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Guide for Risk Assessment in Small and Medium Enterprises

4 Slipping and Falling from a Height

Identification and Evaluation of Hazards; Taking Measures

Guide for
Risk Assessment in
Small and Medium Enterprises

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Identification and Evaluation of Hazards; Taking Measures

Imprint

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Introductory Note

This brochure has been designed to satisfy the demand for assessing the risks of people slipping and falling from heights.

The information is divided into the following chapters:

1. **Basic Information on Slipping and Falling from a Height**
2. **Checklist for Determining the Risks of Slipping and Falling from a Height**
3. **Risk Assessment**
4. **Determination of Measures**
5. **Annex**

Note:
This brochure is dealing exclusively with the European aspects, laid down in the directive for protection of workers at work (89/391/EEC and single directives). For specific national aspects please look up the respective legal transpositions (see page 24).

The present series of brochures is not intended to deal with the documentation of evaluated risks, since the pertinent rules and regulations differ widely in the individual member states.

Other topics treated in this series of brochures organised along the same lines and already published or being prepared are:

- **Noise**
- **Hazards arising from machinery, equipment and materials**
- **Chemical hazards**
- **Hazards arising from electricity**
- **Hazards arising from fire and explosions**
- **Hazards arising from whole-body/hand-arm vibrations**
- **Physical strain (e.g. heavy and one-sided work)**
- **Mental workload**

1. Basic information

1.1 | Legal Basis

The legal framework for harmonization of social issues in the European Economic Area and for introducing measures to encourage improvements in the safety and health of workers at work is Council Directive 89/391/EEC of 12 June 1989. According to Article 6 of the Direc-tive, the employer has to evaluate the risks of employees slipping or falling from a height and take the measures necessary for avoiding or reducing these risks according to the general principles of prevention.

Slipping or falling from a height is one of the most frequent causes of accidents at work today. From a humane perspective, but also on economic grounds, it is worth thinking about how these accidents can be avoided instead of accepting them as inevitable.

The kinds of risks and measures to avoid them are manifold and covered by several Directives of the European Union, which include minimum standards of accident prevention, and make it obligatory to adhere to them.

The following Directives are relevant for the issue at hand:

- Directive 2001/45/EC of the European Parliament and of the Council of 27 June 2001 amending Council Directive 89/655/EEC concerning the minimum safety and health requirements for the use of work equipment by workers at work
- Council Directive 89/656/EEC of 30 November 1989 on the minimum health and safety requirements for the use by workers of personal protective equipment at the workplace
- Council Directive 92/57/EEC of 24 June 1992 on the implementation of minimum safety and health requirements at temporary or mobile construction sites.

1.2 | Procedure for the Risk Assessment

For evaluating the extent of danger at a workplace at a height the following procedure could be applied for risk assessment:

Step 1:
Step-by-step identification of all the slipping and falling hazards at the workplace

Recommendation for the structure:

1. Availability and quality of the access or traffic route,
2. Solidity, resistance and accessibility of the workplace and
3. Efficient fall prevention

Step 2:
Evaluation of the risk of slipping and falling

Based on the identified hazards for slipping and falling the risks of slipping and falling have to be evaluated, e.g. structured as seen in step one in access to the workplace, solidity of the workplace and prevention against falling from a height.

Step 3:
Decision on measures to be taken

It is advisable to start applying safety measures directly at the source of danger, e.g. to conduct the pre-assembly of some groups of components on ground level.

Step 4:
Rescue of a fallen person

The rescue of a fallen person has to be planned and organized in advance. Employees have to be trained in the special topic of First-Aid for fallen persons. Rescue equipment has to be organized and the employees have to be trained in using this equipment. For further information please have a look at chapter 4.5 Rescue of a fallen person.

1.3 | Definitions

Slipping or falling is an unintentional fall of a person while moving on

- A plain surface, e.g. caused by tripping, slipping, twisting the ankle
- Stairs, e.g. caused by tripping, slipping, twisting the ankle
- A level with low difference in altitude e.g. caused by jumping or falling on a deeper level

A fall from a height is defined as a fall, which spans a distance of at least one metre. The difference in height between the spot, where a possible fall can begin (a workplace or traffic route), and the next lower plane with sufficient width and resistance to bring the fall to a halt, is called the height of fall. The fall through a surface unable to carry the load or the fall or sinking into fluid or grainy substances is also called fall from a height.

