry Safety Regulation (BetrSichV)
Road Traffic Regulations (StVO)
Regulation on the Approval of Road Vehicles (StVZO)
Vehicle Registration Regulation (FZV)
DGUV-V68 "Industrial Trucks"
DGUV V79 "Use of LPG"
TRBS 2121-4
DGUV Information 208-031

Mobile Elevated Work Platforms

B 212

Risks

- Toppling of mobile elevated work platform (MEWP), e.g. by driving into holes/openings in the ground and driving over terracing.
- Fall from height due to being thrown out/off or when climbing over
- e.g. by leaving the basket when elevated, climbing onto the railing, from the railing getting caught on and underneath structures, getting hit by other vehicles.
- Crushing e.g. getting caught between the control panel/railing of the MEWP and elements in the surrounding area due to operator error.

Safety measures

Setting up

- Stably set up and operate the MEWP in accordance with the operator's manual ①.
- Pay attention to pinch points and shear points during setup and operation.

Operation

- Do not overload the MEWP.
- Secure the area underneath MEWP platforms swung to the side if they are lowered to below 4.50 m above ground level in the path of road vehicles.
- When working on the public roads, switch on yellow flashing lights ②.
- Only carry out work in the vicinity of live overhead power lines if the MEWP is isolated according to the rated voltage, but at least for 1000V. For this sort of work, there must be at least two persons on the platform.
- Put folding guardrails in the safety position before starting work ③.
- Make sure safety features are free of defects and are working before and during operation.

Work restrictions

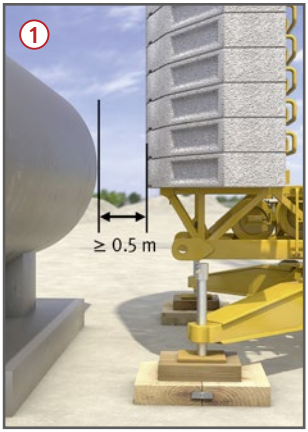
- Only use persons to operate MEWPs
  - who are at least 18 years old and reliable,
  - who have been instructed in the operation of the particular MEWP and on the risks and safety measures associated with their work,
  - who have been instructed to do so by the business operator.
- DGUV-G 308-008 “Training and Hiring of MEWP Operators” goes into how operators can obtain the qualifications required.

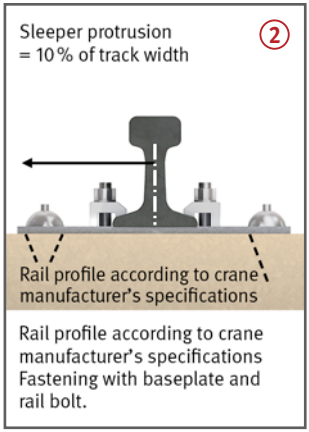
Inspections

- Only use MEWPs that have been inspected by an expert before being put into operation for the first time (see test certificate prior to 1/1/1997) or that have the CE mark and a declaration of conformity.
- Determine the type, scope and intervals of inspections required (risk assessment) and adhere to them, e.g.:
  - function tests each working day,
  - at least once a year by a “qualified person for inspection” (e.g. expert).
- Document the results of regular inspections in the inspection log book.

- When the MEWP is travelling, workers may only be on the platform if this is described in the operator’s manual.
- The need to use personal fall protection equipment (PPE) follows from the risk assessment (whiplash) and/or the requirements of the MEWP manufacturer’s operator’s manual.
- Fall PPE must be attached to the attachment points in the basket designated by the manufacturer. The fasteners between safety harness and attachment point should be kept as short as possible, so that persons cannot be thrown out of the basket.

Further information:
Industry Safety Regulation (BetrSichV)
DGUV-R 100-500 “Operation of Equipment”
DGUV Information 208-019 “Safe Handling of MEWPs”
DGUV-G 308-008 “Training and Hiring of MEWP Operators”





Risks

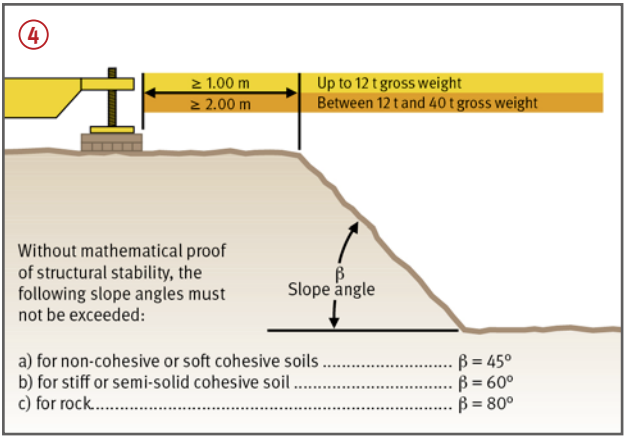
- Insufficient ground bearing capacity, inadequate support or failure to maintain safe clearances around excavations with embankments can result in the crane toppling.

Safety measures

- Safe clearance of 50 cm between moving fixed parts of the crane structure and fixtures in the surrounding area, e.g. structure, scaffolding or stacks of material, etc. must be maintained ①.
- If the safe clearance cannot be maintained, secure the danger area using stable guardrails or safety fences.
- In the case of bottom-slewing tower cranes, secure the shear points in the crane's lower slewing range, e.g. enclosure, cordon.
- Connect cranes with frequency control to the power supply with suitable RCDs as directed by the manufacturer.
- Earth the crane as directed by the manufacturer.
- Maintain safe clearance from overhead power lines. If the safe clearance cannot be maintained, talk to utility. Take safety measures, e.g.: disconnect from the mains, cabling, fencing off, slewing limiter, working range limiter systems.
- Where crane is erected near railway facilities, special precautions must be taken; make contact with the railway's grid operator in advance.
- Where crane is erected beside sheeted excavations: Proof of adequate ground bearing capacity and that the sheeting can take the additional soil pressure.
- Where crane is erected beside a soldier pile wall: For a shallow crane foundation, do not erect the crane until the sheeting is finished, especially the infill.
- Design ergonomic access to crane cab; if applicable, plan for use of a crane lift for the operator.

Crane on railway track

- Lay railway track horizontal on load-bearing base (gravel or ballast bed, concrete foundation or the like); base must be well compacted.
- Only use concrete or timber sleepers that have been structurally tested or approved.
- Sleeper spacing according to manufacturer's specification.
- If part-sleepers are used, pay attention to tracking.
- Only use rail profiles specified by the manufacturer; realise rail joints and rail fastening ② according to the operator's manual.



• Secure the end of the track with buffers ③. They must be attached before the last sleeper and in parallel.
• Install the stops for the travel limit switch so that the crane comes to a halt 1.00 m before the end of the track.
• Maintain safe clearance around excavation embankments and the edges of trenches as specified in DIN 4124 or obtain mathematical proof of structural stability ④. Keep a strip of at least 0.60 m clear.

Crane with single outrigger support

• For stationary slewing tower cranes, set the floats of the outriggers on load-bearing blocking; the blocking must be structurally sound ⑤. The determining factors for the size of the support area are bearing load and permissible ground pressure. The bearing loads are given in the operator's manual or the crane inspection log book.
• Maintain safe clearance around excavation embankments and the edges of trenches as specified in DIN 4124 or obtain mathematical proof of structural stability ④.

Ground type	zul. Bodenpressung N/cm²
Backfilled soil, not artificially compacted	0 – 10
Natural ground, obviously undisturbed – silt, marsh, topsoil	 0
– non-cohesive, sufficiently firmly bonded soils Fine to medium sand Coarse sand with gravel	 15 20
– Cohesive soils plastic soft stiff semi-solid solid	 0 4 10 20 30
– Rock, unweathered with little jointing and with favourable grain	150 – 300

Inspections

• Determine the type, scope and intervals of inspections required (risk assessment) and arrange them, e.g.:
– daily, before starting work, function test of all limit switches by the crane operator,
– after each re-erection, retrofit and as required, but at least once a year by a "qualified person for inspection" (e.g expert).
– after major modifications and otherwise regularly after the following number of years of operation by an authorised expert: 4, 8, 12, 14, 16, 17, 18, ... and so on annually.
• Also pay attention to the test and inspection information in the manufacturer's operator's manual.
• The results of periodic inspections and after major modifications must be documented in the inspection log book.

Further information:
Industry Safety Regulation (BetrSichV)
DGUV-V38 "Construction Work"
DGUV-V52 "Cranes"
DIN 4124

Tower Cranes

Operation

B 214

Risks

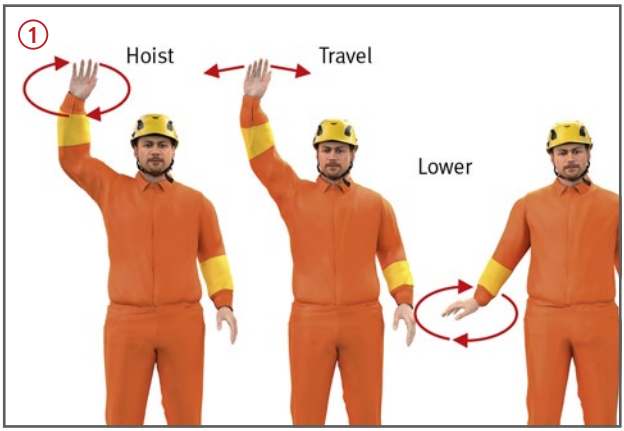
- Falling or swinging loads pose a risk to persons.
- Operator error, climatic conditions (wind, lightning) or electric arcing in the proximity of overhead power lines can cause accidents.

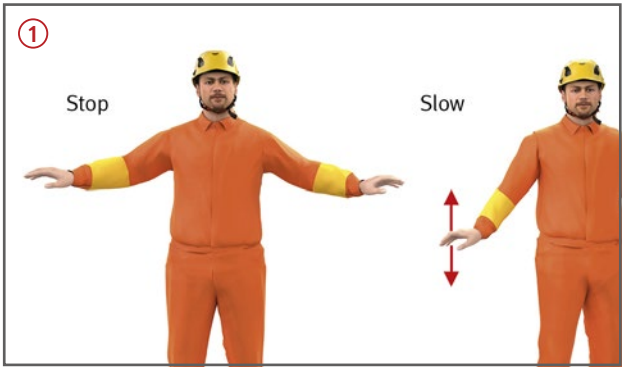
General

- The crane must only be operated by crane operators who have been briefed and trained on the crane, are at least 18 years old, are physically and mentally suitable and have been instructed in writing by the business operator.

Safety measures

- Only lift correctly attached and secured loads.
- Use a guide if the crane operator cannot watch the load.
- Communication between dogman and crane operator via direct visual contact using set hand signals ① or walkie-talkie ②.
- If loads can no longer be lifted in a controlled manner due to wind, crane operation must be stopped.
- Maintain safe clearance from overhead power lines.
- Pay attention to special measures near railway facilities.
- Crane operation must be stopped in bad weather (strong winds or storm and thunderstorm).
- If the working areas of multiple cranes overlap, ensure impeccable communication between crane operators, e.g. using walkie-talkies; set out rules for yielding and workflows.
- Guide with ropes any long loads that could get caught while being lifted or that need to be positioned ③.
- Lifting persons with cranes is not permitted except in justified cases according to the TRBS 2121-4 and DGUV-R 101-005.
- The statutory accident insurance association must be notified of such carriage of persons at least 14 days in advance.
- Set out measures to rescue the crane operator from the crane cab.



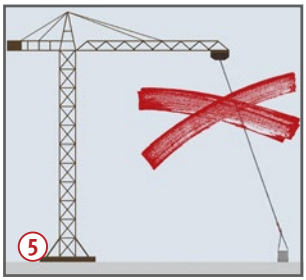


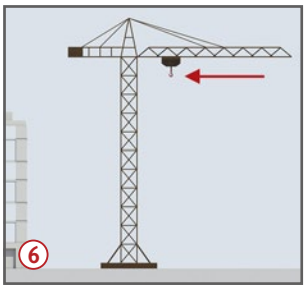
Additional information for concrete skips with standing platform

- Such use is not permitted except in justified cases following completion of a risk assessment.
- The additional requirements for technical measures on the crane and on the attachment for the lifting of persons as well as for inspection must be met (See "Further information").

Additional information on the crane operator's duties

- Carry out function check of all limit switches and brakes as well as a visual check of the outriggers/railway track.
- Check function of the latch on the crane hook daily ④.
- Regularly maintain and check ropes for damage.
- Keep a crane inspection log book, and enter defects identified and checks carried out. Report defects and request their rectification.
- Do not use limit switches as routine end stops.
- Do not carry persons with the load or the load-handling accessory.
- Do not pull loads diagonally or swing them; do not pull stuck loads loose ⑤.
- Do not leave loads suspended from the crane if unoccupied.
- Stop crane operation if the load cannot be safely held and taken off in the wind, or if defects arise that compromise safe operation.
- Lock railway cranes with rail clamps after finishing work.
- Weathervane the crane according to the manufacturer's specifications ⑥. No load or load-handling accessories are suspended from the crane hook in this mode.





Inspections

- Determine the type, scope and intervals of inspections required and arrange them, e.g.:
  - daily, before starting work, function test of all limit switches by the crane operator,
  - after each re-erection, retrofit and as required, but at least once a year by a "qualified person for inspection" (e.g. expert).
  - after major modifications and otherwise regularly after the following number of years of operation by an authorised expert: 4, 8, 12, 14, 16, 17, 18, ... and so on annually.
- Also pay attention to the test and inspection information in the manufacturer's operator's manual.
- Document the results of regular inspections.

Occupational healthcare

- Schedule compulsory or offer recommended occupational healthcare appointments according to the results of the risk assessment. Obtain advice of the Medical Officer in relation to this.

Further information:
Industry Safety Regulation (BetrSichV)
DGUV-V52 "Cranes"
TRBS 2121-4
"Risk of falling in the Workplace – Exception: Lifting Workers Using Equipment Not Specifically Designed for this Purpose"
BGR 500 DGUV-R 100-500 "Operation of Equipment"
DGUV-R 101-005 "Attachments for the Lifting of Persons"

Concrete Pumps and Placing Booms

B 216

Risks

- Accidents happen as a result of unstable setup, insufficient safe clearance from overhead power lines or the presence of persons in the danger area at the end hose when starting to pump.

General

- Briefing according to the operator's manual.

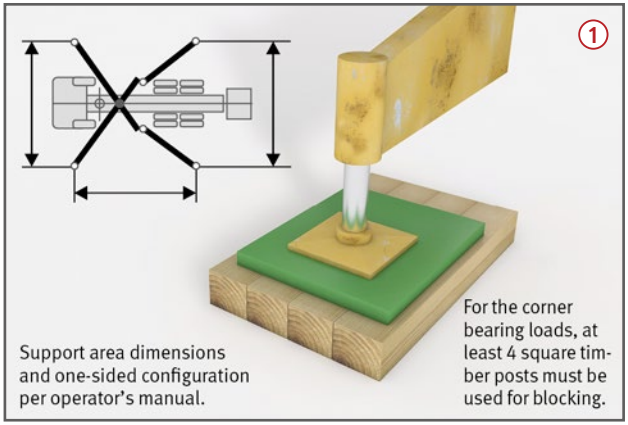
Safety measures

Setting up

- Set up concrete pumps and placing booms so they are stable. Use blocking to distribute the load ①.
- Determine the area of the blocking according to the permissible ground pressure and the corner bearing loads.
- Maintain safe clearance from excavation embankments and the edges of trenches ②.
- Maintain safe clearance from overhead power lines.

Operation

- Do not extend placing booms beyond the maximum length ③. Follow the manufacturer's operator's manual.
- When starting to pump or resuming pumping, e.g. after blockages, the end hose must be free-hanging. There must be nobody inside the danger area of the end hose ④.
- Do not use placing booms as hoists ⑤. Further pipelines must not impose additional loads on the boom.



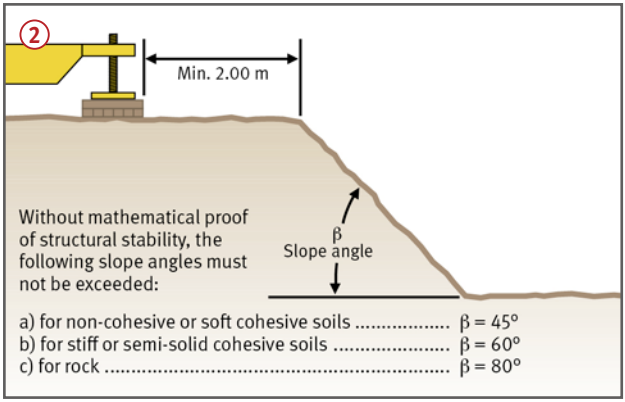
- Support area dimensions and one-sided configuration as per operator's manual.
- Only carry out work at a height with fall protection, e.g. concreting platform with full decking and guardrails! The top of formwork is not a suitable place to stand ⑥.
- Brief and instruct the operator based on the instructions for use, taking the manufacturer's operator's manual into consideration.

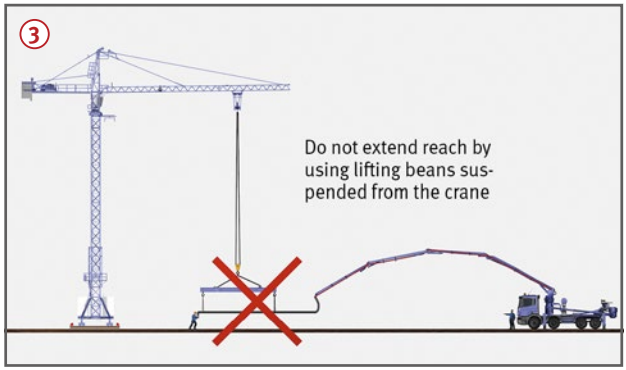
Additional information for pipelines

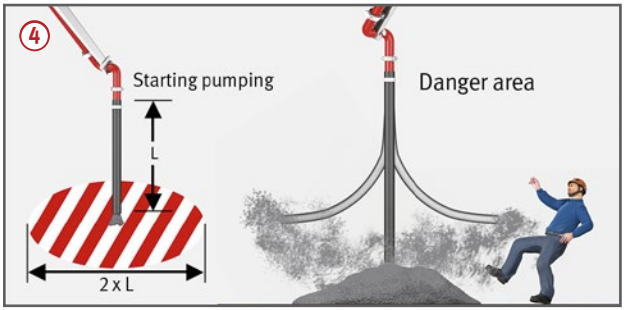
- No fixed attachments ⑦ and extensions ⑧ on end hoses.
- Securely attach pipelines ⑨ Secure lever couplings with split-pin ⑩.
- Before opening pipeline couplings (e.g. in the event of blockages) depressurise the delivery system.
- Empty and clean pipelines to the hopper.
- For pneumatic cleaning, remove end hose and attach catcher. There must be nobody inside the danger area of the end of the hose with the catcher attached during pneumatic cleaning.

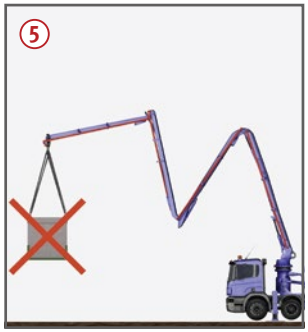
Inspections

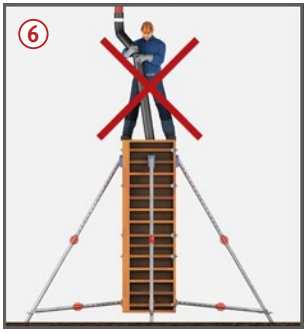
- Determine the type, scope and intervals of inspections required (risk assessment) and adhere to them, e.g.:
  - check for visible defects each day before starting work,
  - check the pipeline regularly for wear,
  - as necessary, at least once a year by a "qualified person for inspection" (e.g. expert).
- Document the results of regular inspections.

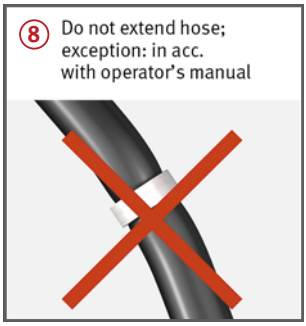


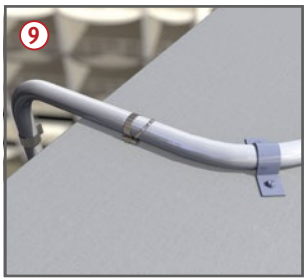


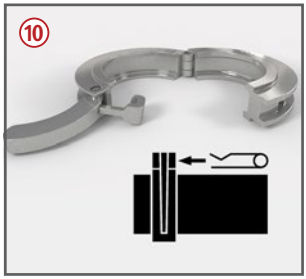








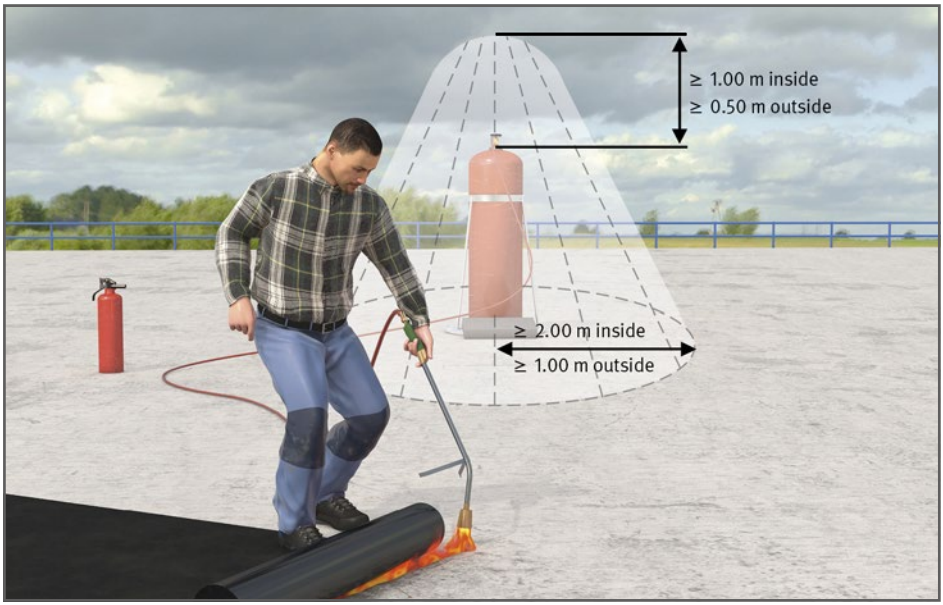




Further information:
Industry Safety Regulation (BetrSichV)
DGUV-V38 "Construction Work"
DIN 4124

LPG Equipment

B 231



Risks

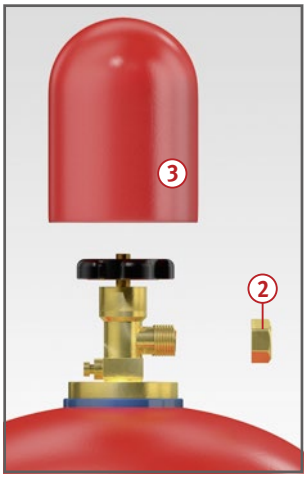
- There is a risk of fire and explosion when using LPG.

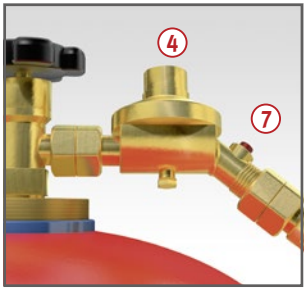
General

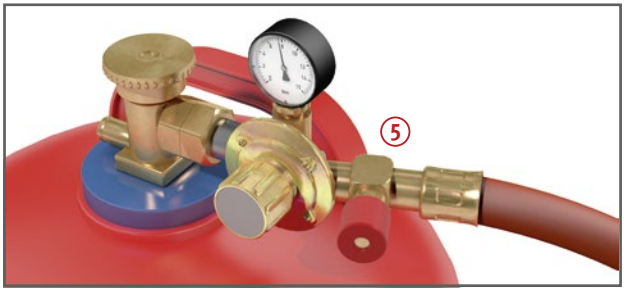
- Ensure even working pressure downstream of the cylinder valve.
  Very useful: regulators with adjustable outlet pressure ④.
- Only use high-pressure hoses between cylinder valve and pressure regulator (pressure class 30). Downstream of the pressure regulator, hoses for exposure to particular mechanical stresses (pressure class 6 with increased wall thickness) may be used.
- Hose connections must have factory-made fixed screw connections.
- LPG cylinders may only be refilled in special refill centres.
- Exception: Refilling small bottles (0.425 kg) in refill stands ⑥.

Safety measures

- Supply points (LPG cylinders or tanks) consisting of portable containers must contain no more than 8 cylinders or 2 tanks.
- Supply points, including the empty containers, must only be set up outside or inside in sufficiently well ventilated rooms directly accessible from outside.
- Supply points must not be set up in rooms below ground level.
  Exception: with expert supervision, sufficient ventilation and if the supply point is removed during extended breaks from work.
- It is only permitted to set up LPG cylinders in passages, thoroughfares, stairwells, hallways and corridors, narrow courtyards, etc. to carry out work there temporarily and only if special safety measures are taken at the same time (cordoning off, securing escape route, ventilation).
- Set up supply point so that the safety zone is free of cellar openings, light wells and ventilation ducts, gullies, drain inlets and sources of ignition ①.
- Portable containers must be set up and stored so that containers and valves are protected to prevent mechanical damage.
- When emptying LPG cylinders, stand them vertical and stable.







