

**Works on the roofs** in most cases at the LG ESWA plant are performed on flat roofs, although works carried out on sloped surfaces are the most dangerous. Workers are close to roof edges or unsecured roof openings (e.g. skylights) are exposed to a number of potential threats. Inaccurate recognition of these threats, or disregarding them and failure to comply with and failure to comply with prescribed measures to reduce or eliminate them may lead to serious accidents, including fatal accidents. This standard contains the minimum requirements that must be met to ensure safety when organizing and carrying out works on roofs and at the edge of the slab on the premises of LG ESWA.

**Workers performing work at height, including work on the roof, obligatorily must fulfilled the following guidelines:**

- are 18 years of age or older,
- have a medical certificate stating that there are no contraindications to working at height,
- have valid health and safety training in accordance with the LG ESWA guidelines,
- become acquainted with the occupational risk assessment during work at height,
- become acquainted with LG ESWA in-house instructions and / or procedures when working at height,
- are equipped with the necessary PPE and have been trained in their proper use.

## 1. Actions before and during roof works

### ➤ General requirements:

- works on the roof belong to particularly dangerous works,
- organize work on the roof minimizing the risk of a potential fall, therefore the use of appropriate equipment should be taken into account or other protective measures to prevent falls.
- before the commencement of works on the roof, the Instructions for Safe Performance of Works (IBWR) should be developed each time, taking into account the results of the Risk Assessment for the job and provide the documents to the OHS department of LG ESWA.
- all works on the roofs must be carried out under the direct supervision of authorized persons, who are at the place of performing work all the time,
- all roof hatch must be covered with durable, stable covers secured against displacement,
- every kind of works on the roof, vicinity overhead power lines must be prepared and maintained on the basis of a detailed standard „4.4 Work in the vicinity of power lines”,
- work on scaffolding should be planned, prepare and conduct based on the provisions of a detailed standard „1.2 Work on scaffolding”,
- **develop an evacuation plan and include it in IBWR.**
- avoid exposing workers to excessive sunlight practise appropriate clothing and protection measures, e.g. sun protective creams.
- all entrances to buildings used for pedestrian traffic, during roof works on LG ESWA facilities, must be protected with a protective roof.

## Remember!

When working on the roof and at the edge of the slab, it is required to use appropriate personal protective equipment:

- a helmet for work at height with a fastened chin strap,
- safety footwear and workwear,
- high-visibility vest,
- depending on the type of work - other adequate PPE.



Before the commencement of works on the roof, the Instructions for Safe Performance of Works (IBWR) should be developed each time - in the case of works where there is a risk of falling from a height. Provide the documents to the LG's health and safety department.

### Instrukcja Bezpiecznego Wykonania Robót (IBWR)

Instrukcja Bezpiecznego Wykonania Robót Nr .....		
ZAKRES ROBÓT	Wykonywanie prac remontowych w kolumnach i aparatach na terenie zakładów rafineryjnych (praca w przestrzeni zamkniętej).	
LOKALIZACJA		
INWESTOR / ZAMAWIAJĄCY		
WYKONAWCA		
PODWYKONAWCY		
WYKONAWCA		
Opracował:	Sprawdził:	Zatwierdził:

Instrukcja Bezpiecznego Wykonania Robót

1/27

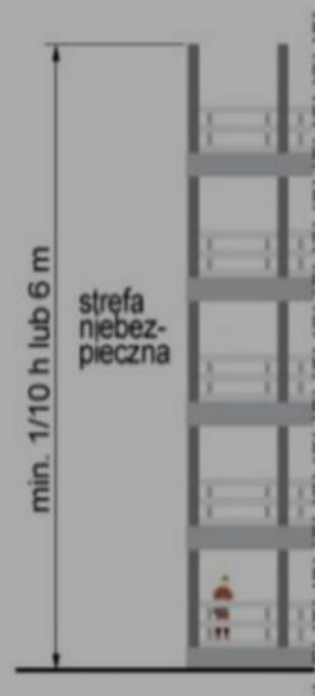


- all workstations on roofs where there is a risk of falling from the roof or through the roof must be secured with safety nets,
- on roofs where workers may stay in connection with the work being performed, or on roofs serving as passageways, railings should be installed, consisting of safety handrails at a height of at least 1.1 m and curbs at least 0.15 m high. Halfway between the handrail and the curb there should be a crossbar or the space should be filled in a way to prevent people from falling out.
- in order to eliminate or reduce the risk of objects falling from the roof, it is necessary to:
  - ✓ use closed chutes for waste,
  - ✓ when the above is not possible, to lower materials or waste to ground level
  - ✓ do not allow material to accumulate on the roof, as this may cause its uncontrolled fall,
  - ✓ designate, partition or otherwise restrict access to places below the works on the roof or in its vicinity, maintaining the minimum size of hazardous zones, i.e. 1/10 of the height from which objects may fall, but not less than 6 m,
  - ✓ wherever possible, carrying large and heavy objects on the roof should be replaced with mechanized vertical transport,
  - ✓ during windy weather, ensure proper storage of necessary materials and items on the roof.