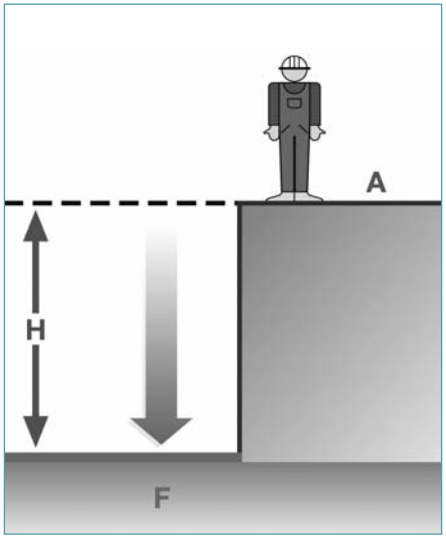

Fig. 1: Definition of the height of fall (H= vertical difference in height between the workplace or fall hazard zone (A) and the point of impact (F)

In this brochure, working environments where people are exposed to these risks will be referred to as **workplaces at heights** (Figures 2 to 7).

Fig. 2: Roofs

Fig. 3: Storey levels

Fig. 4: Working and safety scaffolds

Fig. 5: Aerial work platforms

Fig. 6: Inclined edges of pits and mines

Fig. 7: Work using techniques for rope access and positioning

The risk of falling from a height also occurs by the use of equipment designed to lift persons, such as

- Aerial work platforms
- Working cages on hoisting devices, fork-lift trucks and earth-moving equipment
- Built-in elevators, construction hoists and portable stages
- Building maintenance unit systems
- Shelf access equipment
- Telescopic handlers with a work platform

A workplace at a height is not exclusively defined by the height of a possible fall. Special attention is also required in working environments, where workers can suffer injuries due to holes, cavities and indentations in floors, ceilings and roofs, or where they may drown or sink into various substances or water.

This can happen in cases of work:

- Carried out in and around sewage plants
- In grain elevators
- Near or above bodies of water

Traffic routes are ways for persons and/or vehicles in firms or on construction sites. These ways are used for transport of goods and they are necessary to reach every workplace and job site. It does not matter if the traffic routes are used regularly or rarely. **Accesses** are traffic routes leading to a workplace on a higher or deeper level.

2. Checklist for Determining the Risks of Slipping and Falling from a Height

For determining the risk, the workplace and the activities carried out there are examined in the light of the three principles mentioned above.

For example:

- A production area where prefabricated segments of a product are rigged together
- Steel construction of a warehouse
- Construction of aerated autoclaved concrete

For determining the risk of falls from a height it is recommended to use the suggested structure from chapter 1.2.

2.1 | Determining the Risks of Slipping

To prevent the risk of slipping, safe access and traffic routes can be used. Safe access and traffic routes themselves are dependant on:

- The surface of the floor and anti-slip floor coverings
- The weather, concerning wetness, ice, snow or wind
- Keep away fluids or slippery substances like water or oil
- Keep away lie around material and other things to stumble over
- Width
- Ability to carry the load and the resistance
- The illumination
- The lay out of the traffic routes
- Traffic, e.g. fork-lift truck

Especially the choice and wearing of appropriate footwear in each different area of work has to be kept in mind.

Moreover the cleaning of the floors has to be taken into account.