- Immediately take any leaking LPG cylinders outside, put them in a well-ventilated spot and mark for refilling.
- Never thaw ice on LPG cylinders using flame or heaters and the like!
- Separate shut off must be possible for each work equipment connected (e.g. blow torch, surface dryer).
- When not connected, fit the LPG cylinder with the safety cap ③ and cap nut ②. This also applies to empty bottles.

Additional information for working with LPG on construction sites

- For hoses longer than 40 cm, hose failure valves ⑤ are required, which must be attached directly downstream of the regulator.
- Below ground, leak test system valves ⑧ must be used instead of hose failure valves.

Inspections

- Arrange the required inspections according to the results of the risk assessment and the inspection intervals in Annex 3, Table 1 of the Regulation on Health and Safety in the Use of Work Equipment (BetrSichV).
- Also pay attention to the test and inspection information in the manufacturer's operator's manual.
- Document the inspections.

1 Inspection intervals according to BetrSichV

LPG equipment	Periodic inspection	By whom?
Setup, no leakage	Check daily	Competent person (user) section 2 (5) BetrSichV
Entire system	Annual inspection	"Person qualified for inspection" section 2 (6) BetrSichV

Further information:
Industry Safety Regulation (BetrSichV)
DGUV V79 "Use of LPG"
DIN EN 16129
DIN EN 16436

Handheld Chainsaws

B 259

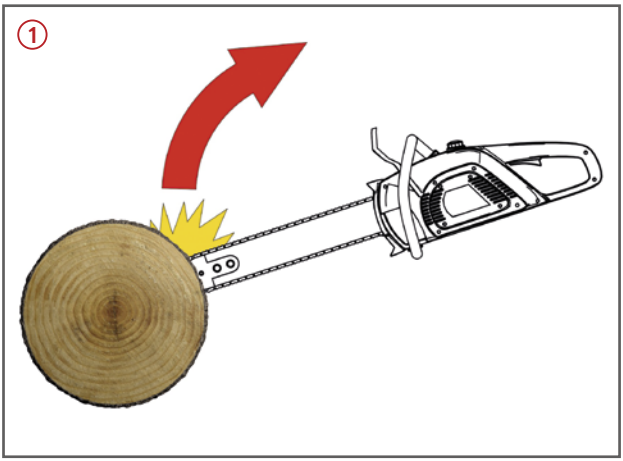
Risks

- Cuts can be caused – in particular by handheld chainsaw kickback – and hearing damage can occur.
- Fuel-driven saws pose a risk of poisoning from ehaust.
- Chainsaw operation produces hand-arm vibration.

Safety measures

- As a rule, do not use handheld chainsaws during construction work.
- Check as part of the risk assessment whether alternative machines, e.g. handheld circular saw, reciprocating saw, alligator power saw, can be used.
- Follow the manufacturer's operator's manual.
- Briefing according to the instructions for use.
- Wear personal protection equipment in accordance with the manufacturer's operator's manual, the result of the risk assessment and risk assessment, e.g.:
  – cut-resistant clothing,
  – cut-resistant footwear,
  – safety helmet with faceguard,
  – ear protection,
  – if necessary, gloves with chainsaw protection.
- Before starting work, check that chain brake works.

- Set the idle speed so the chain does not move when the chainsaw is started up.
- Only use sharp chains. Chain tension as per manufacturer's specification.
- If possible, use low-kickback chainsaws.
- Use log biter.
- Ensure your footing is safe and secure at all times.
- Never saw above shoulder height.
- When starting it up, support handheld chainsaw safely and hold it tightly. The chain must not touch the ground.
- Always hold handheld chainsaw tightly with both hands.
- Only pull the handheld chainsaw out of the timber with the chain running.
- Make sure there is nobody else inside the danger area.
- Do not use chainsaws with combustion engines in enclosed rooms, pits or trenches.
- Do not saw with the guide bar nose. Risk of kickback! ①
- Turn off engine before setting down the saw.
- Put on chain guard when transporting the handheld chainsaw.
- When carrying out repairs and maintenance work switch off the engine/unplug.



Occupational healthcare

- Schedule compulsory or offer recommended occupational healthcare appointments according to the results of the risk assessment. Obtain advice of the Medical Officer in relation to this.

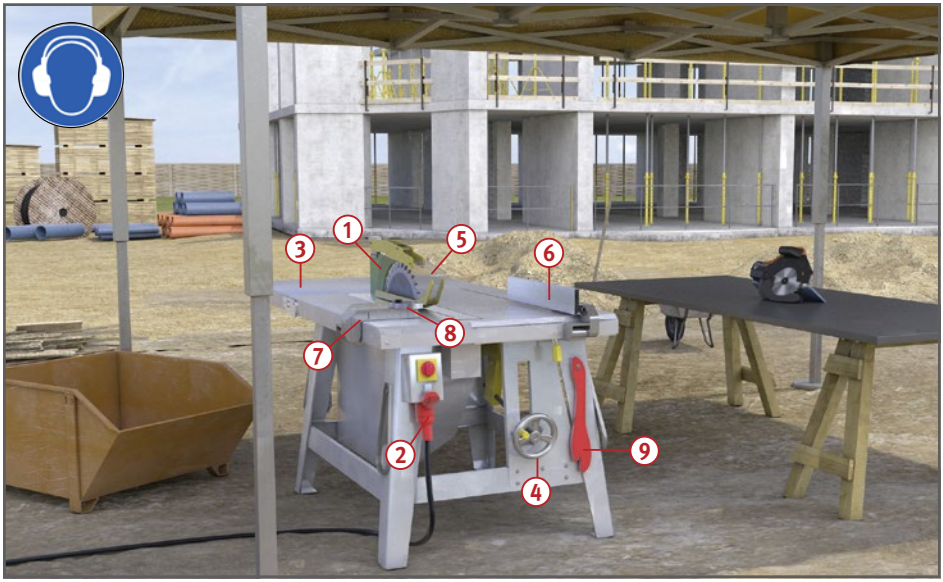
Work restrictions

- Under 15s may not use handheld chainsaws.
- 15 to 18-year-olds may only use handheld chainsaws under the supervision of a competent person and if required as part of their vocational training.

Further information:
Youth Health and Safety at Work Act- (JArbSchG)
Industry Safety Regulation (BetrSichV)
Regulation Concerning Occupational Health Care (ArbMedVV)
DGUV-V1 "Principles of Prevention"
DGUV-R 100-500 "Operation of Equipment"
DIN EN 60745-2-13 VDE 0740-2-13

Building Site Saws
Handheld Circular Saws

B 265



Risks

- Cuts/injuries can be caused by workpiece kickback and hearing damage can occur.

Safety measures

- Follow the manufacturer's operator's manual.
- Use a phase inverter plug and socket.
- Briefing according to the instructions for use.
- Use ear protection and safety footwear. Use noise warning signs in area.
- Wear close-fitting clothing. Do not wear gloves while sawing.
- Observe danger area of a radius of 120 mm around the saw blade.
- Select riving knife according to the size and thickness of the saw blade ①.
- Unplug before changing accessories and before repairs and maintenance work ②.
- After switching off, do not slow down saw blade by pressing against the side of the blade.
- If required, use table length and width extension ③.
- Where provided by the manufacturer, use height-adjustable saw blade according to workpiece thickness ④.
- Extract the sawdust if the circular saw is being used in enclosed spaces.

Additional information for building site saws

- Automatic guards ⑤ must not be tampered with; if possible use STOP button!
- Lower non-automatic guards onto the workpiece.
- If possible, retrofit older machines with automatic guards.
- The distance between the riving knife and the toothed edge of the saw blade must not be greater than 8 mm.
- Use requisite devices as required:
  – rip fence ⑥,
  – mitre fence ⑦,
  – mitre gauge ⑧,
  – push stick ⑨,
  – push block with interchangeable handle ⑩.

- Use push stick or push block with interchangeable handle ⑩ for narrow workpieces if the distance between rip fence and saw blade is less than 120 mm.
- Change the table insert if the gap on both sides of the kerf is >5 mm.
- When working, stand to the side of the risk area.
- Do not use your hand to remove chippings/shavings etc. out of the area of the running saw blade.
- Before leaving the operator's station, switch off the machine.
- Slide the rip fence ⑥ back far enough to prevent the workpiece from getting stuck.
- Rule of thumb: The back end of the fence comes up to an imaginary line that starts roughly at the front edge of the saw blade and runs at a 45° towards the rear.
- Cut large panels with a handheld circular saw and guide rail ⑪.

Additional information for circular saw blades

- Only use circular saw blades bearing the manufacturer's name or logo ⑫.
- Composite circular saw blades must indicate the maximum rpm in addition. Do not exceed the rpm indicated ⑬.
- Use low-noise saw blades ⑭.
- Discard damaged saw blades, e.g. cracked, deformed, with burn marks.

Additional information for handheld tools

- No more than 5 mm between the riving knife and the toothed edge if the manufacturer's operator's manual requires a riving knife.
- Set the cut depth correctly: in the case of solid wood, no greater than 10 mm more than thickness of the workpiece.
- Do not set down handheld tool with the saw blade running.

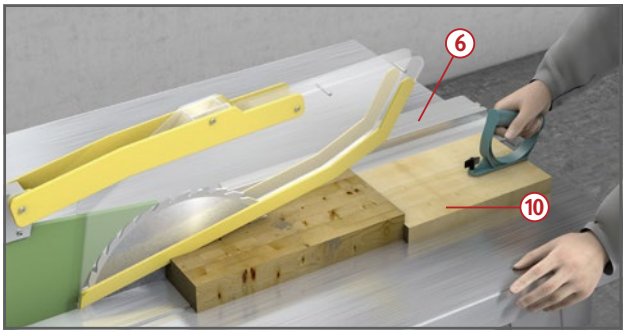
- On the handheld tool, the entire toothed edge of the blade above the work rest must be fitted with a fixed casing ⑮.
- In principle, guide tool using both hands, and fix workpiece.

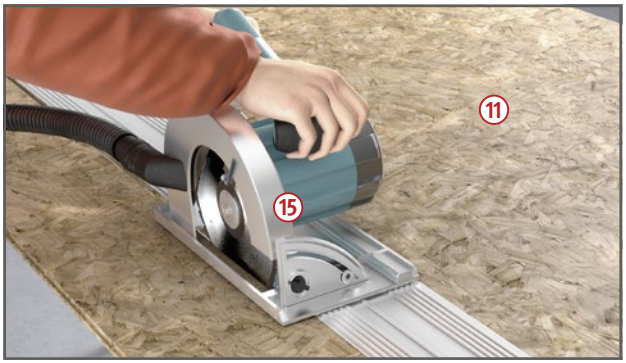
Occupational healthcare

- Schedule compulsory or offer recommended occupational healthcare appointments according to the results of the risk assessment. Obtain advice of the Medical Officer in relation to this.

Work restrictions

- 15 to 18-year-olds may only use jobsite table saws and handheld circular saws under the supervision of a competent person and if required as part of their vocational training.
- Under 15s may not use these tools.



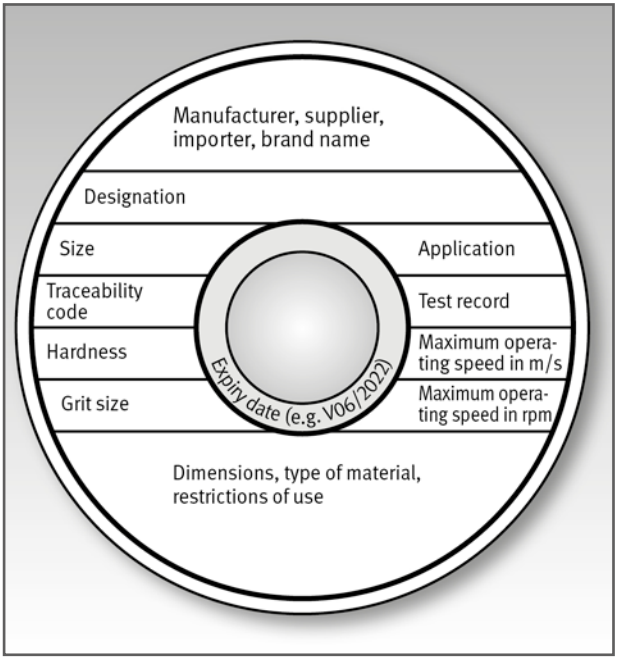


Further information:
Youth Health and Safety at Work Act (JArbSchG)
Industry Safety Regulation (BetrSichV)
Regulation Concerning Occupational Health Care (ArbMedVV)
DGUV-V1 "Principles of Prevention"
TRBS 2111-1 "Mechanical Risks – Measures to Protect against Controlled Exposed Moving Parts"
DGUV-R 100-500 "Operation of Equipment"
DGUV-R 112-194 "Use of Ear Protection"
DIN 19085-10
DIN EN 62841-2-5

Grinders

B 273

Essential markings (sample illustration)

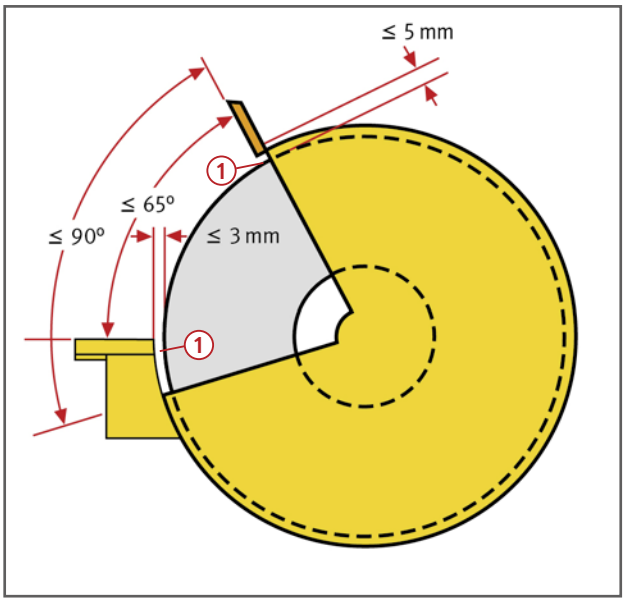


Risks

- Persons may get hit by flying particles and shattering grinding wheels.
- Grinding sparks pose a particularly high risk to the eyes.

Safety measures

- Only use marked grinders and grinding wheels.
- Do not exceed the maximum operating speed rating.
- Choose the right grinding wheel for the job.
- Before mounting, perform a ring test.
- Mount grinding wheel correctly and use a same-size flange that is for the grinder. The minimum diameter of the flange is dictated by the bore diameter of the grinding wheel. Use flexible backing pads if necessary.
- Check grinding wheels and mounting devices for visible defects. Perform a test run; stand to the side out of the danger area.
- Compare the speed of the grinder with the rpm rating of the grinding wheel; grinder speed should not be higher than that of the wheel.
- Abrasive products that are not suitable for all applications must be marked accordingly with restrictions of use.
- Do not reduce the size of grinding wheel bores using reduction bushes or by welding.
- Only briefed persons may change or mount grinding wheels.
- Do not use grinding wheels past their expiry date.
- Regularly re-adjust the guard and the work rest according to grinding wheel wear ①.
- Use safety goggles or faceguard ② and ear protection ③.
- A suitable form of extraction must be used for prolonged grinding work and when working with substances that are harmful to health.
- There is a risk of fire and explosion when grinding light metals (e.g. aluminium, magnesium)!
- When extracting grinder dusts of combustible light metal, only special extractors fit for this purpose may be used.



Additional information for handheld grinders

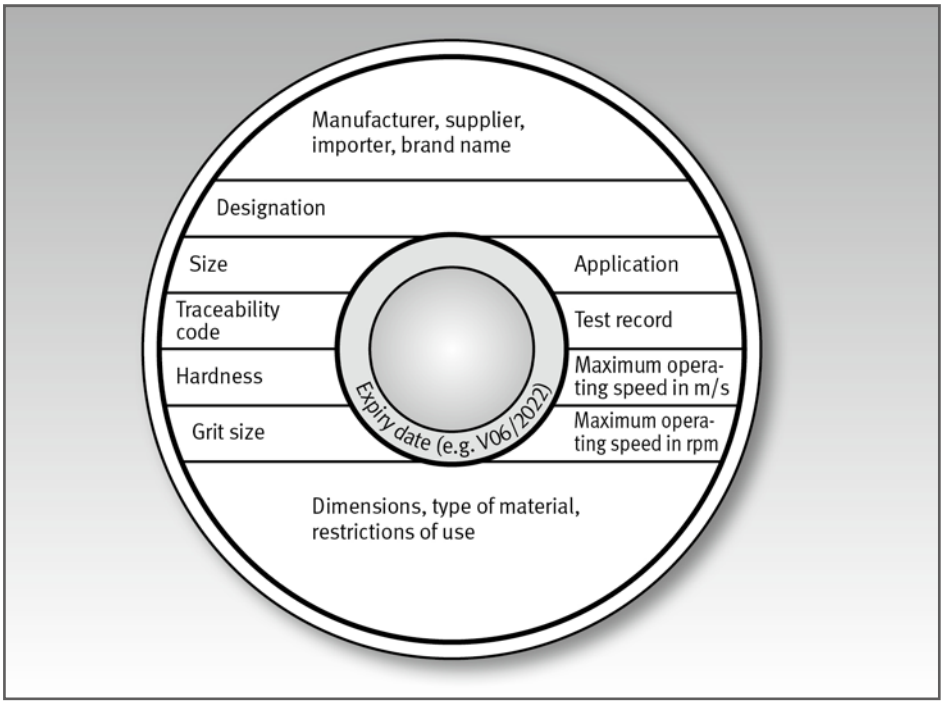
- Only mount with a same-size flange ④ that is for the grinder and using a special wrench. Perform a test run.
- Only use handheld grinders with guards ⑤.
- For cylindrical cup wheels, adjust the wheel guard to the wear.
- Always hold grinders with both hands. Do not reduce grinding speed by applying strong pressure.
- Secure workpiece before working on it.
- When working, adopt a safe place to stand.
- Determine whether there is a risk of fire or explosion at the place of operation and take suitable measures as necessary.
- Use the grinder as intended according to the business operator's instructions for use/ the manufacturer's operator's manual.

Occupational healthcare

- Schedule compulsory or offer recommended occupational healthcare appointments according to the results of the risk assessment. Obtain advice of the Medical Officer in relation to this.

Further information:
Industry Safety Regulation (BetrSichV)
Regulation Concerning Occupational Health Care (ArbMedVV)
Occupational Health and Safety Regulations Concerning Noise and Vibration (LärmVibrationsArbSchV)
ASR A2.2 "Fire Safety Measures"
DGUV-V1 "Principles of Prevention"
DGUV-R 100-500 "Operation of Equipment"
DGUV Information 209-002 "Grinding"
DGUV-R 109-001 "Grinding, Brushing and Polishing Aluminium"

Essential markings (sample illustration)

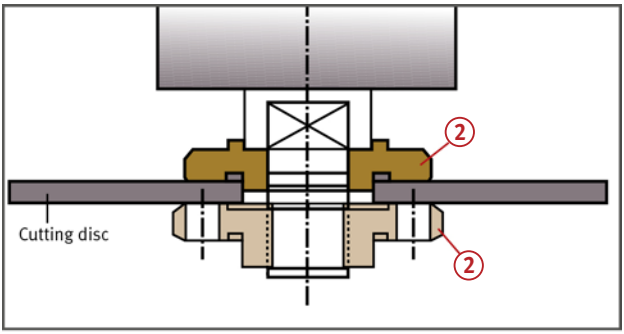


Risks

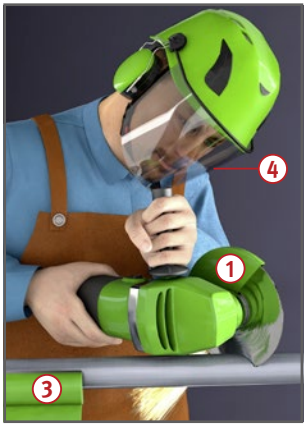
- Persons may get hit by flying particles.
- Tilting can cause cutting discs to shatter, and cause injury.

Signage

- Only use marked grinders and cutting discs.
- Do not exceed the maximum operating speed rating.



Correctly mounted cutting disc up to diameter of 230 mm



Safety measures

- Handheld grinders must be fitted with safety guards ①.
- Only mount with a same-size flange that is for the grinder and using a special wrench ②.

A diameter of at least 41 mm is recommended. Before mounting, perform a ring test.

- Secure workpieces before working on them ③. When working, adopt a safe place to stand.
- Always hold grinders with both hands – do not tilt!

- Do not use cutting discs for side grinding.
- Use safety goggles ④ and ear protection.
- If dust is produced that is harmful to health, use respiratory protection.
- Choose the right cutting disc for the job.
- Compare the speed of the grinder with the rpm rating of the cutting disc. Grinder speed should not be higher than that of the disc.
- Abrasive products that are not suitable for all applications must be marked accordingly with restrictions of use.
- Do not use grinding wheels past their expiry date.
- Determine whether there is a risk of fire or explosion at the place of operation and take suitable measures as necessary.
- Use the grinder as intended according to the business operator's instructions for use/ the manufacturer's operator's manual.

Occupational healthcare

- Schedule compulsory or offer recommended occupational healthcare appointments according to the results of the risk assessment. Obtain advice of the Medical Officer in relation to this.

Further information:
ASR A2.2 "Fire Safety Measures"
Industry Safety Regulation (BetrSichV)
Regulation Concerning Occupational Health Care (ArbMedVV)
Occupational Health and Safety Regulations Concerning Noise and Vibration (LärmVibrationsArbSchV)
DGUV-V1 "Principles of Prevention"
DGUV-R 100-500 "Operation of Equipment"
DGUV Information 209-002 "Grinding"

C Processes

C Processes

	Baustein No.	Baustein title
	315	Wood Dust
	317	Mineral, Silica dust
	319	New Mineral-Wool Insulating Materials Glass Wool, Rock Wool, Slag Wool
	345	Roofing Work Workplaces and Fall Protection
	351	Scaffolding Work Fall Protection during Erection, Alteration and Dismantling
	352	Scaffolding Work Plan for Erection, Alteration and Dismantling/Instructions for Erection
	357	Access to Scaffolding for Scaffolding Erection and Use
	359	Scaffolding Use; Plan for Use Visual Inspection by the User
	360	Scaffolding Use Working and Operational Safety
	403	Coating Work
	404	Paints and Coatings
	423	Gas Welding Flame Cutting Brazing
	467	Excavations Beside Buildings
	469	Sloped Excavations and Sloped Trenches
	470	Sheeted Trenches – Horizontal and Vertical Sheetinga
	472	Underground Cables and Pipes
	482	Working on Gas Pipelines

Wood Dust

C 315

Risks

- Dust from many kinds of hardwood may cause cancer, skin and respiratory illnesses as well as allergic reactions.
- When mixed with oxygen in the air, they create combustible or explosive mixtures.

General

- All machining creates wood dust, e.g. woodworking machines, handheld machines and hand sanding stations.
- Furthermore, when cleaning workstations and equipment as well as carrying out maintenance and clearing faults (e.g. in filter units and silos) wood dust is likely to be released into the air.

Safety measures

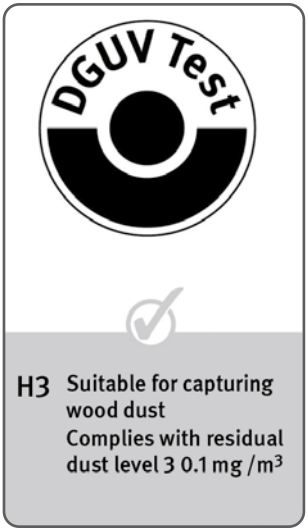
- Extraction is always necessary for all machining operations e.g. on woodworking machines, handheld machines and hand sanding stations, unless a low level of exposure is identified in the risk assessment.

Exceptions:

– For drill presses using normal twist drill bits (however, extraction is required if using cylinder drill bits),
– For machines operated outside or in semi-enclosed spaces, on factory floors (e.g. building site saws, motorised chainsaws, mobile saws, carpentry power tools),
– For circular saws for veneers; knothole boring machines; chain mortisers; slot, dowel and multi drills due to the very low output of chippings,

– For edgers and mitre saws, bench bandsaws, router tables, portable site saws with low runtimes of up to no more than one hour per shift.