**ATTENTION!** Glass roofs with skylights pose a particular danger. Access to these types of roofs must be planned and secured. Work on skylights may only take place if security is ensured. It is forbidden to climb on glazed roofs and with skylights without protection and after dark.

## Remember!

The size of danger zones from which objects may fall must be fenced off according to the following guidelines



Additionally, mark the area with the appropriate pictogram





## ➤ People in charge of work on the roof must first:

- take into account the application of measures ensuring, above all, the protection of all persons at risk, i.e. collective protection systems, such as: scaffolding, safety nets, safety railings, and only in the second place are the safeguards that protect individual people:
  - ✓ **passive means of protection like:** safety nets (the employee does not have to perform any actions to activate the protection),
  - ✓ **in the second order, active protection measures such as:** safety harness (the worker must fasten to the anchor point),
- make sure that the works are performed only in weather conditions that do not endanger the health and life of employees.

## 2. Main hazards during work

The main hazards occurring during the execution of works on the roofs are:

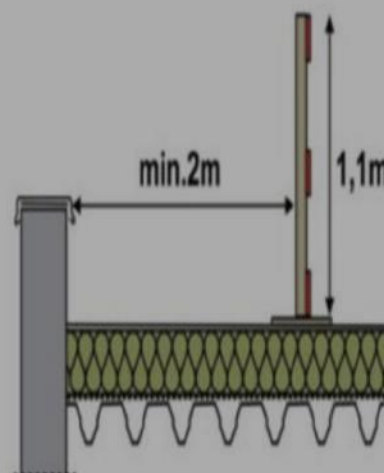
- work at high altitudes,
- work in the immediate vicinity of the roof edge, e.g. during performing sheet metal flashings,
- moving on steep surfaces with a slope of up to 45°,
- the use of materials of specific sizes, i.e. thin, with a large surface, such as roof sheets or with sharp and protruding edges or corners,
- vertical transport, often carried out with the use of simple and even primitive devices, provisory attached to unproven fixed points - sheaves. Work with vertical transport should be planned, prepared and carried out based on the provisions of a detailed standard „2.2 Mechanical and vertical transport (Fab-in)”,
- use of harmful and hot materials,
- using open fire to heat roofing materials (bituminous masses, pitch) or to heat seal of heat-weldable tar paper,
- use of liquid gas cylinders to supply the burners during the heat seal of heat-weldable tar paper. Fire-hazardous work should be planned, prepared and carried out on the basis of the provisions of a detailed standard „3.2 Work with open fire”.

## 3. Falls from the edge of the roof

Full protection of the roof edge (handrail, curb board and crossbar under the handrail) is required each time, **when the works are carried out while being within 2 meters from the edge of the roof**. The role of edge protection is usually performed by independent protective scaffolding surrounding the entire building or by handrails attached to the roof structure. During the situations that work is carried out at a distance of more than 2 meters from the edge of the roof and there is no protection of the edge of the roof, the working area and the travel paths to and from the working area on the roof should be adequately fenced off with continuous physical barriers. Additionally, strict supervision over employees is necessary. The barrier must consist of a curb plank 0.15 m high and a protective railing 1.1 m high. The free space between the curb board and the handrail is to be filled in such a way as to prevent workers from falling from a height.

## Remember!

Installed safety rails must be at least 2 m from the edge of the roof or slab and must be at least 1.1m high.



If, due to the type and conditions of work at heights, the use of this type of railings is impossible, other effective measures to protect workers against falling from a height, appropriate to the type and conditions of work, should be used.



Work at height does not include work on the surface, regardless of the height at which it is located, if that surface:

- 1) it is covered on all sides to a height of at least 1.5 m with full walls or walls with glazed windows,
- 2) it is equipped with other fixed structures or devices to protect the worker from falling from a height.