2.2 | Determining the Risks of Falling from a Height

For determining the risk of falling from a height, at least these topics have to be taken into account:

- The difference in altitude between the edge and the lower level
- The distance to the edge:
  - Horizontal distance to the area without the ability to carry the load
  - Distance between the scaffold and the building
- The composition of the lower level, e.g.:
  - Bulk material (sink, drown)
  - Water (sink, drown)
  - Concrete (hard impact)
  - Reinforcement (pin)
  - Container with hot liquids (burn, scald)
  - Container with liquids (drown, burn)
  - Objects/machinery including mobile parts on the level (impact)
- Kind and duration of the work:
  - Physically easy or hard, brief or long-time, once or several times
- The weather, e.g.:
  - Storm
  - Ice
  - Strong snowfall
- The visibility, e.g.:
  - Make out the edge
  - Illumination
  - Time of day
  - Dazzling from bright surfaces or back-lightning

2.3 Checklist for Determining the Risks of Slipping and Falling from a Height

Field of work: _____ Control Number: _____

Assessment made by: _____ Date: _____

Traffic Routes and Work Areas	Yes	No	Comments
Availability of areas at access points, traffic routes or workplaces that can easily lead to a person breaking through, slipping, tripping, or misstepping.			
The working surfaces and routes are solid enough to carry a load.			
The traffic routes are clearly arranged.			
The floor is dry and non-slippery.			
The lighting conditions are glare-free and sufficient.			
Lack of defective areas.			
The traffic routes and the workplaces are accessible.			
Lack of structural insufficiencies, non-standard construction (e.g. scaffold stairs).			
Fall Protection			
No risk of falling from a height.			
The holes in the floor are covered.			
The equipment (e.g. aerial work platforms, scaffolds, ladders) is stable enough.			
A full set of safety equipment is available (e.g. guardrails and toeboards).			
No risk of falling from a height, using the special equipment (e.g. scaffolds, ladders, aerial work platforms).			
No risk of falling from a height, when aerial work platforms or mobile scaffolds are moved.			
No risk of falling from a height between scaffold and building.			
The risk areas are clearly identified and properly marked.			
Rope Access			
No risk of falling from a height, working with rope access.			
The staff is properly trained.			
Risk assessment has been made for the specific task.			
The used equipment has been tested and is fit for operation.			
Reliable anchor points have been specified prior to starting work.			
First Aid			
First aid is available at any moment.			
The first aid procedure is defined.			
First aid equipment is available.			
Treatment by a medical specialist is available.			
Other			

3. Risk Assessment

In the absence of specifications (laws, regulations, provisions, rules for accident prevention) to define the limits and the minimum requirements, the following method helps to evaluate the risk. The following variables are evaluated in the course of the risk assessment:

1. **Probability** of damage?
2. What is the **extent of the damage**?

The figure 8 at the intersection of the horizontal line and the vertical column indicates the necessity of protection measures:

1 = Protection measures not necessary

2 = Protection measures necessary

3 = Protection measures essential

Fig. 8: Matrix for risk estimation

P Probability		D Extent of Damage: I no work disability	II temporary work disability	III slight permanent damage to health	IV severe, permanent damage to health	V death
frequent	A	1	2	3	3	3
occasional	B	1	2	3	3	3
rare	C	1	2	2	3	3
improbable	D	1	2	2	2	3
practically impossible	E	1	1	1	2	2

3.1 | Risk Assessment for Slipping

Examples:

1. The employees work in a warehouse. On the traffic route, leading through the warehouse towards the workplaces, lie packing material and chips from the production. Thus the employees side step on the traffic route for the fork-lift trucks.

   The possibility of a fall:
   frequent (A)

   The extent of damage:
   slight permanent damage to health (III)

   Result:
   3 = Protection measures essential

For example: Install a container for packing material and chips from the production and organise the inspection of the traffic routes.

2. The employees work on a construction site in November (bare brickwork, four level office building). The staircase is finished in bare brickwork and it is occasionally used by the employees. There is no artificial light in the staircase.

   The possibility of a fall:
   occasional (B)

   The extent of damage:
   slight or even severe permanent damage to health (III or IV)

   Result:
   3 = Protection measures essential

For example: Install artificial light in the staircase.

3.2 | Risk Assessment for Falling from a Height

Examples:

1. The employees work on a flat roof. They assemble the cover of the attic. The attic itself is 50 cm high. The height of the elevated workplace is about 5.00 m.

   The possibility of a fall:
   rare (C), because skilled workers are doing this job

   The extent of damage:
   severe, permanent damage to health (IV) or even death (V)

   Result:
   3 = Protection measures essential

For example: Erect a scaffold, or transfer the workplace from the roof into an aerial work platform.