- If multiple machines are connected to one extractor line, install a valve at each extractor nozzle.
- The valves must open/close automatically when the corresponding machine is switched on/off. An exception is made for systems put into operation prior to 1993 provided they are fitted with manual slide valves or if the extraction flow rate from machines is so low that it has a negligible effect on the overall flow rate.
- For regular hand sanding, use benches with extraction unless working exclusively with sanding pads with dust extraction.
- Floor sanders must have certified extraction or it must be possible to connect them to a dust extractor. Pay attention to the operator's manual.
- Connect handheld tools to dust class M (or H) certified dust extractors.
- Mobile dust extractors that recycle the air into the work area must be labelled dust class M according to DIN EN 60335-2-69 or bear the test mark of the "Fachausschuss Holz" with the additional mark H3.
- Check the effectiveness of extractors and extractor systems using work area analysis. For wood dust, an exposure limit value of 2 mg/m3 inhalable dust applies.
- Always clean using vacuum cleaners, e.g. with certified dust class M (or H) vacuum cleaners. An exception can be made for a combination extractor/blower; e.g. for machines that have vacuum clamps.
- When extraction is switched on, blow away from the worker into the collecting parts.
- Vacuum rather than blow dust off soiled work clothing.
- Measure the air speeds at the extractor connections before putting into operation for the first time and after significant changes.
- Inspect extraction, vacuum and capturing devices once a day for obvious defects, and test function once a month, e.g. by checking the
  – collecting parts for damage,
  – ducts and filters for damage and blockages,
  – function of the cleaning and discharge devices.
- Document the functional test once a year.
- Use ear protection.
- In work areas with a high level of dust exposure, use respiratory protective devices with at least P2 particle filters or – for brief, occasional work – filtering FFP2 masks. Pay attention to the wear time limit.



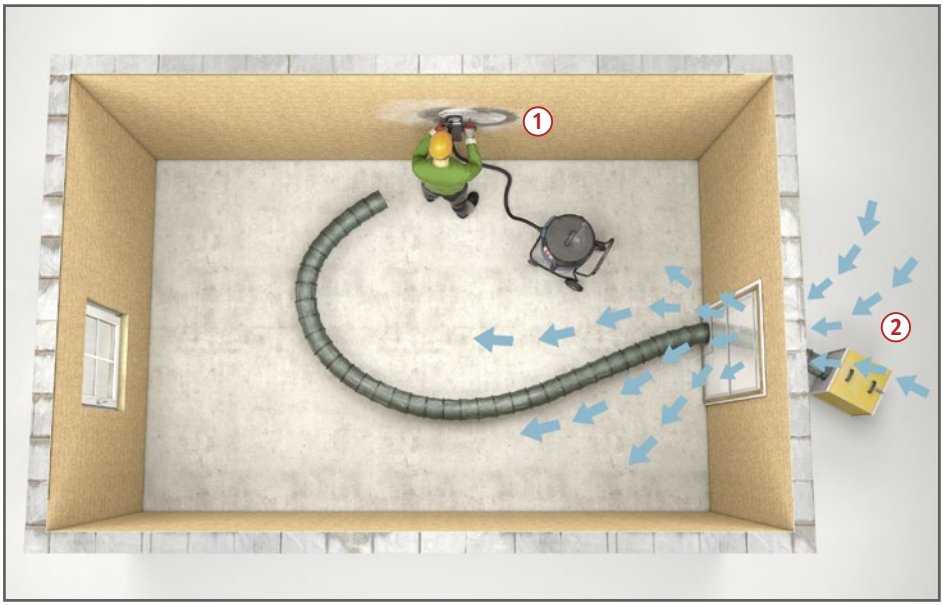
Occupational healthcare

- Schedule compulsory or offer recommended occupational healthcare appointments according to the results of the risk assessment. Obtain advice of the Medical Officer in relation to this.

Further information:
Hazardous Substances Ordinance (GefStoffV)
Regulation Concerning Occupational Health Care (ArbMedVV)
DGUV-V1 "Principles of Prevention"
TRGS 553 "Wood Dust"
TRGS 906 "List of Carcinogenic Activities or Processes According to Section 3(2) No. 3 of the Hazardous Substances Ordinance (GefStoffV), Annex 1"
DGUV-R 112-190 "Use of Respiratory Protective Devices"
DGUV-R 112-194 "Use of Ear Protection"
DGUV Information 209-044 "Wood Dust"

Mineral, Silica dust

C 317



Risks

- Silica dusts can cause pneumoconioses.

General

- Coarse and fine dust is produced during work.
- Fine dust is not visible to the naked eye and workers can breathe it into their lungs. Respiratory illnesses, such as pneumonia or bronchitis, may arise.
- If the fine dust contains free crystalline silicic acid, released when working with rock containing quartz, there is a risk of pneumoconiosis (silicosis) or lung cancer associated with silicosis.

Safety measures

- Only use tools with dust extraction ① or connected to a dust extractor (at least dust class M).
- If dust collection on the machine is not sufficient, use a combination of safety measures, e.g. extraction ② in the work area with extractor system or mobile air purifier.

Workplace limit values

Dust limit values:

- Respirable dust that can reach the alveoli (“A” fraction dust) 1.25 mg/m³.
- Inhalable dust (“E” fraction dust) 10 mg/m³.
- Activities or processes that produce respirable silica dust must be treated as carcinogenic (minimisation measures required). The current exposure standard for silica dust is 0.05 mg/m³.

Organisational measures

- Identify work areas or activities involving dust exposure. If silica dust arises, check whether materials with a lower silica content can be used.
- Carry out risk assessment, specify safety measures, document.
- Draw up instructions for use and brief workers.
- Regularly check the effectiveness of the measures taken.

Technical measures

- Use low-dust methods of working and equipment with direct dust extraction (www.gisbau.de).

- If possible, extract dust directly at the source (spot extraction) and/or collect with funnel of the extractor system or air purifier. Track the source of the dust with the funnel or the suction opening of the air purifier and work in the direction of the suction opening.
- Use dust class M or H dust extractors for handheld tools.
- The following applies in general: Do not limit dust safety measures to one option. Often, only measures used in parallel are effective.
- Purify extracted air and discharge outside.
- Have extractor systems maintained regularly and inspected at least once a year by a "qualified person for inspection" (e.g. expert).
- Document the inspection.
- Clean dust deposits out of/off workrooms, machines and tools regularly. When cleaning, do not dry-brush or use compressed air blowers; vacuum instead. Rake up large pieces.
- For cleaning, only use suitable certified dust class M or higher industrial vacuum cleaners.
- Ensure good room ventilation; provide the technical means (e.g. air purifier) for this.
- Use structural solutions to separate dust zones from other work areas.

Additional information for wet processes

- Using wet processes to work on workpieces can greatly reduce the amount of dust. Despite that, the dust hazard cannot be completely eliminated, because
- with machines that run at high speeds in particular, the dust is mixed with the water (forming an aerosol).
- Direct water right onto the interface.
- Prevent the spray from dispersing, e.g. with guards resting on the workpiece.
- Regularly clean/change the circulating water; at least once a day in the case of machines without water treatment.
- When sanding and polishing, only use silica-free materials.

Occupational healthcare

- Schedule compulsory or offer recommended occupational healthcare appointments according to the results of the risk assessment. Obtain advice of the Medical Officer in relation to this.

Further information:
Hazardous Substances Ordinance (GefStoffV)
Regulation Concerning Occupational Health Care (ArbMedVV)
DGUV-V1 "Principles of Prevention"
TRGS 559 "Silica Dust"
DGUV-R 109-002 "Workplace Ventilation - Technical Measures" DGUV-R 112-190 "Use of Respiratory Protective Devices"
DGUV-R 112-194 "Use of Ear Protection"
DGUV Information 209-073 "Workplace Ventilation – Decision-making Aids for Business Practice"

New Mineral-Wool Insulating Materials

Glass Wool, Rock Wool, Slag Wool

C 319

Risks

- Mineral-wool insulating materials not classifiable as carcinogenic have been manufactured since 1996.
- Even when handling new products, larger fibres (fibre fragments) can cause skin, eye and respiratory irritation.

General

- Since 1 June 2000, only insulating materials made of synthetic mineral fibres classed as non-hazardous (not suspected of causing cancer) under the Hazardous Substances Ordinance may be produced and used in Germany.

RAL GÜTEZEICHEN Erzeugnisse aus MINERALWOLLE

Safety measures

Technical and organisational safety measures

Pay attention to the following minimum measures:

- Prefabricated or laminated mineral-wool insulating materials are recommended.
- Leave packaged insulating materials unopened until in situ.
- Do not throw material.
- Ensure workplace is well ventilated.
- Do not raise dust.
- Cut on a solid surface with a knife and scissors.
- Do not use high-speed, motorised saws without extraction.
- Keep workplace clean; clean regularly. Vacuum using an industrial vacuum cleaner (dust class M) rather than brushing.
- Collect offcuts and waste in suitable receptacles, e.g. plastic bags. When closing the bags do not press the air out.
- Creating as little dust as possible, remove any mineral wool installed after June 2000 in accordance with the safety measures listed here.
- Personal and hygienic safety measures
- Wear loose work clothing that provides full coverage and, if necessary, gloves (e.g. leather or nitrile-coated cotton gloves).
- Wear safety goggles if a lot of dust is produced or if working overhead. To protect against respiratory irritation, wear a half mask with P2 filter or FFP2 filtering half mask as a precaution.
- When finished work, wash dust off the skin.

Occupational healthcare

- Schedule compulsory or offer recommended occupational healthcare appointments according to the results of the risk assessment. Obtain advice of the Medical Officer in relation to this.

Further information:
Hazardous Substances Ordinance (GefStoffV)
Regulation Concerning Occupational Health Care (ArbMedVV)
DGUV-V1 “Principles of Prevention”
TRGS 500 “Safety measures: Minimum Standards”
DGUV-R 112-190 “Use of Respiratory Protective Devices”
DGUV Information 213-031 “Working with Mineral-Wool Insulating Materials (Glass Wool, Rock Wool)”

Roofing Work

Workplaces and Fall Protection

C 345

Risks

• Defects in the setup and condition of workplaces for roofing work can cause falls and falls from height.

General

• For roofing work, workplaces must be set up and their condition must be such (Table 1) that, according to

– the type of building or structure, e.g. structural elements that cannot be walked on (incl. domed skylights, continuous skylights, glass roofs, fibre-cement corrugated sheets), shafts, electrical installations (incl. overhead power lines, transmitters), roof overhangs, dormers, height of parapet,
– the changing conditions on site, e.g. coordination with other trades, progress of construction,
– the weather conditions, e.g. rain, wind, frost, snow and ice, and
– the work to be carried out, e.g. laying the underlay, installing the battens, laying the roof covering,

safe working is ensured.

Safety measures

Fall protection

• Set up workplaces and traffic routes so as to eliminate as far as possible the risk of falling. When choosing safety measures, follow this hierarchy: guardrails before collective fall protection before PPE.

Table 1

	Place/Type of work	I	II	III	IV
		Workplaces with roof pitches of			
		≤22.5°	›22.5°≤45°	›45°≤60°	›60°
A	Building roof trusses	1/4/5/9	1/4/5/9	4/5/9	4/5/9
B	Roof battens	1	1	1/4	1/4
C	Boarding	1	2/3/8/**	2/3/8	2/4/5
D	Roof covering	1	2/3/8/**	2/3	2/4/5
E	Roof waterproofing	1	2/3/4/**	2/3/4	2/4/5
F	Metal surface	1	2/3/4	2/3/4	2/4/5
G	Roof guttering, verge trim fitting	4/5/9	4/5/9	4/5/9	4/5/9
H	Gutter cleaning	1	4/5/9/6	4/5/9/6	4/5/9/6
I	Demolition work	1	2/3/*	2/3/*	2/4/5

* in the case of roofing products made of components that are not fall-through-proof, such as fibre-cement corrugated sheets, old roof coverings or roof battens that do not meet the requirements of Table 2.

**in the case of rough surfaces and roof coverings that ensure sufficient stability, a special workplace is not necessary.

1. No special workplace required.
2. Roof ladder (up to 75°)
3. Roof stands
4. Scaffolds
5. Mobile Elevated Work Platforms
6. Leaning ladders
7. Attachments for the lifting of persons
8. Battens for standing on with dimensions as per Table 2 or opening in the boarding to stand in
9. Mobile scaffold towers / mobile work platforms

Guardrails

- Secure workplaces and traffic routes on surfaces with a slope of ‹22.5° with guardrails to prevent falls.

Additional information for personal fall protection equipment

- In principle, personal fall protection equipment should not be used for roofing work.
- In exceptional cases, use personal fall protection equipment if there are suitable anchor devices and if carrying out roofing work for a short length of time.
- Establish the rescue protocol.
- The business operator or the suitably qualified supervisor must specify suitable anchor devices and points and ensure that the personal fall protection equipment is used.
- Conduct drills to brief workers in use and rescue.

Table 2

Standard cross sections for supporting softwood roof battens without any further calculated proof

Cross section * in mm	Max. span in cm	Colour coding	DIN 4074-1 visual grade	or**	EN 338:2016 strength class
30 x 50	80	red	S10 TS / S 10		C 27 M
40 x 60	100	red	S10 TS / S 10		C 24 M

* According to DIN EN 336:2013-12 the maximum permitted deviations from the standard cross sections are -1/+3 mm (with reference to u = 20 % moisture content)

**The grades may not be correlated with the strength classes – each must be considered separately on the basis of the different criteria!

Further information:
Workplace Ordinance (ArbStättV) Industry Safety Regulation (BetrSichV) DGUV-V1 “Principles of Prevention”
DGUV-V38 “Construction Work”
DGUV-R 101-038 “Construction Work”
ASR A2.1 “Protection against Falls and Falling Objects”
TRBS 2121 “Risk of falling in the Workplace – General Requirements”
DGUV Information 201-054 “Roofing, Carpentry and Timber Construction Works”

Scaffolding Work

Fall Protection during Erection, Alteration and Dismantling

C 351

Risks

- Workers are at risk of falling especially during erection, alteration and dismantling.

General

- Scaffolding work must only be done under the supervision of a competent person and by suitably qualified workers.
- When identifying the risk, determine whether workers can fall over edges (outside, inside, ends).
- When assessing the risk, pay attention to:
  – fall height,
  – horizontal distance from fixed structural components,
  – nature of the impact surface.
- Before carrying out scaffolding work, instructions for erection must be drawn up for the particular construction project.

Safety measures

- Technical safety measures have priority over personal safety measures.
- Hierarchy of safety measures:

1. Fall protection as technical measures, e.g. guardrails, advance guardrail installation, or temporary safety handrails ①.
2. If such fall protection is not possible, collective measures must be used, e.g safety scaffolds, safety nets.
3. If neither is possible due to the building to be scaffolded, the type of scaffolding or the additional construction according to structural requirements, suitable personal fall protection equipment must be used as a personal safety measure (establish rescue protocol).

- Firm up and lay down measures to protect against falls when drawing up the plan for erection, alteration and dismantling (instructions for erection).
- Fix the scaffold as erection progresses to load-bearing components of the façade so as to ensure tensile strength and compressive strength. From the very first scaffold bay, the scaffold must be secured to prevent toppling (see instructions for assembly and use).

Additional information for material handling

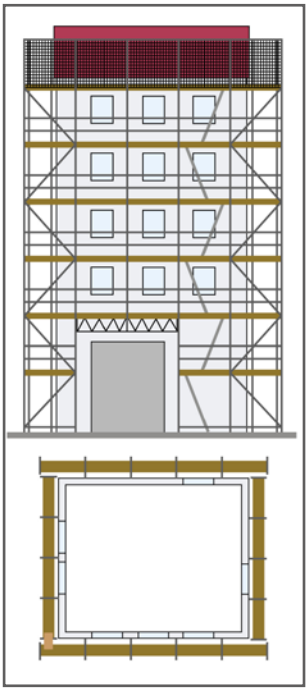
- When erecting and dismantling scaffolding, use ergonomic equipment for vertical transport, e.g. construction hoists, pulley lift systems.
- Vertical manual handling is possible:
  - -up to three lifts (excluding family dwellings) or
  - -for length development up to 10 m and scaffolding height up to 14 m.
- There must be a worker on each lift for vertical manual handling.
- The bay at which vertical manual handling takes place must at least have a top rail and mid rail ②; this also applies to temporary safety handrails.
- The minimum requirement for horizontal handling is a handrail.

Further information:
Industry Safety Regulation (BetrSichV)
DGUV-V1 “Principles of Prevention”
TRBS1203 “Qualified Persons”
TRBS 2121-1 “Risk of falling in the Workplace arising from the Use of Scaffolds”
DGUV-R 112-198 “Use of Personal Fall Protection Equipment”
DGUV-R 112-199 “Rescue from Height and Depth Using Personal Fall Protection Equipment”

Scaffolding Work

Plan for Erection, Alteration and Dismantling/ Instructions for Erection

C 352



Floor plan and elevation (simplified drawing without dimensions)

Risks

• Failure to plan or poor planning of scaffolding work can result in falls from height during erection or scaffolding defects for later use.

Safety measures

• Have contractor responsible for the scaffolding work or a competent person appointed by the contractor draw up the plan for erection, alteration and dismantling/instructions for erection.

Additional information on the plan for erection, alteration and dismantling/instructions for erection

• This plan documents the choice of
– construction solutions on the basis of the instructions for assembly and use and the
– suitable measures on the basis of the risk assessment, e.g. risk of falling, risk of drowning when working above water.

• Above all, the instructions for erection fill in the gaps in the instructions for assembly and use, and should include the following details in particular:
– basic dimensions of the building to be scaffolded,
– type of scaffolding,
– load and width class,
– surface it stands on,
– distances, e.g. from building, from eaves,
– type and number of access points (at least every 50 m)
– to the scaffolding during erection,
– for later use of the scaffolding by the user,
– scaffolding coverings,
– tie-in and anchoring surface, bracing, guying or ballasting in the case of free-standing scaffolds,
– vertical handling (e.g. using lift/hoist or manual),
– measures to protect against falls (e.g. railing, personal fall protection equipment,
– signage and cordoning off of the perimeter of the danger area during erection work (if necessary, this danger area must be set in consultation with the coordinator (German Construction Site Ordinance – BaustellV).
– factors arising from the surroundings (e.g. hazardous substances, overhead power lines, public road/space),
– type and location of signage on the completed scaffolding,
– name of the competent person (supervisor) of the scaffolding contractor,
– details that supplement the general instructions for assembly and use if there are any deviations from the generally recognised standard configuration,
– details on the timing of inspection,
– name of the “qualified person for inspection”.

• Brief the suitably qualified workers on the basis of this plan.

• The instructions for erection must be provided to the competent person supervising the scaffolding work and the workers at the place of use.

→

Further information:
Industry Safety Regulation (BetrSichV)
DGUV-V1 “Principles of Prevention”
TRBS1203 “Qualified Persons”
TRBS 2121-1 “Risk of falling in the Workplace arising from the Use of Scaffolds”
DIN EN 12811-1
DIN 4420-1 and DIN 4420-3

Sample instructions for erection for work and safety scaffolding

– applies in conjunction with the attachments

Company (stamp)

Construction site: _____

Client: _____

Qualified person: _____

Erection period: _____

Type of scaffolding:

☐ façade scaffold ☐ interior scaffolding ☐ scaffold tower/ stair scaffold tower
☐ safety scaffold ☐ roof scaffold
☐ special scaffolding ☐ canopy scaffolding

Erection in conformity with:

☐ standard configuration ☐ type test ☐ analysis of structural stability

Load class (evenly distributed load)

☐ **2** (1.5 kN/m²) ☐ **3** (2.0 kN/m²) ☐ **4** (3.0 kN/m²)
☐ _____ (_____ kN/m²)

Width class

☐ W06 ☐ W09 ☐ W _____

Surface it stands on

☐ load-bearing solid surface ☐ load-distributing base ☐ _____

Technical data

horizontal distance between platform and building _____ m
horizontal distance between eaves and guardrail/screen _____ m
vertical distance between eaves and top platform _____ m

Covering/add-ons

☐ nets ☐ solid wood decking ☐ inside guardrails
☐ tarpaulins ☐ steel decking ☐ brackets
☐ steel lattice beams ☐ combi-type decks ☐ hoist/lift
☐ aluminium steel lattice beams ☐ _____ ☐ _____

Fixing

☐ to inside standard ☐ free-standing scaffold ☐ guying
☐ via both standards ☐ ballasting ☐ _____
☐ v-tie (triangular) ☐ bracing ☐ _____

Access

☐ steps ☐ access ladder ☐ ladder

Vertical handling

☐ manual, from lift no. _____ to _____ ☐ with hoist, from lift no. _____ to _____
☐ advance built-in guardrails (2-part*)
☐ temporary safety railing (2-part*)
☐ personal fall protection equipment (if aforementioned technical safety measures are not possible)

Horizontal handling

☐ advance built-in guardrails (min. 1-part**)
☐ temporary safety railing (min. 1-part**)
☐ personal fall protection equipment (if aforementioned technical safety measures are not possible)
Worker: _____

Special considerations

☐ hazardous substances ☐ overhead power lines ☐ public road
☐ _____ ☐ _____ ☐ _____

Signage

☐ danger area Type: _____
☐ completed scaffolding Type: _____ Where: _____

Anlagen:

☐ manufacturer's instructions for assembly/installation and use ☐ _____
☐ additional details on instructions for assembly/installation and use ☐ _____
☐ basic dimensions of building ☐ _____

☐ list of materials/parts

_____ _____
Date Signature of scaffolding contractor

* Top rail and mid rail
** Top rail (handrail)

Access to Scaffolding

for Scaffolding Erection and Use

C 357

Risks

- If all work sites on the scaffolding do not have a safe access point, falls may result.
- If the access points are not set up correctly, e.g. no guardrails on steps or ladders that are not fixed in place, accidents, e.g. falls or slips, may occur.

General

- Every work site on the scaffolding must have a safe access point.
- Access via lifts, platforms or steps takes priority over ladders ①.
- Access via internal ladders is permitted
  – up to a vertical height of 5 m or
  – when working on family dwellings,

  if the risks presented (e.g. transport of large volume of material, closure of climb-through openings) are taken into consideration in the risk assessment.
- Levels accessed via lifts, platforms or steps may provide access to no more than two additional non-continuous scaffold lifts (e.g. gable area, setback) with internal access ladders.
- Provide access points at least every 50 m (TRBS 2121-In contrast to internal access ladders, lift, platform or stair access is rated particularly highly (General Technical Specifications in Construction Contracts – ATV).

Safety measures

- Access (lift, platform, steps or ladder) is set up and removed in accordance with instructions from the lift installer/scaffolding contractor specially drawn up for the project. These are based on the manufacturer's operator's manual or instructions for assembly and use. These documents must be available on site during installation/erection work.
- Lifts and platforms must generally be fixed directly to the structure of the building. Attachment of anything to the scaffolding requires a written analysis of structural stability in each specific case.
- The thresholds between scaffolding and lift/platform must be safely realised: there should always automatically be a guardrail, e.g. loading point safety rail, at the threshold when the lift/platform is not at the threshold.
- Find out from the scaffolding manufacturer's instructions for assembly and use whether additional anchoring to the structure of the building must be undertaken around the steps.
- There must be no gaps larger than 2 cm between the scaffolding platform and the access point.
- Accesses with flights of steps running in opposite directions must be fitted with a two-part guardrail inside and outside.

• Accesses with flights of steps running the same direction must be fitted with a two-part guardrail outside and, at the decking, a stair guardrail ② so there is only one opening at the access to the steps.

• Generally, the scaffolding is signed off by the scaffolding contractor by signage at the point of access to the scaffolding. If the stair access has a lower load class than the scaffolding, this must be indicated and signed separately at the point of access. The scaffolding contractor must inform the client thereof in the "plan for use".

• The ladder access in the bottom bay must be realised so the ladder is not free-hanging but sits on the deck as in the other scaffolding lifts.

• Additional information for scaffolding work

• When erecting, altering or dismantling scaffolding, access via internal ladders (at least every 50 m) is possible.

• Ladder access points only intended for the scaffolding contractor to erect, alter or dismantle the scaffolding should be secured to prevent access by the user.

Additional information for access to safety and roof scaffolds

• For safety or roof scaffolds with stair access, if a guardrail or screen enclosure cannot be put up to secure the opening for exiting the stairs, then the stair access may go no further than the lift underneath the fall-breaking surface. Access to the fall-breaking surface must in such cases be provided by ladder.

Additional information for scaffolding use

• As with the scaffolding, the user may not make any construction alterations to the access (e.g. remove the guardrails, locking pins, anchors).

• Only use scaffolding and access thereto according to the "plan for use" (signage, warnings).

• The climb-through openings in ladders must be closed each time a person climbs through.

• Access points must be cleared of snow and ice, and de-slicked.

• Workers who operate the lift/platform must be instructed by the business operator in writing, who must ensure that such workers have been instructed in lift/platform operation and such instruction documented.

Inspections

• Scaffolding contractor:
To check its proper condition, inspection by a "qualified person for inspection" after completion and prior to handover to the user (proof – inspection report and signage).

• Scaffolding user:
– The user must have a "qualified person" carry out a visual inspection before use to check that it is safe and free of defects (proof – checklist).
– Check whether the "plan for use" is available and fit for purpose.
– After a prolonged period of non-use or after acts of nature (e.g. storms, heavy rain) the user must arrange with the client to have an unscheduled inspection carried out by a "person qualified for inspection" prior to use.