2. The traffic route is directly next to the edge of an excavation pit. The employees have to use this traffic route for taking their equipment and building materials out of the store room. The depth of the excavation is approximately 5.00 m and the angle of rest is approximately 60° to 80°.

   The possibility of a fall:
   frequent (A), because employees use this traffic route very often

   The extent of damage:
   temporary work disability (II)

   Result:
   2 = Protection measures necessary

For example: Assemble a railing on the edge of the excavation pit.

4. Determination of Measures

4.1 | Basic Information on Measures preventing Slipping and Falling from a Height

In practice, the first and only protective measure that can be found in connection with the risk of falling from a height is the use of personal protective equipment.

But even though Council Directive 89/391/EEC, Art. 6, stipulates that measures must take into account the basic principles of prevention and be adapted to technical progress in combating the risk at source, this does not exclude slipping and falling from a height! The order in which possible solutions have to be found has to follow the following **hierarchy of measures**:

1. Combating the risks at the source
2. Applying technical, absolutely and collectively effective protective measures
3. Taking organizational protective measures
4. Using personal protective equipment against falls from a height
5. Individual safety measures, relating to specific behaviour

Regardless of whether protection measures are necessary or essential, the hierarchy of measures mentioned above has to be followed. Only in particular cases and for work, whose character and progress do not, or not yet, justify a higher-level safety measure, it is allowed to use personal protective equipment against falls from a height or individual safety measures relating to specific behaviour.

Combating the risks at the source means protection measures which eliminate the arisal of the risk of slipping and falling from a height, e.g.:

- Effecting the pre-assembly of some groups of components on ground level (in the case of taller constructions), see figure 9.
- Setting up ground-level workplaces and traffic routes
- Ensuring that there are no trenches and holes on the traffic routes or in the work environmet.

These measures are usually not only those with the best protective effect.

Fig. 9: pre-assembly on the ground and installation with an aerial work platform

When taken into account at the right time, i.e. in the planning stage, they are often also the least expensive.

The **purpose of technical, absolutely and collectively effective protective measures** is to eliminate the sources of risk. Normally, a protective device creates spatial separation between a source of risk and a person, or it reduces the effect of the former.

For example:

- Encapsulation of machines and collecting basins for lubricants in order to prevent slip hazard
- Preventing slipping by using anti-slip floor coverings
- Installing guardrails or edge protection, or if this is not possible, putting up safety scaffolds or similar devices for stopping falls
- Installing stairs, stair towers or ladders on the inside of scaffolds as access points to workplaces at height
- Complying with general regulations for the use of lifting equipment for persons
- Installing safety scaffolds to stop falling objects

Taking organizational protective measures means to prevent hazards by spatial and temporal separation of the sources of risk and the persons and to avoid correlated hazards.

Additionally, the choice of safe equipment can reduce the risk, e.g.:

- Use aerial work platforms instead of ladders
- Use equipment to catch a person instead of PPE against falling from a height
- Spatial separation of traffic routes for vehicles and for persons
- Disable access to scaffolds which are not finished

Only in particular cases, where it is impossible to eliminate the risk at the source, where technical, absolutely and collectively effective protective measures are not possible, and where the progress does not, or not yet, justify a higher-level safety measure, it is allowed to use personal protective equipment against falling from a height. Usually this is related to short-time work, e. g.:

- Maintenance on a roof up to 16 hours extent of work
- Cleaning the outside of windows on a balcony without an effective railing.

Individual measures relating to specific behaviour are designed to reduce the effect of the sources of risk by ensuring safe behaviour of the workers. Taken by themselves they are not sufficient, but they are essential for the other measures to work efficiently.

For example:

- Briefings or technical instructions by means of reference manuals or operating guidelines before certain types of equipment are used (e. g. with aerial work platforms)
- Briefings in using PPE against falling from a height if prescribed
- Information about driving orders and briefings in driving lanes, turning points, speed limits, special sites of danger and behaviour in critical situations

4.2 | Examples for Measures Preventing Slipping

Traffic route, leading to workplaces, storage areas, etc., have to be safely approachable and accessible regardless of the weather or the time of the day. Construction sites have to be cleaned up at any time, and traffic routes must be kept free and may not be obstructed by materials or equipment. It must always be clear which way to go.