Further information:
Industry Safety Regulation (BetrSichV)
DGUV-V38 "Construction Work"
TRBS 1203 "Qualified Person"
TRBS 2121-1 "Risk of falling in the Workplace arising from the Use of Scaffolds"
DGUV Information 201-011 "Use of Work, Safety and Construction Frame Scaffolds"
DIN 4420-1 and 3
DIN EN 12811-1
General Technical Specifications in Construction Contracts (ATV)

Scaffolding Use

Plan for Use
Visual Inspection by the User

C 359

Risks

- If no/an inadequate visual inspection of the scaffolding is carried out after completion or prior to use, scaffolding defects may not be found, which can result in e.g. falls, loss of structural stability and loss of working and operational safety.
- If there is no plan for use, the user may make handling mistakes and accidents may occur.

Safety measures

- The business operator responsible for scaffolding work must have the scaffolding erected by him inspected after erection. After inspection, signage must be put up on the scaffolding in a highly visible place ①.
- The scaffolding contractor hands over the plan for use to the scaffolding user.
- The responsible business operator who permits the scaffolding to be used must have a visual inspection carried out before use to check its safe function and that it is free of defects.

Plan for use

- The plan contains the following:
  - Type of scaffolding, e.g. work and/or safety scaffolding,
  - Load class*,
  - Width class,
  - Name and address of the scaffolding contractor,
  - Date and inspection after erection,
  - Warnings and other building-related details,
  - Type, number and position of access points,
  - Restrictions on use.

*in the case of scaffolding with multiple lifts, the total evenly distributed traffic loads in one bay.

Inspections

Visual inspection

- The visual inspection that is the user's responsibility is carried out on the basis of the plan for use (incl. signage; if applicable, inspection report from scaffolding contractor) and the type of work to be done, by a "qualified person" appointed by the user.
- The result of the inspection must be documented, e.g. ②.

Further information:
Industry Safety Regulation (BetrSichV)
DGUV-V1 "Principles of Prevention"
TRBS 1203 "Qualified Persons"
TRBS 2121-1 "Risk of falling in the Workplace arising from the Use of Scaffolds"
DGUV Information 201-011 "Use of Work, Safety and Construction Frame Scaffolds"
DIN EN 12811-1
DIN 4420-1 and DIN 4420-3

Scaffolding Pre-Use Visual Inspection by Scaffolding User

Scaffolding user: _____ Date _____

Scaffolding contractor: _____

Construction project: _____

Visual inspection	OK yes	OK no	Not applicable
Purpose (suitable e.g. for bricklaying work, moulding and plastering work, painting work)	☐	☐	☐
Is the scaffolding signage in a visible place (e.g. way up)?			
– DIN EN 12811/DIN 4420 work/ safety scaffolding	☐	☐	☐
– Load class and safe working load, width class	☐	☐	☐
– Scaffolding contractor	☐	☐	☐
Structural safety and load safety			
Is the scaffolding visibly anchored?	☐	☐	☐
Are the surfaces the scaffolding stands on visibly OK?	☐	☐	☐
Working and operational safety			
Are safe access points/ways up, e.g. stair towers provided?	☐	☐	☐
Is each used scaffolding lift fully decked (e.g. decks with frame and insert or planks)?	☐	☐	☐
Are the scaffolding platforms and planks laid so they cannot rock or part and are they secured so they cannot lift?	☐	☐	☐
If scaffolding around the corner of the building, is the platform continued around the full width?	☐	☐	☐
Are platform components visibly undamaged, e.g. no cracks, cuts?	☐	☐	☐
Do all lifts have a 3-part guardrail (top rail, mid rail and toeboard)?	☐	☐	☐

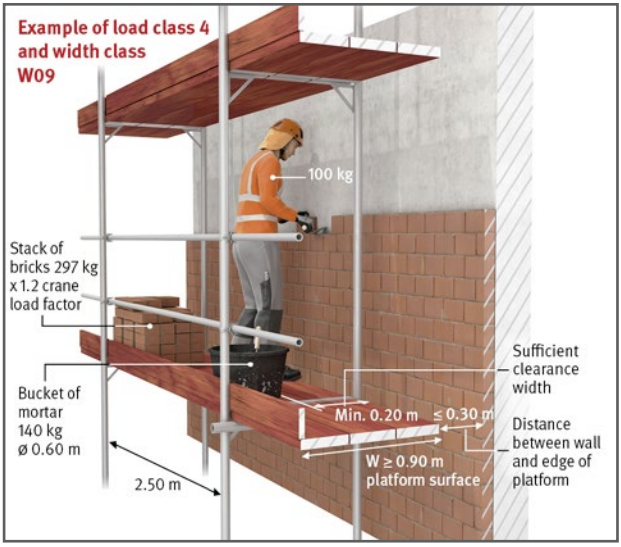
Visual inspection	OK yes	OK no	Not applicable
Is the 3-part guardrail mounted on the ends and at openings as well?	☐	☐	☐
Is the scaffolding within the maximum distance from the wall of 0.30 m? (if not, guardrails are required here too)	☐	☐	☐
Requirements for safety and roof scaffolds			
Is the surface of the roof scaffold platform at least 0.60 m wide?	☐	☐	☐
Is the platform of the roof scaffold no more than 1.50 m below the eaves?	☐	☐	☐
Is the clearance between the screen and the eaves at least 0.70 m?	☐	☐	☐
Is the screen the minimum height above the edge of the drop (e.g. eaves, edge of roof)?	☐	☐	☐
Is the safety net or mesh screen properly attached to the scaffolding?	☐	☐	☐
Is the surface of the safety scaffold platform at least 0.90 m wide?	☐	☐	☐
Is the platform of the safety scaffold no more than 2.00 m below the edge of the drop?	☐	☐	☐
Other requirements			
Are live wires and/or equipment in the scaffolding area switched off, covered or fenced off?	☐	☐	☐
Is the lighting to ensure safety from public traffic in place?	☐	☐	☐
Does the scaffolding have a canopy for use in public spaces?	☐	☐	☐
Comments/ Notes:			

Date: _____ Name/signature of the scaffolding user's qualified person _____

Scaffolding Use

Working and Operational Safety

C 360



Risks

- Risk of falling due to defective, unsafe scaffolding.
- Unauthorised alterations to the scaffold by the scaffolding user can reduce structural stability and/or operational safety, which can result e.g. in the scaffolding toppling or workers falling.

General

- Only scaffolding that is free of defects and suitable for the intended work may be used; pay attention to the plan for use.
- Scaffolding may only be used as intended. It is prohibited e.g. to jump off of platforms ①, to climb onto scaffolding or to store material on canopies or fall-breaking surfaces ②.
- The business operator who uses scaffolding or permits it to be used must ensure that the scaffolding is kept in proper condition. He must brief his workers in relation to this.
- The business operator must instruct his workers that any visible defects or alterations to the scaffolding they notice must be reported to their supervisor.

Safety measures

- Keep hatches in climb-through platform closed after climbing through ③.
- The total load from the weight of the persons, the tools and the material in the bay must not exceed the applicable maximum load class. The load class must be visible on the scaffolding signage.
- For scaffolding bays lying one above the other, the total load on these platforms must not be greater than the specified load class ④.
- Where material is stored on the surface of the platform, a clearance width of at least 0.20 m ⑤ must be maintained on the scaffolding platform.

Additional information for alterations to the scaffolding

- In principle, alterations to the scaffolding may only be made by the scaffolding contractor, especially if they affect the structural stability, e.g. removal of platforms or ties, addition of lifts, rubble chutes, nets and tarpaulins.
- No additional elements, such as containers or brackets for materials may be attached to the outside of the scaffolding.
- If certain rules are followed, alterations to the scaffolding may be made by the scaffolding user in individual cases, e.g. brief removal of guardrail components or brief opening of scaffolding covering (nets, tarpaulins) for transporting material, moving internal max. 30 cm wide brackets for cyclical work on walls or working on an External Thermal Insulation Composite System (ETICS).
- The rules for alterations to the scaffolding by the scaffolding user are:

– a written agreement between the scaffolding contractor and the scaffolding user concerning: by whom, what, with what, when and how alterations are made,

– the scaffolding user draws up instructions for use for the alterations to be carried out and the requisite safety measures in which his workers are briefed,
– only the competent workers duly instructed and briefed by the business operator may carry out alterations,
– the scaffolding user appoints a qualified person as supervisor, who conducts the "visual inspection" after every alteration to the scaffolding.

• If guardrails are briefly removed, measures to protect workers from falling must be taken (e.g. use of personal fall protection equipment). They must be specified in the instructions for use.

Additional information for moving scaffolding using a crane

• In principle, scaffolding may not be moved using a crane unless described by the manufacturer in the instructions for assembly and use.

• If no reference to this is made in the instructions for assembly and use, the following criteria must be met:
– the scaffolding contractor must plan a scaffolding that is movable by crane,
– a structural analysis with details on structural stability (e.g. anchoring, bracing or ballasting) is required,
– the scaffolding contractor must draw up a "plan for use" for the scaffolding user, incl. details on the slinging points on the scaffolding and the slings to be used,
– the scaffolding must have signage.

• The scaffolding user draws up instructions for using and moving scaffolding in which his workers are briefed.

• The scaffolding user appoints a qualified person as supervisor, who conducts the pre-use "visual inspection" after every time the scaffolding is moved.

Inspections

Visual inspection

• Before use, the business operator must carry out or have a qualified (competent) person appointed by him carry out a visual inspection and, if necessary, a functional check for obvious defects.

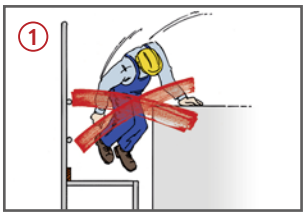
• Persons who have completed vocational training in the building or construction trade or who have the necessary expertise based on recent practical experience and appropriate instruction may be appointed as a qualified person.

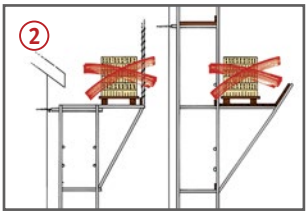
• The basis for the visual inspection by the scaffolding user is his risk assessment, the scaffolding signage, the "plan for use" drawn up by the scaffolding contractor and, if applicable, the scaffolding manufacturer's inspection report.

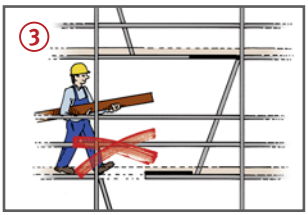
• The visual inspection consists of checking:
– for suitability for the intended use as a work or safety scaffolding, taking into consideration the load, width and height classes,
– for visible defects, e.g. in the surface it stands on, the ways up, the platforms, the corner configuration, the anchoring, the guardrails and the distance from the building.

• If the scaffolding is used by more than one firm at the same time or one after the other, each business operator must ensure that the aforementioned visual inspection is carried out.

• The result of the visual inspection must be documented (e.g. checklist).







• After a prolonged period of non-use or after acts of nature (e.g. storms, heavy rain) the scaffolding user must arrange with the client to have an unscheduled inspection carried out by a "person qualified for inspection" prior to use of the scaffolding.

Further information:
Industry Safety Regulation (BetrSichV)
DGUV-V38 "Construction Work"
TRBS 1203 "Qualified Person"
TRBS 2121-1 "Risk of falling in the Workplace arising from the Use of Scaffolds"
DGUV Information 201-011 "Use of Work, Safety and Construction Frame Scaffolds"
DIN 4420-1 and 3
DIN EN 12811-1

Coating Work

C 403

Risks

- Solvents and coating materials can pose a risk to the environment.
- There is a risk of fire and explosion when working with coating materials containing solvents.
- Health hazards are associated with breathing in atomised sprays or skin contact.

General

- Spraying and coating work is carried out on construction sites and in workshops. There are no special requirements if
  – coating materials that contain hazardous substances are used but no more than 20 ml per m³ room size per hour and no more than 5 l per room in one shift and the volume/area of the room is at least 30 m³ and 10 m², respectively.

Safety measures

- Avoid skin contact and wear protective gloves. Selection guides are provided in the Hazardous Substances Information System of BG BAU – WINGIS (www.wingis-online.de).
- If there is a possibility of spatter, wear closed safety goggles.
- If there is a possibility of atomised spray, wear respiratory protection.

Occupational healthcare

- Schedule compulsory or offer recommended occupational healthcare appointments according to the results of the risk assessment. Obtain advice of the Medical Officer in relation to this.

Further information:
Hazardous Substances Ordinance (GefStoffV)
Regulation Concerning Occupational Health Care (ArbMedVV)
Industry Safety Regulation (BetrSichV)
DGUV-V1 “Principles of Prevention”
DGUV-R 109-013 “Safety Measure Concept for Spray Painting – Aerosol Lacquers”
DGUV-R 100-500 “Operation of Equipment”
DGUV-R 112-007 “Chemical Resistant Gloves”
Explosion protection guidelines
DIN VDE provisions
Hazardous Substances Information System of BG BAU – WINGIS (www.wingis-online.de)

Safety measures when using coating materials that contain hazardous substances

■ Mandatory requirement
□ Recommended; take individual safety measures

	Using			
	highly flammable and flammable coating materials	other hazardous coating materials	highly flammable and flammable coating materials	other hazardous coating materials
	Workshop		Construction site	
General requirements				
Use coating materials in separate rooms. If this is not possible segregate an area 5 m around the place of use.	■	■	■	
If there is a potential risk of explosion in rooms or areas, take special explosion protection measures. Also, put up signage and possibly barriers, floor markings, etc.	■		□	
Adequately ventilate rooms and areas: – in the workshop, in general, using a technical solution, – on construction sites, using natural ventilation (opened windows and doors).	■	■	■	■
Make sure there are no sources of ignition.	□		■	
Provide fire extinguishing equipment to put out clothing fires: powder extinguishers and fire blankets.	■		■	
Make sure that room lighting and air extractor systems will continue to operate after the other electrical installations are switched off.	■			
In rooms and areas where there is a fire risk, make sure that electric motors (IP 44) and luminaires (IP 54) meet special requirements. Additional requirements must be met in areas where there is a risk of explosion.	■		■	
Only store as much coating material as is required for one shift in rooms and areas. Remove empty tins/drums from the workrooms on a daily basis.	■		■	
Earth objects that can build up an electrostatic charge.	□	■	■	■
Stands, walls, booths				
Only carry out spraying work on spray painting stands, walls or booths that have an extractor. **Exception:** Interior surfaces and fixtures of rooms, containers and cavities. However, in such cases, the business operator must specify and take individual safety measures!	■	□	□	□
Stands, walls and booths must be cleaned regularly.	■	■		
If coating materials are used on stands, walls and in booths on an alternating basis, clean the entire system before each change, e.g. in the case of nitro lacquers, polyester lacquers, epoxy-resin lacquers, PUR lacquers, synthetic-resin lacquers, epoxy lacquers.	■	■		
Dip tanks				
Cover dip tanks and other containers for flow-, pump- and dip-coating with a lid that can be closed immediately and safely in case of fire. If there is no lid, keep a fire extinguisher close by.	■		■	
When finished work, either empty or cover dip tanks.	■	■	■	■
If using coatings with a flash point ‹45° C or if fumes or mists that are harmful to health arise, install extraction for dip tanks and the like with a surface area of more than 0.25 m².	■	□	□	□

Paints and Coatings

C 404

Risks

• When working with paints and coatings, harm to health may be caused by exposure through inhalation or skin contact.

General

• Paints and coatings contain the following ingredients, among others:
– binders, pigments (colourants) and fillers, additives, e.g. preservatives, oil drying agents or retarders, wetting agents, organic solvents and/or water.

The generally less harmful water-based coatings (emulsion paints, emulsion varnishes) contain up to 10 % solvents. Solvent-based coatings, however, contain between 30 % and 70 % solvents.

Safety measures

Information on handling old rust-inhibiting protective coatings

• Pigments containing heavy metals were often used in rust-inhibiting protective coatings. Some of these pigments are now prohibited due to risk of cancer. They include: zinc chromate (Zinc Yellow or Buttercup Yellow) and strontium chromate (Strontium Yellow). Pigments containing lead were also frequently used (e.g. red lead).
• Exercise caution when removing old rust-inhibiting protective coatings. Use low-dust methods of working. Use respiratory protection with a P2 particle filter and Type 5–6 coveralls.

Information on handling solvent-based coatings and thinners

• The GISCODE for coatings in the Hazardous Substances Information System of BG BAU-WINGIS (www.wingis-online.de) provides information on health and safety and draft instructions for use as well as details on protective gloves.
• Ensure adequate ventilation. If technical measures are not possible or are insufficient, use respiratory protection with an A2 gas filter.
• For spray processes, use a A2-P2 combination filter.
• Use skin protection, skin cleansers and skin care products.
• When using highly flammable coatings
– avoid sources of ignition,
– use equipment with explosion protection,
– provide electrostatic earthing.

Information on handling epoxy, polyurethane and polyester resins

- Epoxy resins generally take the form of two-component products. They consist of an epoxy resin and a hardener.
- Polyurethane resins may be single or two-part products, and contain isocyanates, which – like epoxy resins – can cause allergies.
- Styrene is added to unsaturated polyester resins, which initiates a reaction. Styrene is harmful. Resin and hardener can cause harm.
- Only mix resin and hardener as directed by the manufacturer. Beware an uncontrolled reaction on mixing.
- Store containers separately and closed.
- Use suitable personal protection equipment, e.g.:
  – respiratory protection; type A or B gas filter depending on concentration,
  – protective gloves,
  – safety goggles.

Work restrictions

- Under 18s, pregnant and breastfeeding women are prohibited from working with certain harmful substances. Details can be found in the Hazardous Substances Ordinance (GefStoffV), the Youth Health and Safety at Work Act (JArbSchG) and the Maternity Protection Act (MSchG).

Occupational healthcare

- Schedule compulsory or offer recommended occupational healthcare appointments according to the results of the risk assessment. Obtain advice of the Medical Officer in relation to this.

Further information:
Hazardous Substances Ordinance (GefStoffV)
Regulation Concerning Occupational Health Care (ArbMedVV)
DGUV-V1 “Principles of Prevention”
DGUV-R 112-189 “Use of Protective Clothing”
DGUV-R 112-190 “Use of Respiratory Protective Devices”
DGUV-R 112-192 “Use of Eye and Face Protection”
DGUV-R 112-195 “Use of Protective Gloves”
Hazardous Substances Information System of BG BAU-WINGIS (www.wingis-online.de)

Gas Welding
Flame Cutting
Brazing

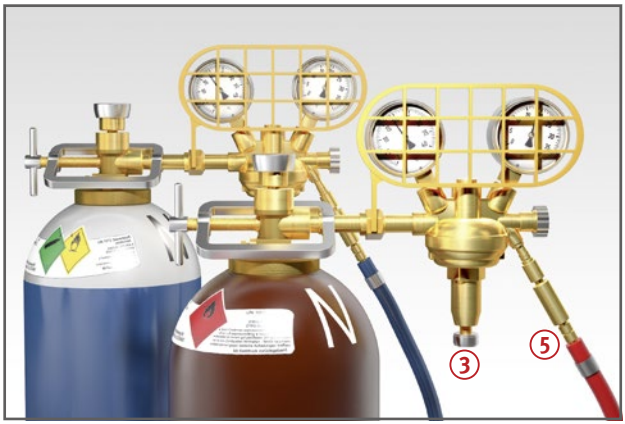
C 423

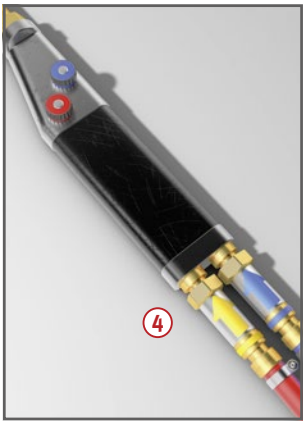
Risks

- Hazardous substances may cause fire and explosion, burns to the skin, eye injury and poisoning.

Safety measures

- A hot work permit must be obtained for welding, cutting and soldering work in areas where there is a risk of fire or explosion.
- Remove all combustible objects from the hazardous environment.
- Specify safety measures to prevent the outbreak of fire in the hot work permit; in particular,
  – cover combustible objects that cannot be removed,
  – seal up openings.
- Post a fire watch and provide suitable fire extinguishing equipment, e.g. a powder extinguisher, during welding work ⑥
- When finished work, re-check the work area for pockets of fire (fire watch).
- On construction or job sites, transport gas cylinders using racks or carts if possible ①.
- Secure gas cylinders to prevent them from falling over and do not store or set them up in passages, thoroughfares, hallways, stairwells or near sources of heat.
- Only use certified and approved pressure regulators, and connect them to the gas cylinders so that persons are not endangered when the safety valves actuate.





Ventilation in rooms

Processes \ Materials	Non-alloy and low-alloy steel, aluminium material		High-alloy steel, non-ferrous materials (excl. aluminium material)		Welding on coated steel	
Gas welding						
stationary	N	T	N	T	N	T
non-stationary	N	T	N	T	N	T
Flame cutting						
stationary	N	T	N	T	N	T
non-stationary	N	T	N	T	N	T

N = natural ventilation
T = technical (mechanical) ventilation, e.g. ventilators
E = extraction at source of harmful substances

= brief
= prolonged

- Do not open cylinder valves suddenly. First, turn the adjusting screw on the pressure regulator until the spring is relieved ③.
- Keep oxygen regulators oil- and grease-free.
- Single acetylene bottle setups that are out of the welder's sight while gas is being fed from the cylinder must be fitted with a flashback arrestor either at the pressure regulator or the outlet point ④.
- Protect gas hoses to prevent mechanical damage and scorching, and do not coil over regulators on bottles.
- Fuel gas and oxygen hoses must be at least 3.00 m long. Blow out new gas hoses before using them for the first time.
- Only use approved, safe hose connectors (hose nozzles with clips ⑤ or a patented coupling).
- Pay attention to safe torch ignition and in the event of flashback do not re-ignite the cutting torch until the problem has been eliminated.
- Ensure adequate ventilation (table).
- In the event of work stoppages, do not put torches into toolboxes or other hollow objects.
- Use suitable safety goggles (classes 2–8) ②.
- When flame cutting, wear flame-resistant coveralls or a leather apron, welding gloves, possibly also spats and ear protection.
- The colour coding for LPG hoses was amended in DIN EN 16129 with effect from July 2013.

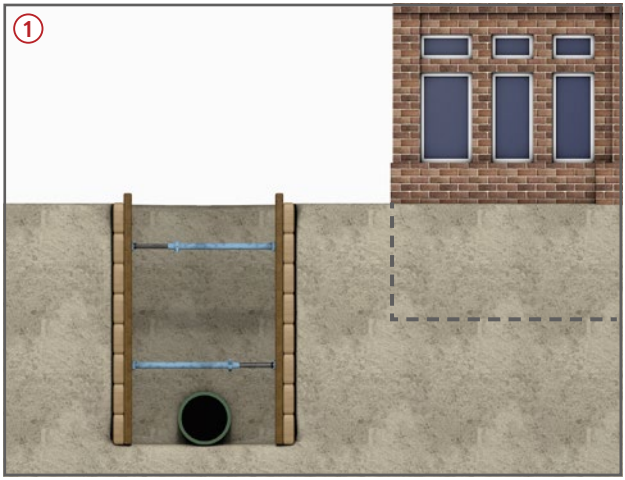
Occupational healthcare

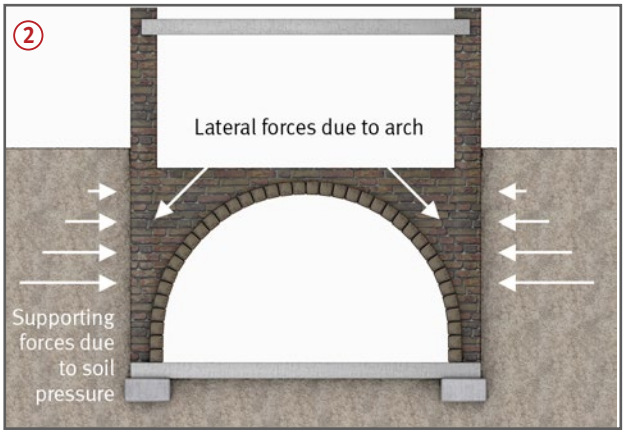
- Schedule compulsory or offer recommended occupational healthcare appointments according to the results of the risk assessment. Obtain advice of the Medical Officer in relation to this.

Further information:
Workplace Ordinance (ArbStättV)
ASR A2.2 "Fire Safety Measures"
TRGS 510 "Storage of Hazardous Substances in Non-Stationary Vessels"
TRGS 528 "Welding Work"
TRGS 725 "Hazardous Explosive Atmospheres – Measuring, Control and Regulating Devices in the Context of Explosion Protection Measures"
TRBS 3145 / TRGS 745 "Non-Stationary Compressed Gas Cylinders – Filling, Supply, On-Site Transport, Emptying"
DGUV-V D79 "Use of LPG"
DGUV-R 100-500 "Operation of Equipment"
DGUV-R 112-192 "Use of Eye and Face Protection"
DGUV Information 209-011 "Gas Welding"
DGUV Information 209-047 "Nitrous Gases for Welding and Related Processes"

Excavations Beside Buildings

C 467





Risks

- Incorrectly planned and realised excavation work within the range of existing buildings can compromise the structural stability of the building and the excavation/trench. This can put workers and residents at risk.