This is guaranteed by:

- Straightforward and clearly arranged routes
- Separation of footways and driveways (e.g. by using different colours or railings (Figure 10)
- Labelling of restricted areas
- Not installing stairs or steps in front of or behind doors
- Not allowing doors to open onto traffic routes
- Obeying minimum widths of footways next to driveways (e.g. in fork-lift traffic)

Fig. 10: Example for the separation of footway and driveway

In case of **increased slip hazard**, anti-slip floor coverings should be used, e.g.:

- Floors with displacement areas
- Anti-slip struts on slippery paths or edges

Furthermore, the occurrence of slippery substances should be avoided:

- leaking machinery
  - ➜ Catch the substances in enclosed basins;
- spill liquids while transportation
  - ➜ Use closed container, boxes;
- when wet or icy because of the weather
  - ➜ Install roof over the traffic routes.

In **road traffic**, driveways and footways have to be separated as distinctly as possible. In addition, a driving order should be put up, which includes information on

- Driving lanes
- One-way traffic
- Turning points
- Speed limits
- Special sites of danger

In this connection, it is crucial to adhere to safety margins and not to enter dangerous areas. If possible, driving in reverse should be avoided as well.

Bridges (Figure 11) are technical devices to create traffic routes with integrated fall protection in line with the height of a potential fall. Bridges that are used for crossing building pits, mines, etc., can have a maximum inclination

of 30 degrees, otherwise they are defined as stairs.

- Non-slip slats have to be mounted on tilted bridges to improve accessibility.
- Bridges have to be protected against slipping and tilting to either side.
- They can be manufactured from various materials, including wood, steel and aluminium.

Fig. 11: Bridge

Moreover, when bridges are installed, the risk of falling from a height has to be taken into account. To prevent falls, solid edge protection has to be provided on both sides of a bridge, depending on the height of a potential fall.

In buildings with more than one storey, **stairs** are needed to facilitate vertical access, and to serve as escape routes in cases of emergency. Stairs are subject to different building codes in each European country. If available, it is always advisable to use them for access.

For **ascending a scaffold** (Figure 12), the most common solution is ladder steps and hatches on the inside. Sometimes, platform stairs built in front of the scaffold are used. When ladders are mounted on the inside, the hatches for passing have to be staggered. When nobody is passing through, they must always be closed.

When platform stairs are used, an additional board is installed in front of the scaffold. Platform stairs have to be connected to the main scaffold according to the specifications of the scaffold manufacturer and where necessary fixed with additional ties.

Just like platform stairs, freestanding stair towers (Figure 13) with platforms have to be placed on foundations capable of carrying and distributing the load. Here again, the manufacturer's instructions on the construction and use have to be followed. Sometimes, additional anchorage may be required with a view to static considerations.

Fig. 12: Scaffold

Fig. 13: Freestanding stair towers

4.3 | Examples for Measures Preventing Falling from a Height

Fall protection equipment is designed

- to prevent persons from falling or
- to catch falling persons.

As an option, it is possible to use personal protective equipment for arresting a fall or for catching falling persons.

Remember:
Preventing a fall is better than alleviating its consequences!

Railing or edge protection at nearly horizontal surfaces

Railing systems inside or outside buildings, at control stations, exposed platforms, balconies, various openings or flights of stairs, etc., are installed according to the individual building laws of each European state and generally accepted as adequate fall protection measures.

During the erection of a building or other kinds of construction work, or if fall prevention equipment has not yet been fixed at access points and control consoles of machinery, temporary railings have to be installed.

In the case of nearly horizontal surfaces, edge protection is a directly effective measure, which does not even allow a fall to happen, as this kind of protection eliminates the fall-hazard zone. Edge protection is the preferred technical fall protection measure. It is mandatory, except if for practical reasons (e.g. if a person has to stand directly on the edge during work) it cannot be installed, or if it is not time- or cost-efficient (e.g. if installation would take longer than the work itself).

Other safety measures include railing posts and guard nets to secure the edges of a platform, as well as certified edge protection systems. Edge protection systems are made up of edge protection elements and guard nets or system elements which are provided by manufacturers or suppliers.

Indirect fall-arrest measures

If for practical reasons (e. g. inclined surfaces, work at the edge) no direct fall protection equipment can be used, indirectly effective measures of fall protection have to be provided instead, such as:

- Edge protection at inclined surfaces
- Safety scaffolds for catching falling persons
- Safety nets

Edge protection at inclined surfaces

Edge protection helps to catch persons who slip while working on inclined surfaces like roofs with an inclination of 20 to 45 degrees. It consists of an enclosed protective wall with a net or grid structure and a maximum mesh size of 10 centimetres.

Production of protective barriers and other safety devices is standardized by standard EN 13374 "Temporary Edge Protection Systems".

Safety scaffolds for catching falling persons

Safety scaffolds are used to prevent the falling of persons from a height, if for

practical reasons (like work at the edge) edge protection cannot be applied. They catch falling persons and prevent them from falling too deep. They are made up of scaffold components or scaffold system components which are provided by manufacturers or suppliers. Production is standardized by standard EN 12811 “Temporary Works Equipment”.

Safety nets

Safety nets (Figure 14) can be used to catch falling persons, if for practical reasons other safety protection systems cannot be used.

They should be installed below holes as well as on edges and below inaccessible construction elements. They have to be installed as close to the working level as possible.

Safety nets have to be stretched in such a way that, according to EN 1263-1 “Safety nets”, f_{max} is not exceeded. The lowest point on the edge of the net must not be more than 3.0 metres below the fall-hazard zone.

Below the net, depending on local conditions, free space must be left between the net and next lower level, and there must also be enough space for traffic routes.

Workplaces with the risk of falls from a height

Each site at the workplace and each route that leads to it have to be examined as to whether they contain inaccessible surfaces or constructional components. If this is the case, special surfaces and routes have to be installed.

Inaccessible constructional components may include:

- Loosely applied grids
- Fibre cement boards
- Skylights
- Roof lights and light domes
- Suspended ceilings

In order to create a solid and stable ground on a surface with an inclination of ≤ 30 degrees, coverings which distribute the load are advisable (Figure 15).

Fig. 14: Safety nets

Fig. 15: covering which distributes the load

These have to be

- Stable enough to carry the load
- Guardrailed, so that they do not lift off or tilt
- Provided with non-slip slats if the covering is inclined

These coverings can be made from a variety of materials.

When the surface has an inclination of more than 30 degrees and there is a risk of slipping, measures against gliding off are required and, in the case of particularly steep surfaces, special working surfaces have to be installed in line with local regulations.

Such special surfaces may be, for instance, slatted roof surfaces, roof ladders or roofer seats.

Working scaffolds

Working scaffolds are temporary, directly effective protective measures against falling. They help to create a safe workplace with safe access that is appropriate for the work that has to be done. Working scaffolds can also be used as temporary, indirectly effective protective measures against falling, when for practical reasons (e.g. because the worker has to stand on the edge) no edge protection can be applied. They catch falling persons and prevent them from falling too deep. Working scaffolds are made up of scaffold components or scaffold system components which are provided by manufacturers or suppliers.

Ladders

Basically, lean-to ladders may also be used to access scaffolds. However, they should be chosen only if none of the access options mentioned above can be used, or if none of them is justified because of a particularly low difference in height or the short-term nature of the construction work. **The ladder is put on a flat ground, stable enough to carry the load of the worker and the ladder itself. The ladder is positioned and used in a safe manner, guaranteeing its stability and preventing its displacement during usage.**

Fig. 16: Ladder

4.4 | Rope Positioning and/or Access through the Structure

This method is yet more frequently used for short work, where lifting platforms are not applicable due to the height of the workplace or the tricky terrain and the erection of a scaffold is not justified (for instance, ascending a lattice pole). The principle of double security is at the basis of safety (Figures 17 and 18). That is accomplished with two ropes (a main rope and a safety lanyard) in case of rope access only, or the worker is fixed to the structure, secured with a safety lanyard or using a Y-Shaped-Lanyard with two scaffold hooks.