General

- The structural stability of the building/parts of the building is a function of settlement in the foundation area.
- Settlement can be caused by:
  – incorrect slopes (too steep/too close),
  – sheeting-related ground movements ①.

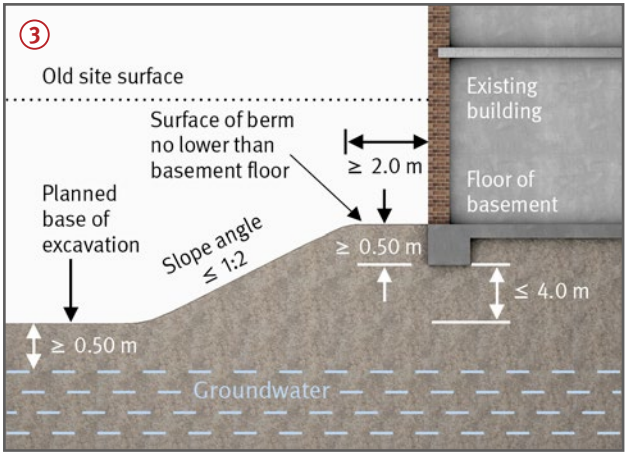
Safety measures

Requirements (building, soil and groundwater)

- Building on strip foundations or rigid reinforced concrete slab.
- Vertical foundation pressure ≤250 kN/m (generally 5 full storeys).
- Actual live load on basement floors behind the strip foundation ≤3.5 kN/m².
- Adherence to the permissible ground pressures under DIN 1054/verification of the bearing capacity according to DIN 4017.
- Predominantly vertical loads are introduced into the subsoil.
- There are no major horizontal forces at play, e.g. due to arching ②.
- Water table during construction is at least 0.50 m below the new foundation level.
- At least medium-density non-cohesive or at least stiff cohesive soil.

Additional information on planning and preparation

- Find out and check the conditions on site, subsoil, existing foundation foots, structural stability of the building, forces exerted in the subsoil (e.g. application of horizontal forces due to arching or structural frame effect).
- Gather evidence, e.g. documentation of existing cracks.
- Compile required information in construction file, e.g. in plans.



Additional information on site management

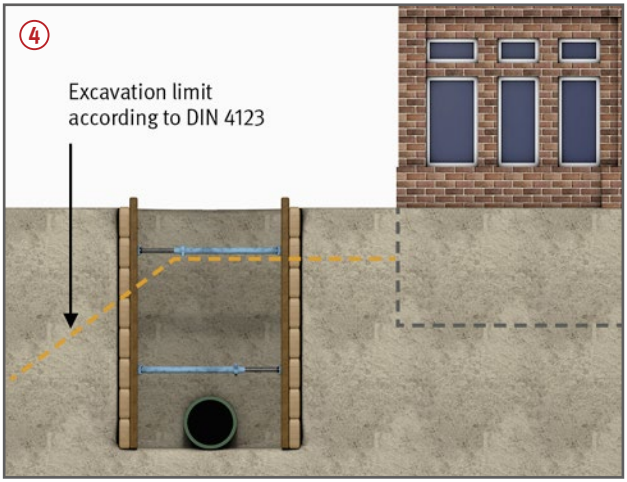
- Site manager or a competent stand-in must ensure that the work is carried out properly and that person must be on-site during the work.
- For control purposes, measure and document settlement and displacement, if any, during construction.
- Monitor cracks, e.g. using plaster marks.
- Document the progress of construction on a daily basis.

Additional information on excavation limit

- Do not expose buildings as far as the foot of its foundation or below.
- Ensure structural stability of the existing foundations by adhering to the excavation limit according to DIN 4123 ③.

Measures if exceeding the excavation limit

- Choose low-deformation sheeting methods.
- Conduct a structural analysis of the sheeting.
- Perform a deformation analysis for the sheeting.
- Check/analyse the effects of potential settlement on the building ④.



- Safety measures may be required.

Additional information on safety measures for existing buildings

- Repair masonry or concrete.
- Tie back or brace at-risk parts of the building.
- Reinforce walls, e.g. by bricking up openings.
- Improve the junction between external and transverse walls.

Further information:
DGUV-V38 "Construction Work"
DIN 1054
DIN 4017
DIN 4123
DIN 4124

Sloped Excavations and Sloped Trenches

C 469

Risks

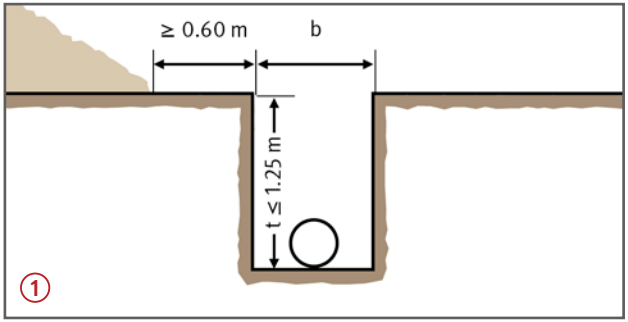
- Slopes that are not properly realised could result in persons getting buried.

General

- Before beginning excavation work, check for the presence of underground wires/cables/pipelines or installations.
- At the top edge, a strip 0.60 m wide must be kept clear on both sides ①.
- The working area and minimum trench widths must be adhered to.
- For excavation work, all circumstances and factors that could affect the structural stability of the walls of the excavation or trench must be taken into consideration. Examples include:
  – Compromised soil structure (cracks, faults),
  – Backfilling or deposits,
  – Lowering of groundwater,
  – Inflow of stratum water,
  – Strong vibration (traffic, pile driving).

Safety measures

- Excavations and trenches up to 1.25 m deep may be constructed with vertical walls without sheeting if
  – vehicles and construction equipment keep the permitted distances,
  – there are no special circumstances or factors that compromise structural stability,
  – no structural installations are put at risk,
  – the slope of the surrounding area, for non-cohesive soils, is ≤1:10, for cohesive soils, ≤1:2.
- For trenches up to 0.80 m deep, there is no need for the clear strip on one side.
- Excavations and trenches up to 1.75 m deep may be constructed without sheeting in at least stiff, cohesive soils if



– vehicles and construction equipment keep the permitted distances,
– there are no special circumstances or factors that compromise structural stability,
– no structural installations are put at risk,
– the walls of the excavation or trench are sloped ② or the area that is more than 1.25 m above the base is either sloped at an angle ≤45° ② or secured as shown in ③,
– the slope of the surrounding area is ≤1:10.

• Unsheeted excavations and trenches more than 1.75 m deep must be sloped from base to edge.

The type of soil determines the slope angle ④.

• A structural stability analysis of the slopes must be carried out if, e.g.:
– the slope is higher than 5.00 m,
– the slope angles β are exceeded ④,
– existing wires/cables/pipelines or structural installations could be put at risk.

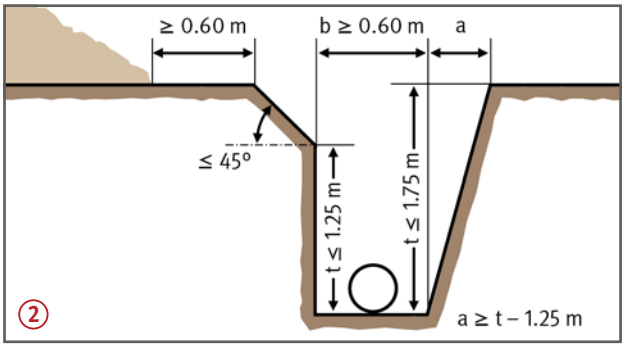
• In the case of trenches with a width of ›0.80 m, bridges are required; the bridges must be at least 0.50 m wide.

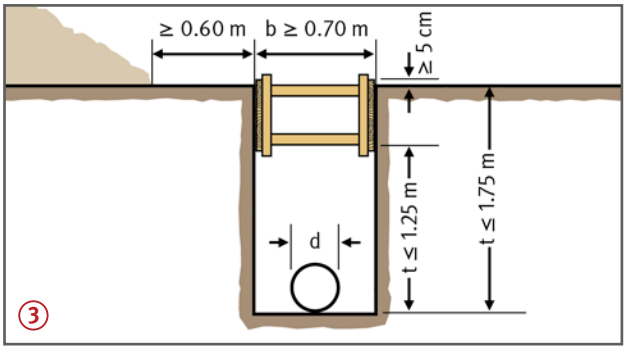
• In the case of trenches with a depth of ›1.00 m, both sides of the bridges must have three-rail guardrails.

• In the case of excavations or trenches with a depth ›1.25 m, construction site steps or ladders must be used for access.

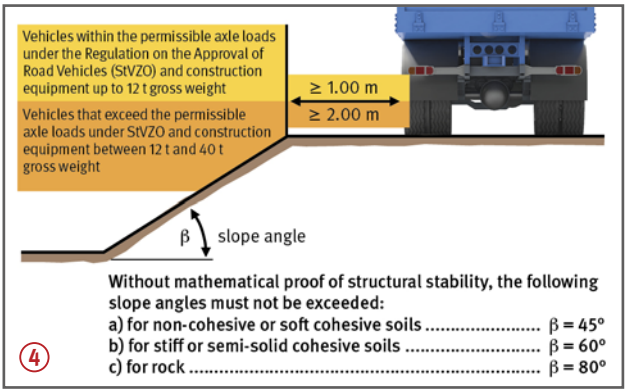
• Maintain safe clearances between edge of slope and vehicles or construction equipment, etc. ④.

• Install fall protection for slopes with an angle greater than 60° and a depth greater than 2.0 m.





Safe clearances between vehicles, construction machinery or equipment and non-sheeted excavations and trenches with embankments



Without mathematical proof of structural stability, the following slope angles must not be exceeded:
a) for non-cohesive or soft cohesive soils ..... β = 45°
b) for stiff or semi-solid cohesive soils ..... β = 60°
c) for rock ..... β = 80°

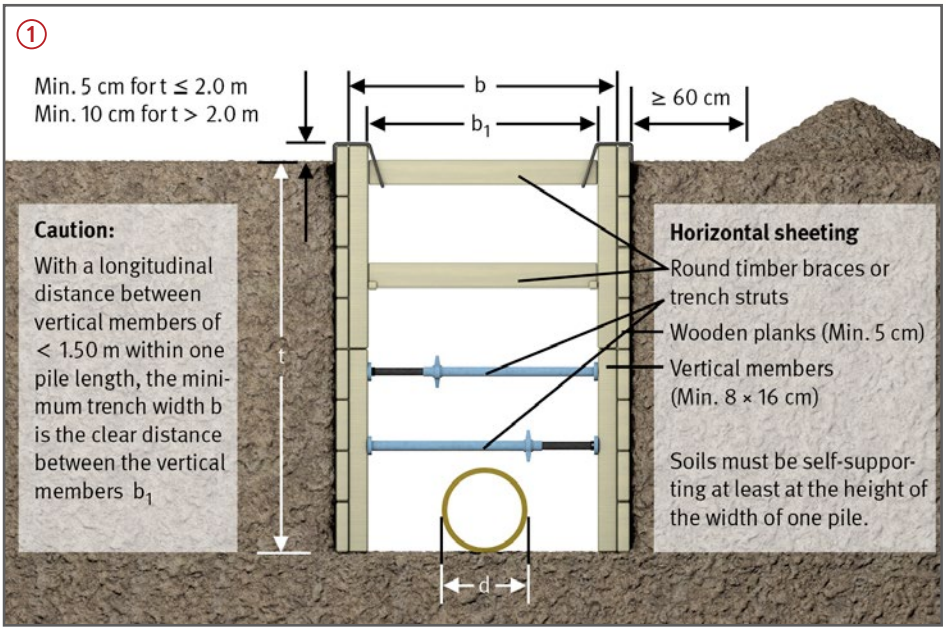
Additional information on traffic safety

• Take traffic safety measures if digging excavations or trenches near traffic on public roads or such work affects road use. Consult with the relevant authorities.

Further information:
Workplace Ordinance (ArbStättV)
DGUV-V38 "Construction Work"
RSA Guidelines for Safety at Roadworks
ASR A5.2 – "Requirements for Workplaces and Traffic Routes on Construction Sites Bordering Road Traffic"
DIN 4124

Sheeted Trenches – Horizontal and Vertical Sheeting

C 470



Risks

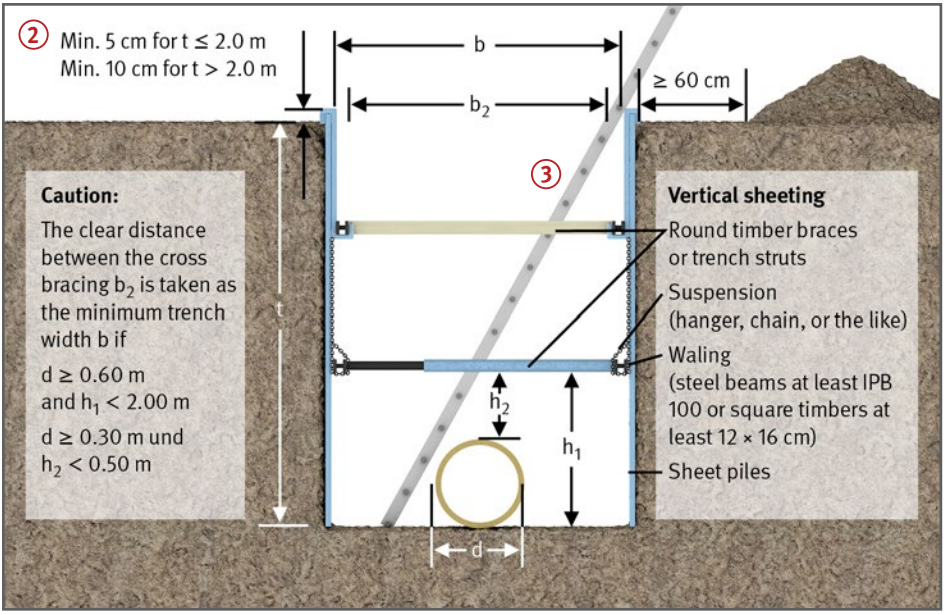
- Insufficiently supported trench walls could result in persons getting buried.

General

- Horizontal sheeting ① and vertical sheeting ② can consist of wooden planks or sheet piles.
- Before beginning excavation work, check for the presence of underground wires/cables/pipelines or installations.
- At the top edge, a strip 0.60 m wide must be kept clear on both sides.
- The working area and minimum trench widths must be adhered to.
- The projection above ground level for
  – trench depths of up to 2.0 m must be at least 5 cm,
  – trench depths greater than 2.0 m must be at least 10 cm.

Safety measures

- Sheet pipe trenches in conformity with DIN 4124. In the event of any deviations from the standard configuration, a structural analysis of the sheeting must be conducted.
- Any holes between the sheeting and the soil must be backfilled and compacted.
- The full surface of the sheeting must lie tight against the soil. There must be no soil coming through at joints and seams.
- Start sheeting at a trench depth of no more than 1.25 m.
- Check all parts of the sheeting:
  – after heavy rain,
  – in the event of significant changes in loading,
  – at the start of a thaw,
  – after extended work stoppages,
  – after blasting operations.
- Secure struts to prevent them from falling.
- Steel trench struts and spindle heads must conform to the “Principles for Testing Bracing Equipment for Pipeline Construction”.
- For trenches with a depth of more than 1.25 m, the minimum thickness of wooden planks is 5 cm.
- Round timber braces must have a minimum diameter of 10 cm.
- The sheeting must be dismantled as backfilling proceeds.



Additional information for bridges – access

- In the case of trenches with a width of ›0.80 m, bridges are required; the bridges must be at least 0.50 m wide.
- In the case of trenches with a depth of ›1.00 m, both sides of the bridges must have three-rail guardrails.
- In the case of trenches with a depth ›1.25 m, steps or ladders must be used for access ③.

Additional information on traffic safety

- Take traffic safety measures if digging trenches near traffic on public roads or such work affects road use. Consult with the relevant authorities.
- Maintain safe clearances between edges of trench and vehicles or construction equipment, etc.

Additional information for trench depths ›2.0 m

- As of a trench depth of 2.0 m, install fall protection. If applicable, fall protection need not be installed if work is being done on that section of trench (e.g. during excavation, installation of sheeting, laying cables/pipes).

Further information:
Workplace Ordinance (ArbStättV)
DGUV-V38 "Construction Work"
DIN 4124
ASR A5.2 – "Requirements for Workplaces and Traffic Routes on Construction Sites Bordering Road Traffic"
RSA Guidelines for Safety at Roadworks

Underground Cables and Pipes

C 472

Risks

- Damaged underground cables and pipes can lead to persons getting injured.

General

- Before starting construction, obtain information from the owners of the pipes/cables about location and safe distances, e.g. grid operator, Deutsche Telekom, civil engineering office, and inform employees and companies concerned.
- Have telephone numbers to hand: of pipe/cable operators (technical services), authorities (environmental agency, water authorities, civil engineering office), police and fire service.
- If you come across unknown pipes/cables, stop work immediately and inform client or pipe/cable operator.
- Keep any manhole covers, surface boxes, etc. clear at all times.
- If a pipe/cable gets damaged, stop work immediately; seal off the danger area, if necessary, and inform the relevant bodies (pipe/cable operator, police, fire service). Warn passers-by, residents, and keep unauthorised parties out.

Safety measures

- To locate pipes/cables, use detectors ① or dig investigative trenches. Use suction excavator in the area in which the presence of pipes/cables is suspected ③ or dig manually with a shovel.
- Clearly mark the route of the pipe/cable, allowing for a safety margin of 1.0 m along the longitudinal axis.

- When excavating, pay attention to protective covers or warning tape ② as well as signage for utilities/marker signs, cable markers and the like in the ground.
- Do not proceed with excavation by machine beyond the point at which there is a danger to underground pipes and cables.
- Cables must be regarded as live until the operator confirms (in writing) that they have been de-energised.

• Expose the underground pipes or cables by digging manually or using e.g. suction excavators ③.
• Pay attention to the safe distances and pipe/cable protection instructions from the the relevant pipe/cable operator.
• In the case of horizontal drilling, compaction and driving (also when using moling tools, soil displacement hammers), obstacles in the ground (stones, rock, concrete or steel) can cause deflection.
• Maintain safe clearance from existing pipes and cables.

Additional information for crossing cables/pipelines

• Secure pipes, cables, insulators and connectors, and protect them against damage caused by excavator buckets, tools, swinging pipes, falling objects, e.g. pieces of rock, steel beams, sheeting elements.
• Beware disused pipelines! Old gas pipelines may still contain gas. Have old power lines checked.

Additional information for data and electrical cables

• Only use pointed or sharp tools as far as the safe distances specified by the distribution system operators (DSOs).
• Within these safe distances, only use "blunt" instruments e.g. shovels.
• Strain relief, support and re-routing of electrical cables must only be carried out by the distribution system operator (formerly energy utility).
• If, in the event of damage, arcing occurs, proceed as follows:
– Move machine out of the danger area,
– If this is not possible, the operator must not leave the cab,
– Tell people outside the machine to keep their distance,
– Get the electricity switched off.

Additional information for gas pipelines

• In the event of damage (even minimal deformation) or if you smell gas
– No naked flames or sparks,
– Inform network operator immediately,
– Remove sources of ignition,
– Turn off engines/motors,
– Do not operate electrical switches,
– Do not unplug cables.
• Check work area for gas leaks.

Additional information for water pipelines

• Before starting construction, locate the shut-off valves.

Further information:
DGUV-V38 "Construction Work"
DGUV-R 100-500 "Operation of Equipment"
DGUV Information 203-017 "Safety Measures for Earthworks Near Underground Cables and Pipes" Leaflets from pipe/cable operators

Working on Gas Pipelines

C 482

Risks

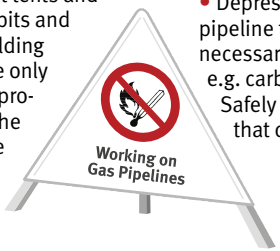
- Leaking gas can cause fires, deflagrations and explosions. There is also a risk of asphyxiation. Further risks may arise due to the release of hazardous substances when installing and removing sleeves.

General

- If possible, carry out work on gas pipelines in a gas-free state (within the work area, less than 50% of the Lower Explosive Limit). Use low-risk methods of working.
- Work on gas pipelines may only be carried out by persons who are suitable, reliable and have received instruction.

Provide instruction at least once a year. Attendance must be documented.

- Work on gas pipelines that entails a health risk, a risk of fire or a risk of explosion, may only be carried out under the supervision of a person who is suitable, reliable and has received instruction in this job. The task of supervision, including functional authority, must be assigned in writing.
- Condensates (e.g. odorants) may collect at dips in gas pipelines. Collect these using suitable vessels. Avoid skin and eye contact by using eye and face protection and body protection.
- Do not erect tents and the like over pits and trenches. Welding umbrellas are only permitted to protect against the weather if the possibility of gas accumulating under them can safely be ruled out.



- Make sure that there are no sources of ignition in areas in which ignitable mixtures can form. Sources of ignition include:
  - naked flames (e.g. welding torches, LPG torches),
  - glowing pieces of sleeving,
  - electrical equipment (e.g. angle grinder, alligator power saw, power drill, welding electrode, compressor, standby generators),
  - sparks from electrostatic discharges,
  - contact potential when cutting metallic pipes,
  - sparks from passing vehicles, rail vehicles, and construction machinery without explosion protection.
- Do not use equipment and machines that produce flying sparks to cut gas pipelines. Options include pneumatic pipe cutting machines ①, pneumatic pipe milling machines, pipe cutters and spark-reduced tools.
- Before cutting or joining metallic pipelines, bridge the cutting point/joint with a flexible copper cable (cross section of copper cable up to 10 m in length ≥25 mm², up to 20 m in length ≥50 mm²).
- Earth bag positioning devices.

Safety measures

- Depressurise the section of pipeline to be worked on and, if necessary, purge with inert gas, e.g. carbon dioxide or nitrogen. Safely discharge any gases that come out.

• The concentration of gas in the work area must be monitored continuously with a meter. It must be possible to leave workplaces quickly and safely. At least two escape routes, ideally in different directions, must be provided.

• Fire-fighting must be geared towards personal protection; suitable fire-fighting equipment must be provided, e.g. two fire extinguishers, each with at least 15 extinguishing units. 2x12 kg powder extinguishers are recommended.

• For tapping pressurised gas pipelines, use e.g. a safety lock tapping device.

• To stop gas pipelines on a provisional temporary basis, use e.g. the following devices in accordance with the manufacturer's information:

– shut-off valves: If one valve does not achieve leak tightness, take the following measures,
– Bag positioning devices (single or double); as of an operating pressure of 30 mbar or pipeline diameter of 150 mm, use two flow stop bags with venting between them. In the case of LPG supply lines, always use two flow stop bags with venting between them. Do not use flow stop bags as the sole stopper when welding,
– stopple device,
– squeeze-off tools (PE pipes): If one single squeeze-off tool does not achieve leak tightness, take additional measures:

• Before returning them to service, vent gas pipelines with operating gas until all the air in the pipeline has been dispelled. Discharge safely to atmosphere the gas-air mixture that comes out.

Additional information for high-risk work

• High-risk work is not permitted except in justified cases. In such cases there is a risk of fire and explosion in the work area, such as:

– when tapping under controlled gas outflow conditions,
– manual bag positioning,
– cutting pipelines under controlled gas outflow conditions.

• The following applies to work under controlled gas outflow conditions:

– tapping: hole diameter max. 65 mm,
– cutting: max. pipe diameter 65 mm. After cutting, immediately stop the pipe on a provisional basis,
– operating pressure (OP): max. 100 mbar, only use specially instructed personnel,
– use advanced PPE.

• It is not permitted to work on LPG pipelines under controlled gas outflow conditions.

Personal protection equipment

• Use flame-retardant and anti-static protective clothing ②. Other options include:

– safety helmet,
– protective gloves ③,
– S3 or S5 safety footwear.

• Do not wear textiles that melt easily (synthetic shirts, etc.) under protective clothing.

• For high-risk work, additional PPE, e.g. flame-retardant headgear, safety goggles, independent respiratory protection, must be worn.

Inspections

• On completing work on gas pipelines, the supervisor must confirm that the gas pipelines in the work area are leak tight under operating conditions.

• Determine the type, scope and intervals of equipment inspections required (risk assessment) and adhere to them, e.g.:

– the user must check the flow stop bags for visible defects and leaks before each use, report any identified defects to the supervisor,
– a "qualified person for inspection" (e.g. expert) must carry out inspection before putting equipment into service for the first time and as necessary, at least once a year (follow manufacturer's instructions).

• Document the results.

Occupational healthcare

• Schedule compulsory or offer recommended occupational healthcare appointments according to the results of the risk assessment. Obtain advice of the Medical Officer in relation to this.