The Y-Shaped-Lanyard has two anchor points on the structure, one of them above the worker's head. The points are chosen so that in case of a fall the scaffold hooks should not slip downwards.

Take care that both anchor points are not below the worker's feet at the same time (Figure 18).

In case of securing only with a harness, performing work with rope access and positioning, the safety system must have a reliable anchor point placed at the worker's level or above. Slacks of the rope between the anchor point and the worker are to be avoided. When a worker is partially or fully hanging, there are two anchor points – one for the main rope and another for the safety lanyard.

Good practice demands that the anchor points should be specified in the design phase of the building and/or the structure and should be marked with a signal colour or in another suitable way on the finished structure (building).

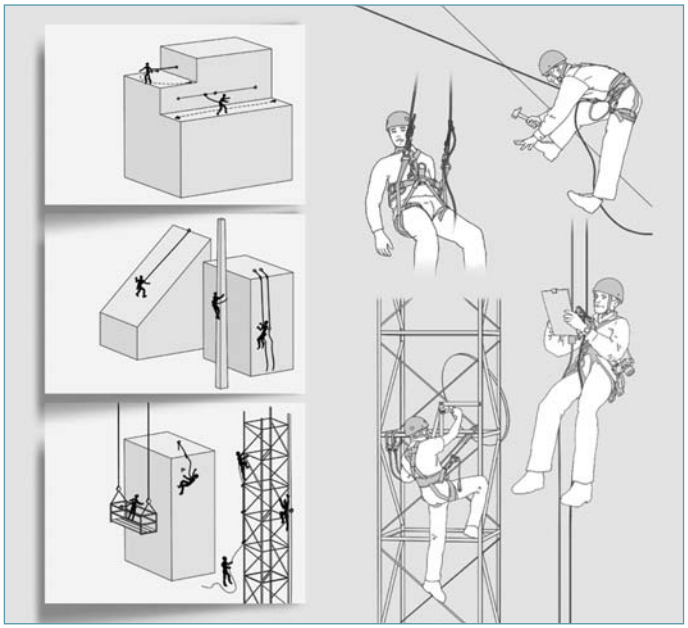

Fig. 17: Examples rope positioning

All elements guaranteeing the safety of rope access (anchor point, connectors, ropes, etc.) should meet extremely high requirements for strength. As a rule, they must bear (not breaking) twice as high load as the worst predictable situation (e.g. the dynamic load of a person falling from a certain height)

The height of the fall is important not only for the assessment of the possible consequences of a fall, but also to define the length of the rope used by the worker to hold on to the anchor point with the help of a harness. Using a harness with energy absorber, evaluating the effect of a possible fall the energy absorber extension should also be taken into account.

Working above water, a grain silo, etc., it is possible that the fall arrester is not actuated in contact with the yielding surface and the fallen person may go deep into the water (grain, etc.).

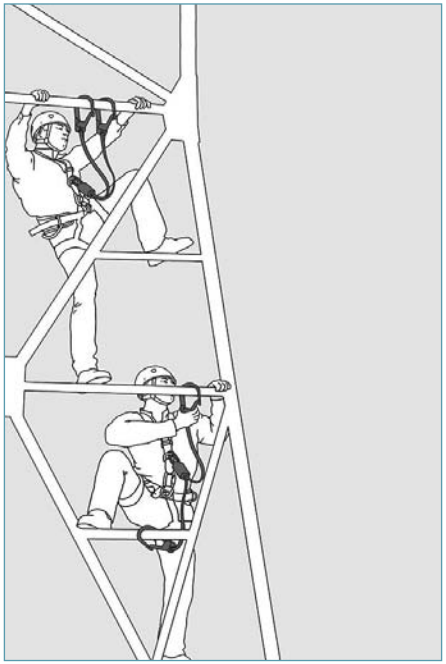

Fig. 18: Example access through the structure

4.5 | Rescue of a Fallen Person

The need for rapid and effective rescue is particularly important when using personal protective systems where a delay might have severe consequences, e.g. when someone is left hanging motionless in a harness after a fall. In a worst-case scenario, loss of consciousness followed by death could occur in a few minutes.