Further information:
Industry Safety Regulation (BetrSichV)
DGUV-R 100-500 "Operation of Equipment"
DGUV-R 112-189 "Use of Protective Clothing"
Rules of German association for gas and water (DVGW)

D Health protection

D Health protection

Baustein No.	Baustein title
 500	Risk from Noise
 501	Risk from Vibration
 502	Risk from Dust
 503	Risk from Biological Agents
 504	Risk from Chemicals
 505	Risk from UV Radiation, Heat and Cold
 506	Risk from Heavy Physical Workload
 511	Occupational Health Management
 512	Work-Related Health Hazards

Risk from Noise

D 500

Risks

- Prolonged exposure to noise causes long-term hearing damage. Even a short but intense burst of sound can cause direct hearing loss.
- Noise causes stress and sleep disturbances, increases blood pressure and is a contributory factor in heart attacks.

General

- Noise is objectionable sounds and tones. Measurable sound is defined as mechanical waves and oscillations that travel through solid, liquid or gaseous matter and affect humans depending on their frequency.
- Frequency (f) is the number of oscillations per second and is measured in Hertz (Hz). The audible frequency range is between 16 Hz and 16,000 Hz.
- The A-weighted frequency is adjusted to the sensitivity of the human ear and must be regarded as a filter. The C-weighted frequency is close to the unweighted sound level. In Health and Safety, the Aand C-weightings, i.e. dB(A) and dB(C) are used.
- The sound pressure level is the measurable sound level at a point in space Lp in dB(A). The human hearing range goes from the threshold of hearing (= 0 dB) to the threshold of pain (= 120 dB).
- The sound power level LwA is the characteristic value given for a noise source and is dependent neither on the space nor on the distance.
- The sound power level describes the total rate (actual sound energy) at which sound is emitted by a noise source. The suffix “A” refers to the A-weighting.
- Two equally loud sources of noise increase the sound level by 3 dB and this doubles the risk, even though the increase is hardly noticeable. A 10 dB increase in the sound level is perceived as twice as loud.
- The daily personal exposure level Lex,8h is the average exposure to noise for one 8-hour shift. LpC,peak is the C-weighted peak instantaneous sound pressure value at workstations.

Exposure action values

Lower exposure action values:
Daily noise exposure level
$L_{EX,8h}$ = 80 dB (A)
Peak sound pressure level
$L_{pC,peak}$ = 135 dB (C)
Upper exposure action values:
Daily noise exposure level
$L_{EX,8h}$ = 85 dB (A)
Peak sound pressure level
$L_{pC,peak}$ = 137 dB (C)

Safety measures

- After identifying potential risk from noise, the risk must be assessed and measures specified.
- Exposure to an unknown level of noise must be measured. Workplace-related noise measurements must measure the equivalent continuous sound

level Leq and use the “A” filter; unit = dB(A). Impulse noise must be measured as peak sound pressure level LpC,peak using the “C” filter; unit = dB(C).

- Noise reduction programme: Technical measures should be given priority to organisational measures and to personal measures (ear protection).

The implementation and effectiveness of the noise level reduction programme must be checked regularly.

- Choose alternative low-noise equipment and processes.
- Noise-reducing design and fit out of workstations and workplaces.
- Signage of noisy areas.
- Instruct and train workers:

– draw up working time regulations for workers,
– coordination of workplaces affected,
– consideration of distance from the noise source,
– determine the maximum length of exposure in noisy areas.

- Select suitable ear protection.
- Select suitable ear protection for workers with a hearing impairment.

Additional information

- A distinction must be made between the radiation of sound in a free field and the radiation of sound inside buildings (reflected sound). Increases in sound levels of up to 8 dB(A) must be assumed inside buildings (e.g. building shell, fit out).

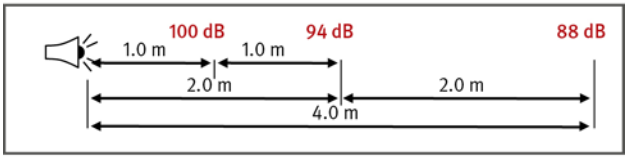
Occupational healthcare

- Schedule compulsory or offer recommended occupational healthcare appointments according to the results of the risk assessment. Obtain advice of the Medical Officer in relation to this.

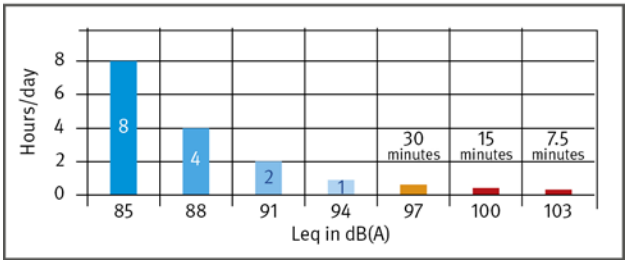
Work restrictions

- Pregnant women may not work as of a daily noise level › 80 dB(A).

Noise level reduction per doubling of distance in a free field



Maximum exposure without ear protection



Further information:
Occupational Health and Safety Act (ArbSchG)
Maternity Protection Act (MSchG)
Regulation Concerning Occupational Health Care (ArbMedVV) Occupational Health and Safety Regulations Concerning Noise and Vibration (LärmVibrationsArbSchV) DGUV-V1 “Principles of Prevention” Technical Rules on LärmVibrationsArbSchV – Noise (TRLV-Lärm)
DGUV-R100-001 “Principles of Prevention”
DGUV-R 112-194 “Use of Ear Protection”
DGUV Information 209-023 “Noise in the Workplace”
DGUV Information 212-024 “Ear Protection”

Risk from Vibration

D 501

Risks

- Working with handheld and/or hand-operated machines can cause damage to the bones and joints of the hands, arms and shoulders and/or damage to the blood supply and nerves of the fingers and hands (e.g. vibration white finger) or CTS (carpal tunnel syndrome).
- Whole-body vibration (e.g. driving construction machinery) can damage the spine and/or the skeletal system.

General

- Vibration is mechanical oscillation that is transmitted to the human body and can cause a direct or indirect risk to the health and safety of workers.
- Hand-arm vibration arises when working with handheld machines such as demolition hammers, rotary hammers, drills, angle grinders, chainsaws, handheld circular saws, soil compacters. Such vibration can be transmitted through handles, housing, tools and workpieces.
- Whole-body vibration is produced by vehicles or ride-on machines such as earth-moving machines, construction trucks on uneven terrain and forklift trucks. Such vibration travels into the body from vibrating stands or seats through the feet/buttocks.
- The vibration load depends mainly on:
  – the frequency,
  – the strength of the vibration,
  – grip force and push force in the case of hand-arm vibration and
  – the length of exposure.

Exposure action values and exposure limit values for vibration

The daily vibration exposure value A(8) is the mean vibration exposure value over an eight-hour shift.

The values for hand-arm vibration are:

- Exposure action value: A(8) = 2.5 m/s^2.
- Exposure limit value: A(8) = 5.0 m/s^2.

For whole-body vibration:

- Exposure action value A(8) = 0.5 m/s^2.
- Exposure limit value A(8) = 1.15 m/s^2 in the horizontal direction and A(8) = 0.8 m/s^2 in the vertical direction.

Risk assessment

- Calculate the daily exposure from length of exposure and vibration levels.
- If the vibration level is unknown: perform a professional measurement.
- If measurement is not possible, the vibration level stated in the operator's manual can be used for reference.

Safety measures

- Choose alternative, low-vibration methods of working.
- When purchasing new machines, choose tools with low vibration levels such as handheld or hand-operated machines with vibration damping.
- Reduce the vibration load, e.g. by reducing exposure times and switching activities.
- Use seats with vibration damping that are adjusted to the user's weight.
- Avoid swells, potholes, ledges in the road surface.
- Use remote-control soil compacters.
- Repair and maintain handheld machines and tools regularly.
- Avoid using blunt or worn tools.
- Keep hands warm, e.g. using grips that insulate against the cold or heated grips as well as gloves.

If the exposure action value for vibration is met or exceeded

- Offer recommended occupational healthcare appointments.
- Brief workers.
- Put in place a programme of technical and organisational measures to reduce vibration.

If the exposure limit value for vibration is met or exceeded

- Take immediate measures to reduce the vibration level to below the exposure limit value.
- Schedule compulsory occupational healthcare appointments.
- Keep medical records.

Occupational healthcare

- Schedule compulsory or offer recommended occupational healthcare appointments according to the results of the risk assessment. Obtain advice of the Medical Officer in relation to this.

Further information:
Occupational Health and Safety Regulations Concerning Noise and Vibration (LärmVibrationsArbSchV)
Regulation Concerning Occupational Health Care (ArbMedVV)
Technical Rules on LärmVibrationsArbSchV – Vibration (TRLV-Vibrationen)
VDI 2057 "Effect of Mechanical Oscillation on the Human Body, Sheet 1: Whole-Body Vibration"
VDI 2057 "Effect of Mechanical Oscillation on the Human Body, Sheet 2: Hand-Arm Vibration"
Hand-Arm Vibration Handbook, BMAS
Handbook Whole-Body Vibration, BMAS
IFA: Exposure Calculator

Risk from Dust

D 502

Risks

- Depending on the type of dust, the size of the particles and where it settles, dust can lead to irritation and disorders of the respiratory tract, skin and eyes.
- Asbestos dust can cause asbestosis, mesothelioma and throat and lung cancer.
- Mineral, silica dust can cause silicosis and lung cancer.
- Hardwood dust can cause cancer of the nasal mucosa.
- Dusts with microbial contamination, depending on the type of germs, can cause infections and can be sensitising or toxic.

General

- Dust is the collective term for very fine solid particles that can be lifted into the air and float there for a long time.
- The harmful effect is a function of:
  - the type of dust,
  - the duration and level of dust exposure, where it settles in the respiratory tract and
  - the particle size.
- Types of dust:
  - mixed mineral dust, e.g. mixture of sand, lime, gypsum, cement or concrete with a varying proportion of quartz,
  - wood dust,
  - asbestos fibre dust,
  - ceramic fibre dust,
  - dust containing components of microbial origin.
- Tobacco smoking increases the risk of lung disease if exposed to dust.

Safety measures

- Complete risk assessment (industry solutions at www.staub-war-gestern.de).
- Use low-dust products (e.g. low-dust tile adhesive, granulate). Selection guides are provided online in the Hazardous Substances Information System of BG BAU (WINGIS).
- Use low-dust methods of working and machines (e.g.
- use dust class M dust extractors, wet process with particulate removal). Selection guides are provided online on GISBAU in the section “Weniger Staub am Bau”.
- If one technical safety measure is inadequate, dust can be reduced sufficiently using a combination of safety measures (e.g. handheld machine with dust extraction and air purifier).
- Pay attention to the occupational exposure limit values (OELVs) for dust.
- If dust collection in the workplace is inadequate, the spread of dust must be prevented (e.g. directed ventilation, sealing off area)
- Technical and organisational measures have priority over personal safety measures.
- Brief workers.
- Do not dry-brush. Do not use compressed air blowers.
- For activities that produce high levels of dust, wear protective clothing and keep it separate from work clothing.
- Clean skin regularly by washing or showering.
- If visible dust is produced, wear respiratory protection.

Occupational healthcare

- Schedule compulsory or offer recommended occupational healthcare appointments according to the results of the risk assessment. Obtain advice of the Medical Officer in relation to this.

Further information:
Hazardous Substances Ordinance (GefStoffV)
Biological Agents Ordinance (BioStoffV)
Regulation Concerning Occupational Health Care (ArbMedVV)
DGUV-V1 “Principles of Prevention”
TRGS 900 “Occupational exposure limit values”
TRGS 559 “Silica Dust”
TRGS 906 “List of Carcinogenic Activities or Processes According to Section 3(2) No. 3 of the Hazardous Substances Ordinance (GefStoffV), Annex 1”www. staub-war-gestern.de

Risk from Biological Agents

D 503

Risks

- Biological agents, such as bacteria, viruses and moulds can cause infections and can pose a risk to the health of workers due to sensitising or toxic effects.

General

- Work involving contact with biological agents include earthworks, sewage works and in waste management, in soil and groundwater remediation, in mould remediation, in bird dropping removal and when cleaning sanitary facilities or medical facilities.

- Before starting work, check whether biological agents pose a risk. An important basis for the risk assessment is information on the properties of the biological agents present in the workplace (infection risk, sensitising, toxic and other harmful effects), the routes of exposure or routes of uptake of the substances into the body (airways, mouth, skin/mucous membranes) as well as information on the nature, extent and duration of exposure.
- Biological agents are divided into four risk groups. Classification into these four groups is solely on the basis of the infection risk. Sensitising and toxic effects are not a criterion for classification into risk groups and must be considered in addition in the risk assessment.
- In certain work areas, working with biological agents must be assigned a biosafety level. This is the case for work in healthcare facilities (e.g. doctor's offices, hospitals), in laboratories, in laboratory animal husbandry and in biotechnology. A biosafety level classification is required because biological agents with infectious properties can arise mainly in these areas of work.
- For remediation and cleaning work as well as activities in the sewage and waste management industries, a biosafety level classification is not required because such work mainly entails risks from sensitising or toxic effects.

A biosafety level classification is required if such work is carried out in the aforementioned areas; for example, in relation to cleaning work in medical environments.

- The risk assessment must be carried out by a competent person. Competency results from a combination of professional training, professional experience and Health and Safety skills. Examples of persons with the required Health and Safety skills include the OSH professional as well as the Medical Officer, from whom expert advice can be sought.

Safety measures

- At minimum, the basic measures set out in TRBA 500 must be implemented to protect workers when working with biological agents. These include:
- Equipment, floors and walls in the work area should be easy to clean.
- Choose processes that prevent or reduce dust and aerosols, e.g.
  - sealing and extraction at source,
  - dust suppression using moisture or misting,
  - use of dust class H industrial vacuum cleaners to clean the work areas.
- In addition, spatial separation of contaminated and non-contaminated work areas (black/white separation) and technical ventilation may be required.
- Provide washing facilities with running water. Also provide facilities for hygienic hand washing and drying at mobile and remote workplaces.
- Provide changing and recreational facilities.
- Clean work areas regularly and as necessary.
- Change/clean work clothing and personal protection equipment regularly.
- Keep work clothing and personal protection equipment separate from streetwear.
- Do not enter break rooms wearing soiled work clothing/personal protection equipment.
- Collect waste in suitable containers.
- It may be necessary, based on the risk assessment, to wear personal protection equipment (e.g. protective gloves, protective clothing, eye/face protection, particulate filtering respirators). Pay attention to the wear time limit for personal protection equipment.

Occupational healthcare

- Schedule compulsory or offer recommended occupational healthcare appointments according to the results of the risk assessment. Obtain advice of the Medical Officer in relation to this

Further information:
Biological Agents Ordinance (BioStoffV)
Regulation Concerning Occupational Health Care (ArbMedVV)
DGUV-V1 “Principles of Prevention”
TRBA 200 “Competency Requirements under the Biological Agents Ordinance”
TRBA 400 “Instruction Manual on the Risk Assessment and for Training Workers for Working with Biological Materials”
TRBA 500 “Basic Measures for Working with Biological Materials”

Risk from Chemicals

D 504

Risks

- Hazardous substances can enter the body through the skin (dermal), via the airways (inhalation) or by swallowing (oral). Attention must also be paid to physicochemical effects, such as fire and explosion hazards, heat or cold as well as environmental risks. Hazardous substances can cause acute and chronic harm to health.

General

- Hazardous substances are either pure or mixtures, such as paints and coatings, cleaning agents, adhesives.
- Hazardous substances include not only products labelled as dangerous but also dangerous substances and mixtures that are produced or released on use.
- The risk from chemical substances can result from:
  - uptake into the body (skin and mucous membranes, lungs),
  - type and concentration of substance,
  - effect on specific organs, e.g. skin, liver, bladder, kidneys, nervous system.

Safety measures

- Carry out risk assessment.
- Pay attention to the safety data sheet and the supplementary information provided by the manufacturer.
- Check whether a different, less harmful substance can be used.
- Draw up instructions for use and brief workers.
- Detailed information and draft instructions for the use of hazardous substances are provided online in WINGIS.

- Give substance-specific First Aid instruction.
- When handling chemical substances, do not eat, drink or smoke.
- Only use the original containers or approved containers, and label them like the original container.
- Remove contaminated clothing immediately.
- Work clothing and personal protection equipment, including footwear, must be kept separate from streetwear, and be cleaned regularly.
- Use personal protection equipment if required, e.g. respiratory protection, chemical resistant gloves, eye protection, protective clothing.
- Protect skin and apply skin care products.
- Observe work restrictions for under 18s as well as pregnant and breastfeeding women.

Occupational healthcare

- Schedule compulsory or offer recommended occupational healthcare appointments according to the results of the risk assessment. Obtain advice of the Medical Officer in relation to this.

Further information:
Maternity Protection Act (MSchG)
Youth Health and Safety at Work Act (JArbSchG)
Hazardous Substances Ordinance (GefStoffV)
Regulation Concerning Occupational Health Care (ArbMedVV)
DGUV-V1 “Principles of Prevention”
TRGS
www.wingis-online.de

Risk from UV Radiation, Heat and Cold

D 505

Risks

- UV radiation can cause skin cancers and sunburn as well as eye damage.
- Heat can lead to acute heat-related illness, including, in extreme cases, life-threatening heatstroke.
- Cold can cause hypothermia or frostbite. In addition, there is an increased risk of accident.

General

- In the construction industry, work is predominantly carried out under the naturally prevailing climatic conditions. Climate-related factors can cause the following reactions/illnesses if individual limitations are exceeded, which vary from person to person.

UV radiation

– Increased risk of skin cancer,
– Skin damage as a result of sunburn,
– Irritation of the conjunctivas and retinas as well as clouded vision (cataracts).

Heat

– Sun exposure (exposure of the head to excessive heat irritates the cerebral membranes).
– Heat exhaustion (overheating of the entire body leads to substantial depletion of water and salt due to perspiration and to a state of shock).
– Heatstroke (extreme overheating of the body >40°C; the body becomes unable to control its temperature, mental confusion with an acute risk of death).

Cold (sub-zero temperatures or chilling wind)

– Reduction of physical sensitivity, dexterity and slower reflexes; therefore, an increased risk of accident,
– Frostbite (in particular, fingers and toes).

Safety measures

- Brief workers.
- Training in First Aid with the following additional measures in case of heat-related illnesses:
  – Sun exposure: Position the patient with head slightly elevated; cool the head with a damp cloth,
  – Heat exhaustion: Position the patient with head slightly elevated and legs elevated; offer something to drink,
  – Heatstroke: remove heavy clothing, spray patient with water to cool them down.

In case of exposure to UV radiation

- Shade the workplaces, e.g. with a canopy, awning, sun shelters or special sunshades.
- Avoid working outside when the sun is strongest (especially at height of summer between 11 a.m. and 4 p.m. (CEST)).
- Wear work clothing that covers the body and a helmet or headgear with adequate neck and ear protection.
- Wear sunglasses (UV protection) with side shields.
- Apply sunscreen with sun protection factor (at least SPF 30, preferably SPF 50) to uncovered skin every two hours.

In addition, in case of exposure to heat

- Use construction machinery and vehicles with air conditioning.
- Good ventilation of work areas inside buildings.
- Reduce work intensity.
- Adjust working hours and breaks.
- Provide cooling clothing.
- Pay attention to adequate fluid intake (mineral water).
- Eat light meals.
- Make sure that new workers become acclimatised to the heat.

In case of exposure to cold

- Wear suitable protective clothing (cold-weather protective clothing, wet-weather protective clothing).
- Adhere to the times to allow the body to warm up.
- Drink warm beverages.

Occupational healthcare

- Schedule compulsory or offer recommended occupational healthcare appointments according to the results of the risk assessment. Obtain advice of the Medical Officer in relation to this.

Further information:
Regulation Concerning Occupational Health Care (ArbMedVV)
DGUV-V1 “Principles of Prevention”
Brochure “Sun Safety at Work”
(Gut geschützt durch den Sommer)

Risk from Heavy Physical Workload

D 506

Risks

• Lifting and carrying heavy loads, working in unnatural postures and repetitive motions involving strenuous exertion can cause spinal, joint and muscle injuries.

General

• Workload limits for lifting and carrying heavy loads are a function of
– the weight of the load,
– the frequency of load handling,
– the posture of the body and the position of the load,
– the conditions of handling (enough space, no obstacles in the work area),
– the lifting and carrying technique,
– the individual's personal capacity.

• Constant repetitive motions involving strenuous exertion, e.g. when bricklaying or shovelling, stress the muscles and joints on one side and can cause inflammation, among other things.

• Kneeling, squatting and crawling working postures stress the knee joints and can cause arthroses, among other things.

• Unnatural postures are forced awkward postures with little ability to move for prolonged periods (without an effective break or shifting of weight), which can cause musculoskeletal symptoms.

Safety measures

• Use technical equipment and tools to handle materials (e.g. crane, wheelbarrow ⑧, grabs or vacuum lifting tools ①).

• Reduce the weight; reduce the container size.

• Avoid carrying over long distances; deliver direct to the place of use.

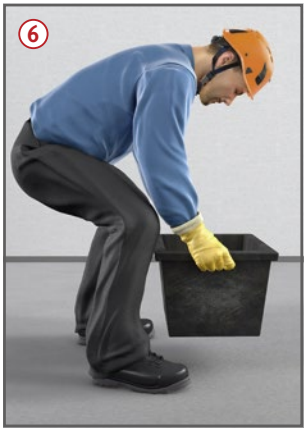
• Store and use the material on a raised surface, e.g. bucket holder ②.

• Use height-adjustable devices and structures (e.g. telescopic handles ③, scissors lifts).

• Discuss the workflow.

• Change the working postures, take mini-breaks, do corrective exercises.

Examples of lifting and carrying techniques in the construction industry:



- Protect the body from the cold; keep back and joints warm.
- Instruct workers in lifting and carrying techniques that keep the spine safe.
- Use personal protection equipment e.g. knee protection ④.

Additional information on lifting and carrying techniques

Light loads:

– Pick up load with knees slightly bent, supporting your upper body by placing your lower arm on your thigh ⑤.

Heavy loads:

– Use lifting aids,
– If possible, split loads or carry them in pairs,
– Step right up to the load,
– Lift the load keeping your back straight and squatting only as low as necessary (no less than a 90° bend of the knee) ⑥,
– Hold load close to your body,
– Ideally, carry long items and sacks on your shoulder ⑦,
– Set load down evenly, again keeping your back straight.

- Avoid jerking movements, twisting, lifting and carrying heavy loads on one side, overarching your back and obscured vision when handling loads.

Occupational healthcare

- Schedule compulsory or offer recommended occupational healthcare appointments according to the results of the risk assessment. Obtain advice of the Medical Officer in relation to this

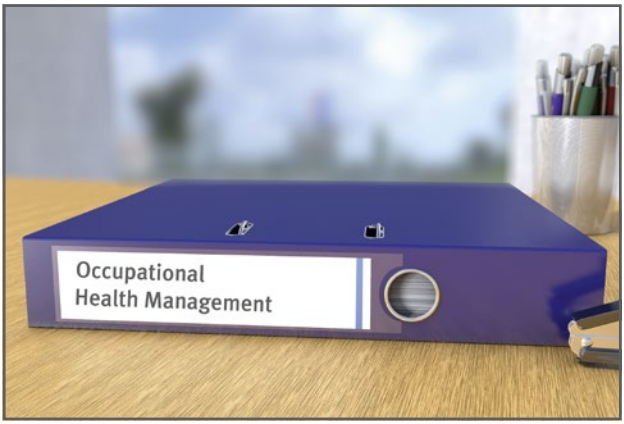
Further information:
Load-handling Regulations (LasthandhabV)
DGUV-V1 “Principles of Prevention”
DGUV Information 208-033 “Identifying and Assessing Musculoskeletal Risks”
DGUV Information 208-053 “Physical Workload in the Workplace”
www.bgbau.de/ergonomisches-arbeiten/

Occupational Health Management

D 511

General

- Occupational Health Management (BGM) is the responsibility of the business operator and consists of systematically designing, controlling and developing company structures and processes that promote health within the business.
- BGM maintains and promotes workers' health, motivation and ability to work/performance. It leads to greater job satisfaction and thus increases the productivity and competitiveness of the business.
- Fundamental to BGM is adherence to the statutory provisions for health and safety at work. The systematic pursuit of health and safety at work involves the following steps:
  - Set goals for health within the business,
  - Designate (train) persons responsible and set up a regular control group,
  - Provide resources (funds, time),
  - Identify and assess the risks to workers' health,
  - Plan and implement measures to promote health,
  - Evaluate the effect of the measures and adjust them if necessary,
  - Progress and improve the process on a continuous basis.



- In small businesses, these steps must be adapted according to the structures in place and the resources available.
- When implementing the individual steps, one important element is to involve the workers, to report regularly on activities, to utilise external supports if necessary (health insurance companies, statutory pension providers) and to document results. One of the main factors in deciding on measures to promote health is the needs of the company and of the workers! Health in the workplace takes in all parts of the business, and does not happen overnight. It is thus necessary to set priorities and to drive the process forward on a continuous basis.

Measures to promote health

- The following measures can affect behaviour and conditions in the context of promoting health:
  - corporate culture (e.g. works agreement on mutual respect, addiction prevention, management training),
  - organisation of work (e.g. ergonomic workplaces, flexible working hours, fully rounded jobs),
  - Promotion of individual health (e.g. healthy eating and movement, dealing with stress, time and personal management).