This phenomenon, known as suspension trauma, is caused by a number of factors, but is principally due to the disturbance of blood flow to the vital organs, especially the brain but also the heart and kidneys, which is an effect of hanging motionless, and possibly of the restriction of blood flow to the limbs by the harness. It can be exacerbated by other factors such as shock or injury caused by the fall itself.

The time before loss of consciousness depends both on the severity and the combination of these factors, and can vary from about six minutes to two hours.

(Quote: Guide to the Safety Health and Welfare at Work (Work at Height) Regulations 2006; Health and Safety Authority)

Note:

Never work alone! Who is going to help you suspended on the harness? Suspension trauma is more dangerous than other injuries. On-site first aid is vital.

Sometimes special equipment is needed to rescue the fallen person (Figures 19 and 20).

Basic rules for casualty treatment after rescue from the harness:

1. Don't put the rescued person directly in the recovery position because this can cause death. In case of a fall with PPE against falling from heights the pond of blood in the legs will stream towards the heart and cause a heart failure.
2. Therefore put the upper part of the body immediately after the rescue in a high position for 20 to 40 minutes. Then put the person very slowly in the recovery position.
3. Any casualty with a suspension trauma should be taken to hospital immediately for evaluation.
4. Transport the patient in a sitting position to the nearest hospital.

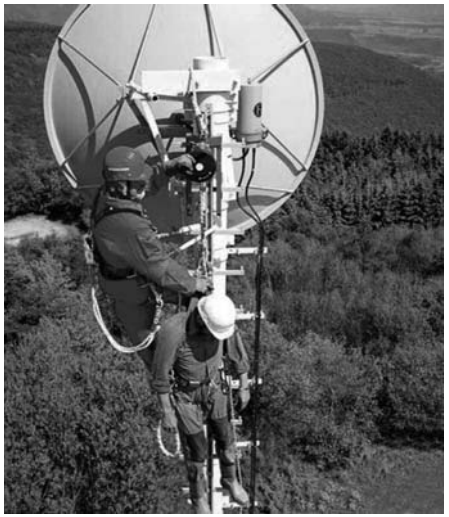

Fig. 19: Example 1 rescue of a fallen person

Fig. 20: Example 2 rescue of a fallen person

5. Annex

A list of standards mentioned in the text and other standards for Reference

Standard	Title
EN 131	Ladders
EN 280	Mobile elevating platforms
EN 341	Personal protective equipment against falls from a height – Descender devices for rescue
EN 353-1	Personal protective equipment against falls from a height – Part 1: Guided type fall arresters including a rigid anchor line
EN 353-2	Personal protective equipment against falls from a height – Part 2: Guided type fall arresters including a flexible anchor line
EN 354	Personal protective equipment against falls from a height – Lanyards
EN 355	Personal protective equipment against falls from a height – Energy absorbers
EN 358	Personal protective equipment against falls from a height – Belts for work positioning and restraint and work positioning lanyards
EN 360	Personal protective equipment against falls from a height – Retractable type fall arresters
EN 361	Personal protective equipment against falls from a height – Full body harnesses
EN 362	Personal protective equipment against falls from a height – Connectors
EN 363	Personal protective equipment against falls from a height – Fall arrest systems
EN 795	Protection against falls from a height – Anchor devices
EN 813	Personal protective equipment for prevention of falls from a height – Sit harnesses
EN 1004	Mobile access and working towers made of prefabricated elements
EN 1263	Safety Nets
EN 1496	Personal fall protection equipment – Rescue lifting devices
EN 1497	Rescue Equipment – Rescue Harnesses
EN 1498	Rescue equipment – Rescue loops
EN 12810	Façade scaffolds made of prefabricated components
EN 12811	Temporary Works Equipment
EN 13374	Temporary Edge Protection Systems
EN ISO 13857	Safety of Machinery