Further information:
DGUV-V1 "Principles of Prevention"
DGUV "Quality Criteria in the Area of Prevention – Health in the Workplace"

Work-Related Health Hazards

D 512

Risks

- Work-related health hazards affect or harm the health of workers; they can cause work-related illnesses.

General

- Work-related health hazards are risks to the health of a worker that can arise in connection with their work. Typical work-related health hazards can arise as a result of:
  - physical stresses,
  - mental stresses,
  - hazards arising from the work environment, such as noise, climate, vibration, hazardous substances, biological agents, radiation,
  - deficiencies in workplace design,
  - deficiencies in workplace organisation.

One of the main stresses in the construction and cleaning industry is physical workload, especially:

- lifting and carrying heavy loads ②,
- picking up and putting down light loads frequently and in quick succession,
- working in unnatural postures ①, e.g. bending far forwards, kneeling, squatting, reaching above shoulder height and twisting,

– repetitive motions involving strenuous exertion, e.g. hammering, rebar tying, window cleaning using pole systems ③,
– hand-arm vibration, e.g., when working with handheld machines (drills, chisels, saws, milling machines and sanders, floor cleaners),
– whole-body vibration, e.g. driving construction machinery.

• One effective instrument in the prevention of health hazards is carrying out a risk assessment of the physical workloads. The Key Indicator Methods, among other things, are used in this area.

Safety measures

• The advance planning of work is crucial to minimising the workloads; for one, by choosing methods of working that are less demanding.

• Provide and use ergonomic machines, equipment and tools, e.g. kerbstone handling devices, rebar tying tools, electric stair lifts, mini-cranes, construction hoists.

• Use height-adjustable working scaffolds/work platforms.

• Use telescopic equipment.

• Use means of transport such as electric stair lifts and wheelbarrows.

• Select equipment with ergonomics in mind (grip/handle design, low-vibration, reduced noise).

• Use low-dust methods of working.

• Check whether there are alternatives to hazardous substances (substitution), e.g. solvent-free products.

• Reduce weight of loads by choosing smaller pack and container sizes.

• Take special measures for construction in winter, e.g. heating, lighting, facilities to warm up and dry out.

• Take special measures in case of exposure to UV radiation and heat, e.g. shade for workplaces, clothing that covers the body, helmet or headgear with adequate neck and ear protection, provide beverages, schedule more mini-breaks in the shade.

• Plan construction site setup with ergonomics in mind, e.g.:
– shorten distances materials need to be transported by storing them at the place of use,
– store materials at the optimal height,
– order and cleanliness on the construction site.

• Instruct workers in manual handling of loads and ergonomic methods of working at the place of work itself.

• Workflow design, e.g. break up periods of one-sided motion and/or unnatural postures with other activities.

• Separate noisy areas.

• Involve workers and develop the working atmosphere.

• Choose clothing appropriate for the working and weather conditions.

• Use suitable personal protection equipment, e.g. trousers with knee pads, protective gloves, safety footwear.

• Use lifting and carrying techniques that are safe for your back.

• Do back-strengthening exercises and keep-fit activities.

• Use skin protection in accordance with the skin-protection plan.

Occupational healthcare

• Schedule compulsory or offer recommended occupational healthcare appointments according to the results of the risk assessment. Obtain advice of the Medical Officer in relation to this.

Further information:
Load-handling Regulations (LasthandhabV) DGUV-V1 “Principles of Prevention”
www.bgbau.de/ergonomisches-arbeiten/
DGUV Information 208-033 “Identifying and Assessing Musculoskeletal Risks”
DGUV Information 208-053 “Physical Workload in the Workplace”

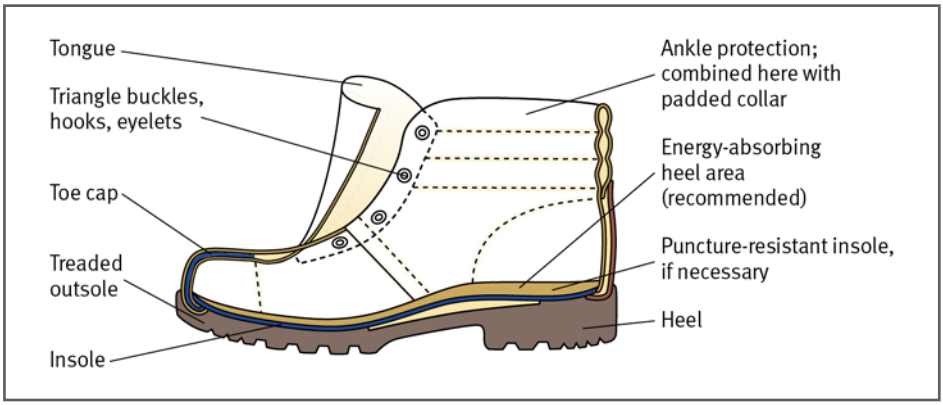
E Personal protection equipment

E Personal protection equipment

	Baustein No.	Baustein title
	600	Foot Protection
	601	Personal Fall Protection Equipment
	602	Head Protection Industrial Use Safety Helmets
	603	Respiratory Protection Respirators
	604	Protective Gloves
	605	Skin Protection
	606	Protective Clothing
	607	Eye and Face Protection
	608	Knee Protection
	609	Ear Protection

Foot Protection

E 600



Risks

- On construction sites and in similar areas, there is a risk of the following in particular: tripping, slipping, falling over, burning, stepping on nails and nails penetrating the soles of shoes, heavy objects falling onto feet or forces acting on the heel.

Selection/Use

- Suitable foot protection must be selected according to the result of the risk assessment. Consideration must be given to ergonomic aspects, such as fit, fastening and shape.
- Only provide/use type-tested products bearing the CE mark.
- Before use, perform a visual inspection of the foot protection and report any defects. Foot protection that is not satisfactory must be withdrawn from use.
- Clean foot protection as directed by the manufacturer.
- If feet perspire a lot, foot protection must be changed every day so it can dry out fully. Alternatively, provide a second pair.

Types/Materials

Shape classification

A= Half shoe
B = Boot – Ankle
C = Boot – Mid-calf
D = Boot – Knee-high
E = Boot – Thigh-high

Material classification

I = made of leather or other materials
II = fully moulded or vulcanised (e.g. PU or PVC boots)

Type of foot protection

- Safety shoes (S) have toe caps (protection against falling objects of 200 joules/compression of 15 kN); work shoes (0) do not have a toe cap.

Safety shoes

- With penetration protection (S3, see table) are required, e.g. for
  – structural works, civil engineering works and roadworks.
  – scaffolding erection, demolition and finishing works (plastering, moulding, pointing, cladding),
  – work in concrete and prefabricated parts works involving formwork erection and removal,
  – work in building yards or stores.
- Use metal insoles if there is a risk of penetration by nails etc. with a diameter of ‹4 mm.
- Footwear **without** penetration protection (see table) is sufficient if the wearer is unlikely to step on pointed or sharp objects.

Safety-relevant basic and additional requirements as a fixed category

Type of foot protection		Ratings					
Safety shoes: S		**SB**	**S1**	**S2**	**S3**	**S4**	**S5**
Work shoes: 0		**OB**	**O1**	**O2**	**O3**	**O4**	**O5**
Basic requirements		I/II	I	I	I	II	II
Additional requirements	Closed heel area		I	I	I	*)	*)
	Petrol-resistant outsole		**)	**)	**)	**)	**)
	Anti-static properties		I	I	I	II	II
	Shock-absorbing heel area		I	I	I	II	II
	Water-penetration and absorption			I	I		
	Penetration protection				I		II
	Treaded sole				I		II

I: Made of leather or other materials
II: Fully moulded or vulcanised
*): Requirements met by virtue of type
**): Only in the case of work shoes (a basic requirement of safety shoes)

Special types of shoes

Foot protection for welders

• There must be no entry for molten metal on the front 2/3 of the upper of the shoe. Fastening buckles and rivets, which could present a risk of entry, are permitted on the back third of the shoe.

Foot protection for working with hand-operated sprayers

• In the case of high pressures (›250 bar) and short lances (‹0.75 m), special foot protection (I or II) is required, or special spats must be used (full coverage from instep to shin).

Foot protection to protect against chainsaw cuts

• Depending on chain speed there are various levels of protection with full coverage from instep to shin.
• The protective material must be permanently fastened to the shoe. Type C, D or E safety shoes (I, II) are permitted.

Foot protection for working on live components

• These must conform to electrical class 00 (500 V~ or 750 V=) or, if necessary, electrical class 0 (1000 V~ or 1500 V=).
• In general, the foot protection must be type II.

Orthopaedic foot protection

• Orthopaedic foot protection must be type-tested and certified and bear the CE mark. The "Foot Protection" (Fußschutz) section of the BG website gives an overview of orthopaedic foot protection.

Foot protection to protect against chemicals (I, II)

• Class I foot protection is intended to protect against certain chemicals (Type A shoes are not permitted).
• Class II foot protection is highly resistant to certain chemicals (Type A or B footwear is not permitted).

Foot protection with heat-insulating sole (compound sole)

• Such protection is required for working on hot (e.g. backtop surfacing) or extremely cold surfaces.

Signage

• Signage of the work area in which foot protection must be worn:

Further information:
DGUV-V1 "Principles of Prevention"
DGUV-R 112-191 "Use of Foot and Knee Protection"
Guidelines "Risk Assessment of Work Involving a Risk of Foot or Knee Injury"
(www.dguv.de/psa)

Personal Fall Protection Equipment

E 601

Risks

- There is a risk of falling off or through edges or openings on construction sites and in similar areas involving work at height.
- Falling into a fall arrest system cannot completely rule out the possibility of injury but can reduce the severity of an injury.
- Failure of the personal fall protection equipment due to incorrect use (e.g. incorrectly fastened safety harness, modification or addition to the fall arrest system)

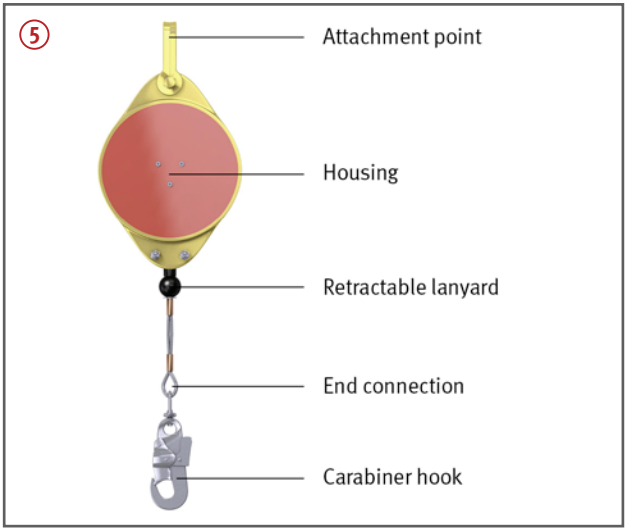
Selection/Use

- Personal fall protection equipment must be used if
  – fall protection (guardrails) is not possible for work-related reasons

and

  – collective fall protection (safety scaffolds, roof scaffolds, safety nets) is impractical.

- Personal fall protection equipment may be used
  – -for non-extensive work, e.g. near the edges of flat roofs, or near holes/openings in the ground,
  – on lattice masts,
  – during installation/erection work,
  – in conjunction with climbing equipment (vertical ladders, manhole steps) ① ④
- Pay attention to the following:
  – Use fall arrest systems with safety harnesses and shock absorbing devices or lanyards with shock absorbers if taking measures to arrest falls or slips ②.
- Anchor devices that conform to DIN EN 795 are suitable for attaching personal fall protection equipment.
- Attachment points on parts of structural installations can be used for attachment if their load capacity is proven in accordance with the technical construction regulations for one person with a fall arrest peak force of 6 kN including the loads to be applied for rescue.
- Personal fall protection equipment should ideally be anchored above the user.



- The worker's supervisor with the necessary skills and authority must determine the suitable anchor devices and ensure that the personal fall protection equipment is used.
- During use, keep the lanyard (rope, webbing) taut and avoid slack by using an adjuster. Retractable type fall arresters automatically keep the lanyard taut ⑤.
- Do not place the lanyards (ropes/webbing) under load over sharp edges; do not knot them and do not lash them together to extend them.
- Only select equipment with carabiner hooks with a lock to protect against accidental opening ③.
- Only use climbing protection devices with a safety harness with a front attachment point ④.

There are fall arresters that are attached at two front attachment points (on waist belt and in the upper chest area).

- The supervisor must specify suitable methods (e.g. using descender devices) for rescuing workers. Bear in mind that hanging in the harness for extended periods of time without moving can present a health hazard.
- Practice the correct and safe use of the personal fall protection equipment and perform rescue drills.
- Store personal fall protection equipment in a dry place, safe from harmful influences, e.g. oil, acids, alkalis, cleaning agents, flying sparks, temperatures above 60°C.

Signage/Marking

- Only use equipment bearing the CE mark.

Sample CE mark

CE 0299

- Work area signage:

Inspections

- Carry out a visual inspection of the personal fall protection equipment before each use.
- An expert must carry out an inspection as necessary, at least every 12 months.
- Do not use personal fall protection equipment that is damaged or has been involved in a fall. It must be removed from use until a suitably qualified person (e.g. expert) has approved their continued use.

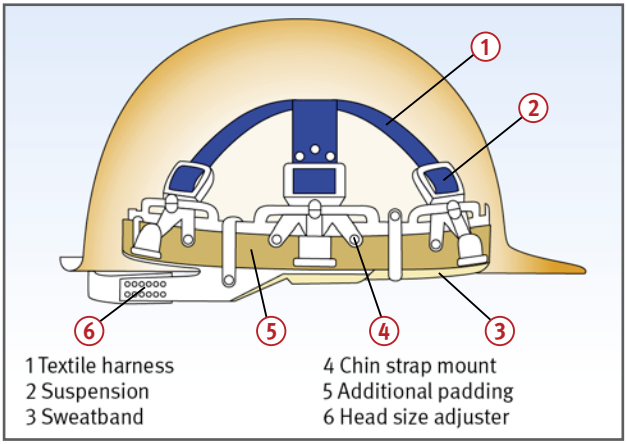
Further information:
DGUV-V 38 "Construction Work"
DGUV-R 112-198 "Use of Personal Fall Protection Equipment"
DGUV-R 112-199 "Rescue from Height and Depth Using Personal Fall Protection Equipment"
DGUV Information 212-515 "Personal Protection Equipment"
DGUV Information 204-011 "First Aid – Emergency: Suspension Trauma"
DGUV-G 312-001 "Requirements for Trainees and Training Institutions to Provide Instruction and Practice the Use of Personal Fall Protection Equipment and Rescue Equipment"
DGUV-G 312-906 "Selection, Training and Qualification of Experts in Personal Fall Protection Equipment"

Head Protection

Industrial-Use Safety Helmets

E 602

Example of an EN 397 industrial-use safety helmet



1 Textile harness
2 Suspension
3 Sweatband
4 Chin strap mount
5 Additional padding
6 Head size adjuster

Risks

- There is a risk of objects falling, swinging, toppling or flying off in an uncontrolled manner on construction sites and in similar areas. In addition, there is a risk of workers hitting their head on objects or sustaining a bump or gash to the head in a fall.

Selection/Use

- If such risks cannot be ruled out by taking appropriate measures, suitable head protection must be selected on the basis of the risk assessment.
- Industrial-use safety helmets (DIN EN 397) or high-performance industrial helmets (DIN EN 14052) may be used.
- High-performance industrial helmets provide protection against off-crown impact, from penetration by a flat blade as well as increased protection against falling objects.
- Both types of helmet consist of an outer shell and an inner structure. The outer shell absorbs the external forces and transfers them to the inner structure. Both DIN standards set the levels of performance for shock absorption and resistance to penetration.
- Additional tests can be done to confirm these properties at very low (down to -30°C) and very high temperatures (+150°C) as well.
- Industrial-use safety helmets, depending on their design (as per helmet marking), may be electrically insulated and protect against molten metal and off-crown impact.
- If there is a risk of falling, industrial-use safety helmets that meet the performance requirements of DIN EN 12492 (helmets for mountaineering) in terms of shock absorption in addition to DIN EN 397/DIN EN 14052 provide good protection. Make sure that the helmet has a three- or four-point chin strap to prevent loss of the helmet in a fall.
- In circumstances that could lead to strangulation, the chin strap must conform to DIN EN 397 and break away when subjected to a load up to 250 Newtons of force (equals a kilogram-force of 25 kg).

- When selecting the helmet, ergonomic aspects – such as good fit, light weight, ability to make precise adjustments and good ventilation – should be considered.
- Brief workers on safe use prior to first use and at regular intervals.
- Always adjust industrial-use safety helmets to the head size using the webbing or the dial.
- Only clean outer shells with lukewarm soapy water.
- Replace industrial-use safety helmets if they receive a strong blow or impact, even if there is no visible damage.
- Do not modify the helmet in any way without the manufacturer's consent. Only use original replacement parts and accessories approved by the manufacturer.
- Do not paint or varnish industrial-use safety helmets. Only affix stickers and tags as recommended by the manufacturer.

Types/Materials

- Thermoplastic materials are used in most cases. As a rule, they are highly resistant to breaking at normal and low temperatures but do not retain their shape at high temperatures. For that reason, they cannot be used in hot environments. Common thermoplastic materials are:

Name	Acronym
Polyethylen, Hart Polyethylen (High Density)	PE, HDPE
Polypropylene	PP
Polypropylene reinforced with glass fibres	GFPP
Polycarbonate reinforced with glass fibres	GFPC
Acrylonitrile butadiene styrene	ABS

- Thermosetting plastics that can withstand high temperatures are also used for special applications. Compared with thermoplastics, they have good chemical resistance, which is why they are often in the chemicals industry:

Name	Acronym
Fibre-reinforced phenol–formaldehyde resin	SFPF
Glass-fibre-reinforced unsaturated polyester resin	GFUP

Marking

① CE mark
② Certification body identifier for Category III helmets under PPE Regulation
③ EN 397 standard
④ Manufacturer's name or logo
⑤ Year/quarter of manufacture
⑥ Type designation
⑦ Head circumference in cm
⑧ Helmet material acronym

Optional requirements:

⑨ Very low temperature (-20°C or -30°C).
Very high temperature (+150°)
⑨ Electrical insulation (440V alternating current)
Lateral deformation (LD)
Molten metal (MM)

- The basic helmet marking must be printed or embossed on the helmet. The optional requirements may be labelled on a tag.
- Work area signage:

Inspections

- Carry out a visual inspection that helmet is complete and undamaged; e.g., no deformation, cracks, etc., before each use.
- Pay attention to the manufacturer's specifications on inspection intervals and scope, and replace the helmet at the end of the stated life span.

Further information:
DGUV-V1 "Principles of Prevention"
DGUV-R100-001 "Principles of Prevention"
DGUV-R 112-193 "Use of Head Protection"

Respiratory Protection

Respirators

E 603

Risks

- Gases, vapours, mists or dusts (aerosols) pose a risk to health via the airways.

Selection/Use

- If alternative substances/materials cannot be used and if structural, technical or organisational safety measures cannot prevent harmful gases, vapours, mists or dusts (aerosols) from arising, the business operator must provide respiratory protective devices, which the workers must use.
- Respirators are divided into devices with gas filters, particle filters and combined filters. For respirators to be used, the oxygen content in the ambient air must be at least 17% by volume; for special activities, e.g. for working underground, at least 19% by volume.
- Filtering half masks may be used as respirators, or full-face masks or half masks as facepieces for respirators. Hoods or helmets in conjunction with fan assistance may also be used as a facepiece. Unlike hooded or helmet-topped fan-assisted respirators, masks are not suitable for workers with beards.
- Follow the manufacturer's instructions for use.
- Select the filter according to the type and concentration of harmful substance.
- Pay attention to the restrictions on use.

Types/Materials

Full-face masks

- These cover the entire face and thus protect the eyes at the same time. There are special glasses masks for workers with glasses.

Half masks/Filtering half masks

- These cover only the mouth and nose and may be unsuitable for very toxic gases and aerosols as well as eye irritants unless suitable gastight goggles are worn.

Hooded respiratory protection

- These cover at least the face, often the entire head, and either have inbuilt filters or are fed with an adequate supply of air (fan with filter or self-contained) and, as of class TH2P, are suitable for all harmful substances within the concentration limits.

Requirements for wearing respiratory protection

- Training in theory and practice and regular briefing is required for device wearers.
- Only wear respiratory protective devices for a short length of time. The wearing duration and recovery time depends on
  – the type of mask,
  – the ambient air,
  – heat radiation,
  – the properties of the clothing.

Signage/Marking

- Use of particle filters in the case of solid and liquid aerosols, e.g. dusts, smoke or mists, if they do not contain volatile substances. There are three classes of particle filter (P1, P2, P3). In addition, the particle filters are marked "NR" or "R". "NR" means: reuse limited to a single shift. "R" means: reuse possible for longer than one shift.
- Gas filters for gases or vapours with no particles. The colour code differs depending on the harmful substance. There are three classes (1, 2 and 3) with least, intermediate and high level of efficiency.

User instructions for respiratory filters based on the harmful substance

Fit filter towards the face in this order.

Name of substance		Type of filter					
		Gas filter				Particle filt.	
		Type of filter and class of filter					
	H[1]	A	B	E	K	P2	P3
Acrylnitrile	H	●					
Formic acid[2]			●	●			
Ammonia					●		
Ammonium fluoride						●	
Antifouling paints[2]		●					●
Asbestos[4]						●	●
Azo dyes							●
Barium compounds						●	
Benzo[a]pyrene (tar, pitch)[4]	H	●				●	●
Lead						●	
Wood dust[4]						●	●
Cadmium and compounds							●
Chromate/Chromium trioxide							●
Dichloromethane[3]		AX[3]					
Epoxy resin (containing solvent)	H	●					
Acetic acid[2]		●	●	●		●	
Ethyl acetate		●					
Hydrofluoric acid/ Hydrogen fluoride[2]			●	●		●	
Formaldehyde[2]			●				●
Furfural	H	●					
Wood preservative (containing solvent)[2]		●				●	
Wood preservative (water-soluble – saline)						●	
Isocyanate		●				●	
Ceramic fibre products[4]						●	●
Mineral wool						●	
Nickel and compounds							●
Nitrocellulose thinners		●					
Polycyclic aromatic hydrocarbons[4]	H	●				●	●
Propanol		●					
Quarz[4]						●	●
Hydrochloric acid[2]			●	●		●	
Sulphuric acid						●	
Styrene		●					
Turpentine (substitute)		●					
Tetrachloroethylene (PER)		●					
Toluene		●					
Trichloroethylene (TRI)		●					
Vanadium (smoke, dust)						●	
Xylene		●					
Zinc oxide (smoke, dust)						●	

1) H = Avoid skin contact at all costs
2) Combined filter (gas filter + particle filter) or multi-type (e.g. ABEK).
3) AX filters have limited efficacy, so may only be used for short periods of time and a brand new filter must be used each time.
4) As per risk assessment

- Combined filters protect against gases, vapours, mists and particles (aerosols) simultaneously.
- Work area signage:

Inspections

- Pay attention to the use time in the case of gas filters.

Once opened, filters can be stored under certain conditions as stated in the documentation and the manufacturer's specifications.

- Pay attention to the maintenance intervals and if necessary carry out the visual inspections, leak tests and function tests of facepieces as stated in the manufacturer's specifications and DGUV-R 112-190.

Occupational healthcare

- Schedule compulsory or offer recommended occupational healthcare appointments according to the results of the risk assessment. Obtain advice of the Medical Officer in relation to this.
- The use of respiratory protective devices is an additional stress for wearers.
- Hooded or helmet-topped fan-assisted respirators do not have a limit to the duration of time you can wear them.

Further information:
Hazardous Substances Ordinance (GefStoffV)
Regulation Concerning Occupational Health Care (ArbMedVV)
DGUV-V1 "Principles of Prevention"
Technical Rules for Hazardous Substances DGUV-R 112-190 "Use of Respiratory Protective Devices"

Protective Gloves

E 604

Risks

- Handling building materials, cleaning agents and remediation work presents risks for the skin.
- Wearing liquid-proof gloves can soften the skin due to perspiration.
- Gloves may get caught in and pulled into machinery, resulting in cuts or crush injuries.

Selection/Use

- If technical and organisation measures cannot prevent injury to the hand or skin or prevent the skin from coming into contact with hazardous substances and preparations, the business operator must provide protective gloves, which the workers must use. Different protective gloves are available that provide protection against:
  – heat,
  – mechanical hazards,
  – chemicals,
  – biological materials (e.g. germs, viruses, bacteria),
  – ultraviolet radiation,
  – electrostatic charge,
  – electrical voltage,
  – vibration.
- To select suitable protective gloves, identify and assess the risks (chemical, biological or physical effects).
- Instructions for use must be drawn up and workers briefed based on them. The use of protective gloves must be drilled.

Expanded list of test chemicals

	Code letter	Test chemical	CAS no.	Class
BIS 2018	A	Methanol	67-56-1	Primary alcohol
	B	Acetone	67-64-1	Ketone
	C	Acetonitrile	75-05-8	Nitrile compound
	D	Dichloromethane	75-09-2	Chlorinated hydrocarbon
	E	Carbon disulphide	75-15-0	Sulphur-containing organic compound
	F	Toluene	108-88-3	Aromatic hydrocarbon
	G	Diethylamine	109-89-7	Amine
	H	Tetrahydrofuran	109-99-9	Heterocyclic and ether compound
	I	Ethyl acetate	141-78-6	Ester
	J	n-Heptane	142-82-5	Saturated hydrocarbon
	K	Sodium hydroxide 40 %	1310-73-2	Inorganic base
	L	Sulphuric acid 96 %	7664-93-9	Inorganic mineral acid, oxidising
	M	Nitric acid 65 %	7697-37-2	Inorganic mineral acid, oxidising
NEW	N	Acetic acid 99 %	64-19-7	Organic acid
	O	Ammonium hydroxide 25 %	1336-21-6	Organic base
	P	Hydrogen peroxide 30 %	7722-84-1	Peroxide
	S	Hydrofluoric acid 40 %	7664-39-3	Inorganic mineral acid
	T	Formaldehyde 37 %	50-00-0	Aldehyde

- To prevent excessive perspiration, cotton glove liners are recommended.

Signage/Marking

- In case of cut or puncture hazards, use gloves with a high level of cut and abrasion resistance:

Types/Materials

Selection guide for liquid-proof gloves that protect against chemical exposure to construction chemicals*. Chemical resistant gloves are generally made of natural rubber, polychloroprene, nitrile, butyl rubber, Viton or a combination thereof.

Chemical group	Substances	Natural latex	Polychloroprene	Nitrile	Butyl rubber	Viton
Alcohols	Methanol (methyl alcohol)				●	
	Propanol (propyl alcohol)			●	●	●
	Ethanol (ethyl alcohol)				●	●
Fuels	Petrol			●		●
	Diesel fuel			●		●
Acids	Formic acid ≥ 50 %				●	●
	Acetic acid, concentrated (glacial acetic acid)				●	
	Hydrofluoric acid ≤ 40 %		●		●	●
	Phosphoric acid, saturated	●	●	●	●	●
	Hydrochloric acid 32 %		●	●	●	●
	Sulphuric acid 96 %					●
Alkalis	Sodium hydroxide, saturated	●	●	●	●	●
	Ammonia solution 25 %				●	●
	Calcium hydroxide solution, saturated	●	●	●	●	●
	Sodium and potassium silicate	●	●	●		
	Soda solution (sodium carbonate)	●	●	●	●	●
Ketones	Acetone (dimethyl ketone)				▼	●
	Butanone (methyl ethyl ketone)				▼	
	Methyl isobutyl ketone (MIBK)				■	
	Cyclohexanone				●	
Aromatic hydrocarbons	Toluene					●
	Xylene					●
	Ethylbenzene					●
	Isopropylbenzene					●
Chlorinated hydrocarbons	Dichloromethane (Metylene chloride)					■
	Tetrachlorethene (perchloroethylene)				▼	●
	Trichloroethylene (TRI)					●
Glycols/ Glycol ethers	Ethylene glycol	●	●	●	●	●
	Propylene glycol	●	●	●	●	●
	Ethyldiglycol				●	
	Methyldiglycol					●
	Butyldiglycol				●	
Esters	Ethyl acetate				■	
	Dimethyl succinate				●	
	Dibutyl phthalate				●	
	Dimethyl phthalate				●	
	Formaldehyde 37 % (formalin)			●	●	●
Others	Styrene					●
	White spirits			●		●
	Epoxy resin (solvent-free)			●	●	
	Turpentine					●
	Acrylnitrile		●			
	Barium compounds		●			
	Lead compounds		●			
	Glycerine	●	●	●	●	●
	Wood preservative (containing solvent)			●		
	Wood preservative (water-soluble – saline)	●	●	●		

- In case of chemical or biological hazards, only use chemical resistant gloves and find out the permeation time of the hazardous substances from the product data sheet for the protective glove or ask the manufacturer.
- Protective gloves marked with a conical flask are tested against at least three chemicals and have a higher level of protection:

- The manufacturer's information states the glove applications.

Pay attention to the manufacturer's information:

- Work area signage:

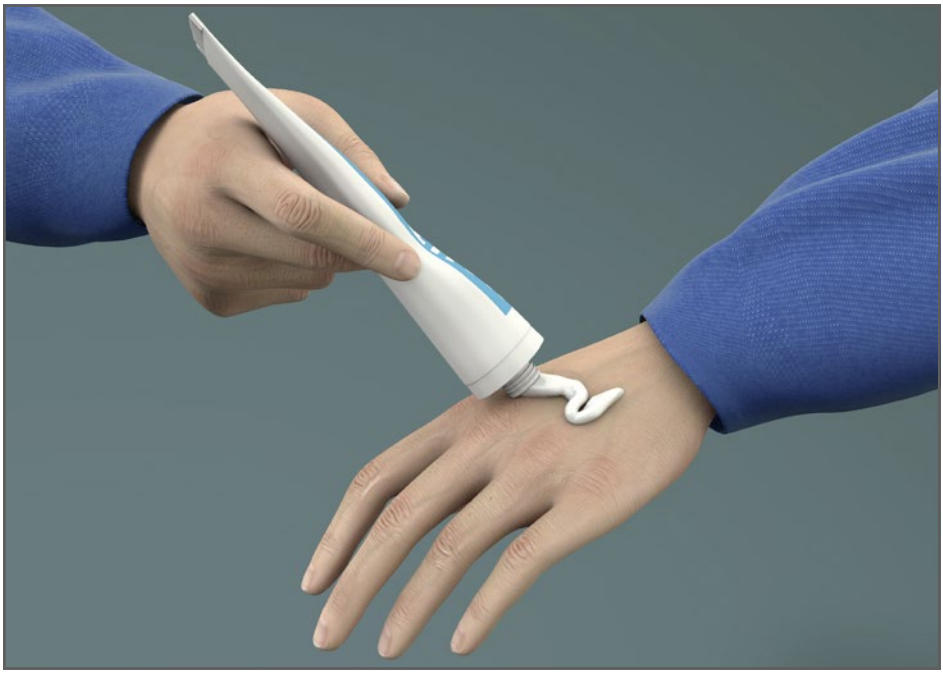
* When selecting gloves, in addition to the acting substance (chemical), the concentration, temperature and duration of use as well as the effect in mixtures must be taken into consideration. If the permeation time for a chemical is not given in the manufacturer's information, ask the manufacturer. Selection guides are provided online in the Hazardous Substances Information System of BG BAU – WINGIS (www.wingis-online.de). Refer to the manufacturer's information for additional information, or ask the product manufacturer direct.

● = max. 8 hours
▼ = max. 4 hours
■ = max. 2 hours

Further information:
Hazardous Substances Ordinance (GefStoffV)
DGUV-V1 "Principles of Prevention"
TRGS 401 "Risk from Skin Contact – Identification, Assessment, Measures"
DGUV-R 112-195 "Use of Protective Gloves"
DGUV Information 212-007 "Chemical Resistant Gloves"
Hazardous Substances Information System of BG BAU-WINGIS (www.wingis-online.de)

Skin Protection

E 605



Risks

- Handling building materials and cleaning agents and working in contaminated areas entail the risk of skin contact with hazardous substances and biological agents that can damage the skin.
- Dry, cracked skin can also make it easier for the uptake of hazardous substances into the body.

Selection/Use

- If technical and organisational measures cannot prevent substances that can damage the skin from getting onto the skin, the business operator must first and foremost provide protective gloves.
- Products that protect the skin are no substitute for protective gloves.

Safety measures

Hierarchy of measures

- The business operator must check whether
  - the material can be replaced by one that is not harmful or is less harmful,
  - skin contact can be reduced by changing the workflow and the process used.
- Technical and organisational measures have priority over personal protective equipment.
- In relation to personal safety measures, protective clothing and protective gloves must be used ahead of products that protect the skin.
- If the priority measures cannot be taken or cannot reasonably be taken, check whether exposure can be reduced by using suitable skin protection products.

Skin protection before work

- Prior to exposure, apply products that protect the skin.
- Skin protection products can protect the skin against irritation as well as, e.g., make cleaning easier.

Sample skin-protection plan			
Who/What activity	**Protective gloves**	**Skin protection product Product A or Product B**	**Skin cleanser Product C**
Warehouse workers	Gloves that protect against mechanical hazards	Only if gloves must not be worn, apply Product A to clean, dry skin	After work, before breaks and if soiled
Outdoor workers	Gloves that protect against mechanical hazards	Apply product B, sunscreen, at least SPF 30, to clean and dry skin; reapply every 2 hours	After work, before breaks and if soiled
When transferring hazardous substances	Chemical resistant gloves		After work, before breaks and if soiled
When cleaning	Chemical resistant gloves with cotton glove liners		After work, before breaks and if soiled
Use skin care products during extended breaks or when off work.			

- There is no universal product; the product must be chosen based on the material the skin is to be protected against.
- The manufacturer must state the specific use of the skin protection product. "Protects against water-soluble substances" is too vague. Unsuitable skin protection products can even expedite uptake of harmful substances.
- When handling substances that can be absorbed through the skin (e.g. PAHs), do not use skin protection products.

Washing the skin

- Wash the skin as gently as possible. Choose skin cleansers based on the type of soiling.
- If possible, avoid abrasive agents (e.g. hand washing pastes) and solvents when washing hands. Dry hands after washing.

Skin care

- Skin care products promote skin regeneration and are thus a great help in keeping the skin healthy.

UV protection

- Priority technical/organisational preventive measures:
  - shading e.g. with free-standing umbrellas,
  - window film,
  - do work preparation in covered areas,
  - avoid working outdoors around noon.
- Wear breathable clothing that covers the body, head protection with neck and ear protection as well as sunglasses for the harsh construction site environment. Apply sunscreen to uncovered skin.

Signage

- Work area signage:

Occupational healthcare

- Schedule compulsory or offer recommended occupational healthcare appointments according to the results of the risk assessment. Obtain advice of the Medical Officer in relation to this

Further information:
Hazardous Substances Ordinance (GefStoffV)
Regulation Concerning Occupational Health Care (ArbMedVV)
DGUV-V1 "Principles of Prevention"
TRGS 401 "Risk from Skin Contact – Identification, Assessment, Measures"
DGUV-R 112-195 "Use of Protective Gloves"
DGUV Information 209-022 "Skin Protection at Wood and Metal Workstations" DGUV Information 212-007 "Chemical Resistant Gloves"
DGUV Information 212-017 "Selection, Provision and Use of Skin Products in the Workplace"
"PPE" (PSA) section of the BG website www.dguv.de/fb-psa

Protective Clothing

E 606

Risks

- On construction sites and in similar areas, during internal and external transport, etc. mechanical, thermal, chemical, electrical and other hazards can arise, and also hazards related to the work environment, which can result in injury.

Selection/Use

- Select protective clothing according to the risk, in accordance with the manufacturer's information (instructions for use). Pay attention to the following:
  - CE mark (e.g.
  - protection classes, compliance with standards),
  - right size,
  - ergonomic requirements depending on the work,
  - health requirements.
- Different protective clothing is available that provides protection against:
  - thermal, mechanical,
  - chemical and/or biological hazards,
  - ultraviolet, infrared, nuclear radiation,
  - static and electrical hazards,
  - hazards in areas of traffic (high-visibility clothing ①),
  - and climatic conditions.
- Before each use, check that protective clothing is in a satisfactory condition, and clean it regularly.
- Only use disposable chemical coverall suits once, as intended.
- Pay attention to the wear time limits.

Additional information on particular types of protective clothing

Wet-weather protective clothing

- Only use wet-weather protective clothing down to -5°C; at lower temperatures special cold-weather protective clothing (thermal clothing) is required.
- Make sure that the water penetration resistance of the clothing is as high as possible and that it is also windproof. If the water penetration resistance is low (class 1), wear time must be limited.

Wet-weather protective clothing

DIN EN 343

Cold-weather protective clothing

DIN EN 342

Protective clothing for handling chainsaws

- Use chainsaw trousers according to the chain speed (manufacturer specification) as per DIN EN ISO11393-2.

Class 1 = 20m/s chain speed (standard),
Class 2 = 24m/s chain speed,
Class 3 = 28m/s chain speed.

DIN EN ISO 11393-2

HazMat suits

- These suits provided protection against contamination with radioactive substances (dusts, liquids, gases), e.g. for deployments in nuclear power plants and similar installations.

No protection against nuclear radiation.

Chemical coverall suits

- Select suitable chemical protective clothing ② according to the risk assessment. The hazardous substance, route of uptake into the body, form of release when handling the hazardous substance (dust, gas or liquid) must be taken into consideration.
- The following different types of chemical coverall suits are available and are typically used in the construction industry. A chemical coverall suit can have more than one type designation:

Type 3
Liquid tight suits

Coverall suits to protect against liquid chemicals.

Type 4
Spray tight suits

Coverall suits to protect against liquid chemicals.

Type 5
Dry particulate protection

Coverall suits to protect against solid particles (dust particles).

Type 6
Reduced spray suits

Coverall suits to protect against a light spray of liquid particles.

Partial body protective equipment

Any garment that covers just one part of the body; protects against a light spray of liquid particles.

Coverall suits always include a hood or helmet.

- Pay attention to the wear time limits, especially in conjunction with respiratory protection.
- Pay attention to the manufacturer specification in relation to chemical resistance and permeation times.

High-visibility clothing

- Wear high-visibility clothing ② if persons are required to be highly visible, e.g. when working in or near public roads, near tracks or as banksmen on construction sites.
- High-visibility clothing must have reflective bands all around.
- To ensure visibility in daylight, the colours fluorescent orange, fluorescent yellow or fluorescent red (emergency services) are mandatory.

DIN EN ISO 20471

Signage

- Work area signage:

Further information:
DGUV-V1 “Principles of Prevention”
DGUV-R 112-189 “Use of Protective Clothing”
DGUV Information 212-016 “High-Visibility Clothing”
DGUV Information 212-019 “Chemical Protective Clothing in the Clean-Up of Contaminated Sites, Landfills and Buildings”

Eye and Face Protection

E 607

Risks

- Flying particles or sparks and splashes of liquid present a risk for the eyes and the face.
- UV and IR (thermal) radiation could damage the eyesight.

Selection/Use

- Provide eye and face protection in case of mechanical, optical, chemical or thermal hazards that could damage the eyes, e.g. for the following work:
  - welding, grinding and cutting work,
  - mortising and chiselling work,
  - stonework and stone processing,
  - shotcreting, - working with nail guns,
  - work involving a high exposure to large dust particles,
  - abrasive blasting operations using granular abrasives,
  - working with acids, alkalis, disinfectants and corrosive cleaning agents,
  - working with power hoses,
  - working under radiant heat,
  - rust removal work,
  - working with lasers,
  - using UV-cured coatings.
- When selecting eye and face protection, consider that more than one hazard may arise at the same time.
- Persons with vision impairments should ideally wear safety goggles with prescription lenses or wear a shield over their prescription glasses.

Types/Materials

- Devices to protect the eyes consist of a frame and lenses.
- Select devices to protect the eyes according to their level of protection (Table 1), their strength (Table 2) and the field of use (Table 3).
- Lenses with a filter are marked with a level of protection. This consists of a code number and the filter shade number (Table 1).

Signage/Marking

- The transmittance of a filter is denoted by a level of protection (Table 1). The level of protection consists of a code number and the filter shade number separated by a hyphen. The higher the shade number, the lower the optical radiation transmittance.

Laser eye protectors and eye protection for adjustment work on lasers

- Selection and use is described in DGUV Information 203-042. The Laser Safety Officer must be consulted, in particular in case of Class 3R, 3B and 4 lasers.
- Filters for laser eye protectors must be chosen based on the laser, certified to DIN EN 207 and marked with the laser wavelength, level of protection and manufacturer's identification number.
- Eye protection for adjustment work on lasers is used in the visible wavelength range of 400 nm to 700 nm, if the laser beam has to be seen to be adjusted.

Sunglasses

- There are four different filter categories for sunglasses. Suitable solar filters for the Central European region are marked 5-2 or 5-2.5.
- If these filters have an additional infrared protection element, the filter is marked 6-2 or 6-2.5.
- Lenses with a tint greater than 90% (filter category 3 and 4) are not suitable for driving on the roads.

1 Levels of protection of DIN EN 166 filters

Type of filter	Code number	Shade number
Welding filter		
– Gas welding	–	4 bis 8
– Arc welding	–	8 bis 15
Ultraviolet filter		
– Colour recognition (may be affected)	2 –	1.2 bis 1.4
– Good colour recognition	3 –	1.2 bis 5
Infrared filter	4 –	1.2 bis 10
Solar filter		
– Without infrared requirement	5 –	1.2 bis 4.1
– With infrared requirement	6 –	1.1 bis 4.1

2 Meaning of codes for mechanical strength

Code	Requirement for mechanical strength
None	Minimum strength
S	Increased strength
F	Low-energy impact resistance
B	Medium-energy impact resistance
A	High-energy impact resistance

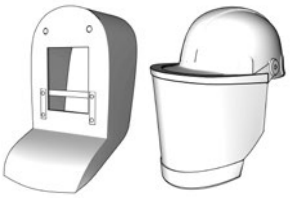
1 Codes for fields of use

Code	Name	Description of field of use
None	Basic use	Non-specific mechanical risks, ultraviolet, visible and infrared radiation and solar hazards
3	Liquids	Liquids (droplets and splashes)
4	Large dust particles	Large dust particles > 5µm
5	Gas and fine dust particles	Gases, vapours, mists, smoke and dust particles < 5µm
8	Arc flashes	Short-circuit electric arc
9	Molten metal and hot solids	Molten metal and penetration by hot solids

- Work area signage:

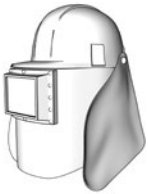
Safety goggles
protect the eyes and eyebrows

Shields/Visors
protect the eyes, face and parts of the neck



Welding helmets
protect the eyes, face and neck

Welding hoods
protect the eyes, head and neck and – depending on type – the tops of the shoulders



Further information:
DGUV-V1 "Principles of Prevention"
DGUV-R100-001 "Principles of Prevention"
DGUV-R 112-192 "Use of Eye and Face Protection"

Knee Protection

E 608

Risks

- Constant kneeling without protection presents a risk for the knees and the musculoskeletal system.
- Activities that involve kneeling can lead to disorders of the synovial bursae, menisci, osteoarthritis of the knee and nerve compression.

Selection/Use

- Knee protection should evenly distribute the forces that arise, and prevent injury caused by the surface and the substances and processes to be used.
- Knee protection cannot reverse existing damage and cannot prevent medical complications resulting from prolonged kneeling.
- Use tools and aids to reduce to a minimum activities that involve kneeling so blood flow in the legs is not restricted.
- Organise work in such a way that activities that put the knees under stress are broken up with other postures if possible.
- Choose knee protection depending on the activity/surface, e.g.
  – wet surfaces:
  – keep knees dry.
  – uneven surfaces:
  – consider the thickness of the knee padding.
  – movement:
  – knee protection must not slip while working.
  – pointed, sharp objects: consider cut resistance.
- Only provide CE-marked, type-tested products.
- Before use, perform a visual inspection of the knee protection and report any defects.
- Knee protection that is not satisfactory must be withdrawn from use.
- Clean knee protection as directed by the manufacturer.

Types/Materials

- For all work to be carried out kneeling, wear knee protection, such as:
  – Type 1: Knee pads fastened around the legs ①.
  – Type 2: Pads combined with trousers, ② clothing (generally trousers) and pads were tested together, so they must be used together.
  – Type 3: Kneelers ③

Further information:
DGUV-V1 “Principles of Prevention”
DGUV-R100-001 “Principles of Prevention”
DGUV-R 112-191 “Use of Foot and Knee Protection”

Ear Protection

E 609

Risks

- High sound levels spread over the shift ($L_{EX, 8h}$) as well as extremely loud impulse sounds ($L_{PC, peak}$) give rise to risks from noise.
- Without adequate ear protection, permanent hearing loss can occur.
- The use of ear plugs presents the risk of inflammation of the ear canals.
- Ear plugs can also affect directional hearing and the awareness of beeping.

General

- Only CE-marked ear protection products may be used.
- Ear protection must be suitable for the wearer; select ear plugs – "S" small or "L" large – according to ear canal size.
- Lots of hair (scalp and facial) as well as glasses reduce ear plug attenuation.
- Consider the manufacturer's operator's manual.
- Select ear protection for the purpose according to the risk assessment. To that end, determine the prevailing sound level and the length of exposure.
- Provide personal ear protection products.
- Draw up instructions for the use of ear protection and provide workers with practical instruction on how to handle and use ear protection products based on them.

Selection/Use

Exposure action values

- Above a daily noise exposure level of $L_{EX, 8h}$ = 80 dB(A) or an impulse noise level of $L_{PC, peak}$ = 135 dB(C), the business operator must provide personal hearing protection devices.
- Above a daily noise exposure level of $L_{EX, 8h}$ = 85 dB(A) or an impulse noise level of $L_{PC, peak}$ = 137dB(C), ear protection must be worn.
- Select the suitable ear protection according to the risk assessment:

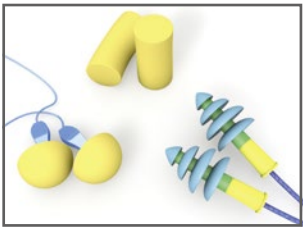
1. Find out the noise source in dB(A), e.g. from the machine's data plate ①,
2. Find out the attenuation properties of the ear protection (manufacturer's information).
3. Do calculations to find out suitable ear protection.

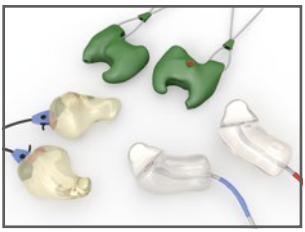
In case of very high noise exposure, if necessary, use permitted combinations of various hearing protection devices.

Chainsaw marking:

- The "residual noise level" must be compared with the manufacturer's H, M, L values.
- Around 85% of all noise in the workplace is medium- to high-frequency (noise class HM, e.g. compressed air nozzles or circular saws); and around 15% of all noise is low-frequency (noise class L, e.g. excavators or soil compacters).

Hearing protector attenuation values	
SNR value	(Single Number Rating)
H value	(High = attenuation value for high frequencies)
M value	(Medium = attenuation value for medium frequencies)
L value	(Low = attenuation value for low frequencies)





Signage:

- Signage of noisy areas:

Additional information

On hygiene

- Ear defenders must be cleaned regularly and replaced after a reasonable period of time (foam ear plugs must be replaced at least daily).
- Ear moulds must be cleaned once a day as directed by the manufacturer.

To select ear protection

Low attenuation of hearing protectors in practice	
Ear protectors generally do not attain their rated levels of protection. The following correction values are applied for the use of ear protection in practice:	
Ear plugs to be shaped before use	KS = 9 dB
Reusable ear plugs	KS = 5 dB
Banded ear plugs	KS = 5 dB
Ear defenders	KS = 5 dB
Ear moulds with function check*	KS = 3 dB

Examples of requirements to be met by hearing protectors		
For ear plugs	**For ear defenders**	**For ear moulds**
100 dB(A) noise level + 9 dB(A) correction factor	100 dB(A) noise level + 5 dB(A) correction factor	100 dB(A) noise level + 3 dB(A) correction factor
109 dB(A)–80 dB(A) residual noise level**	105 dB(A)–80 dB(A) residual noise level**	103 (A)–80 dB(A) residual noise level**
29 dB(A) attenuation value	25 dB(A) attenuation value	29 dB(A) attenuation value

* Function check before first use and then at least every 3 years.
**The aim of selection is to achieve a residual noise level of 70–80 dB(A) or < 135 dB (C_{peak})

Types/Materials

Ear defenders

- With level-dependent attenuation.
- With active noise compensation.
- With built-in speaker or receiver.
- As an extra, e.g. for mounting on industrial-use safety helmets.

Ear plugs

- Ear plugs to be shaped before use (single use)
- Pre-formed ear plugs (multiple use), possibly with level-dependent attenuation or audio input.

Ear moulds

- Custom-made to fit the shape of the user's ear canal.
- Ear moulds can be fitted with different frequency filters according to the noise situation.

Inspections

- A function check must be performed on ear moulds prior to first use and at least every three years thereafter.
- The suitability of ear protection must be checked periodically where exposed to varying levels of loudness at work.

Occupational healthcare

- Schedule compulsory or offer recommended occupational healthcare appointments according to the results of the risk assessment. Obtain advice of the Medical Officer in relation to this.

Further information:
Occupational Health and Safety Act (ArbSchG)
Industry Safety Regulation (BetrSichV)
Occupational Health and Safety Regulations Concerning Noise and Vibration (LärmVibrationsArbSchV)
Technical Rules on LärmVibrationsArbSchV – Noise (TRLV-Lärm)
DGUV-V1 "Principles of Prevention"
DGUV-R 112-194 "Use of Ear Protection"
DGUV Information 212-024 "Ear Protection"

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