These requirements are specified in the **PN-EN 13374 standard** (Temporary security systems at the edges of buildings). This standard defines several classes of temporary edge protectors as well as the requirements and test conditions. The class of the device depends on the slope of the terrain and the height of the fall.

## • CLASS A

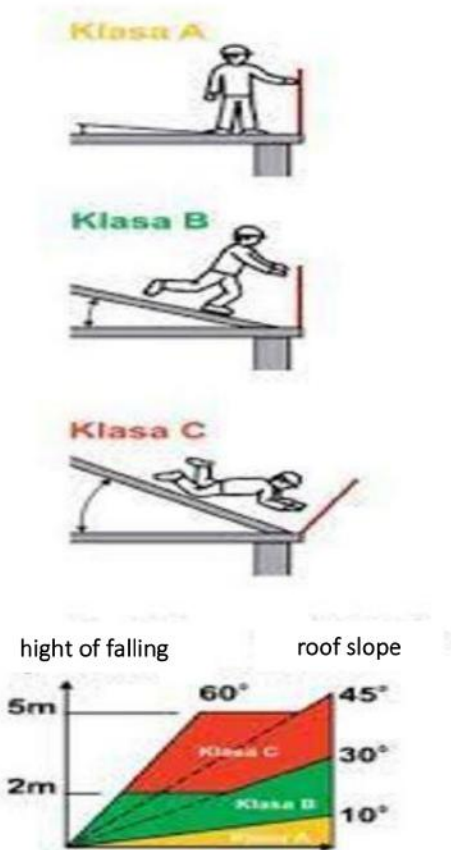
A system that is resistant to static loads to protect people who resist the system or use the system as a handrail when walking along it. Provides protection for a person who moves or falls towards the protection.

## • CLASS B

System resistant to static and dynamic loads, preventing the fall of a person sliding down the slope.

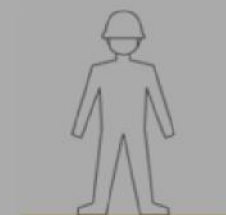
## • CLASS C

The system is resistant to high dynamic loads of people falling on steep surfaces. It should not only brake, but also absorb the force of the fall.

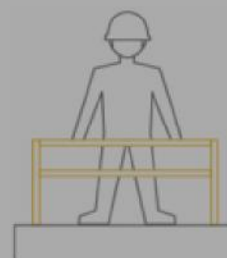


## Remember!

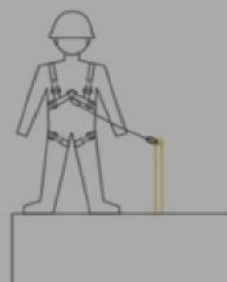
Good planning and following the hierarchy of selection of protective measures when working at height can significantly reduce the risks associated with working on industrial roofs.



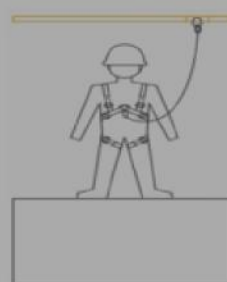
### 1. Elimination of the threat



### 2. Collective protection



### 3. Work in restraint system



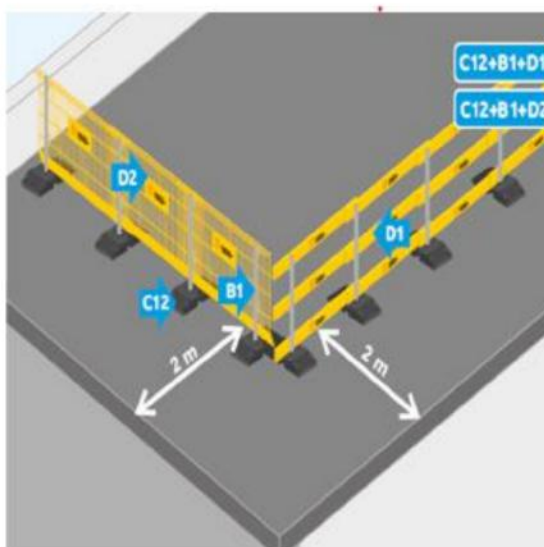
### 4. Fall protection

## 4. Collective protection measures

### Fencing the danger zone on flat roofs.

In order to cordon off the danger zone, a minimum distance of 2 m from the edge of the roof should be kept.

The zone fencing can be made with a PVC foot (C12) with system posts (B1) on which boards (D1) or mesh (D2) are mounted.

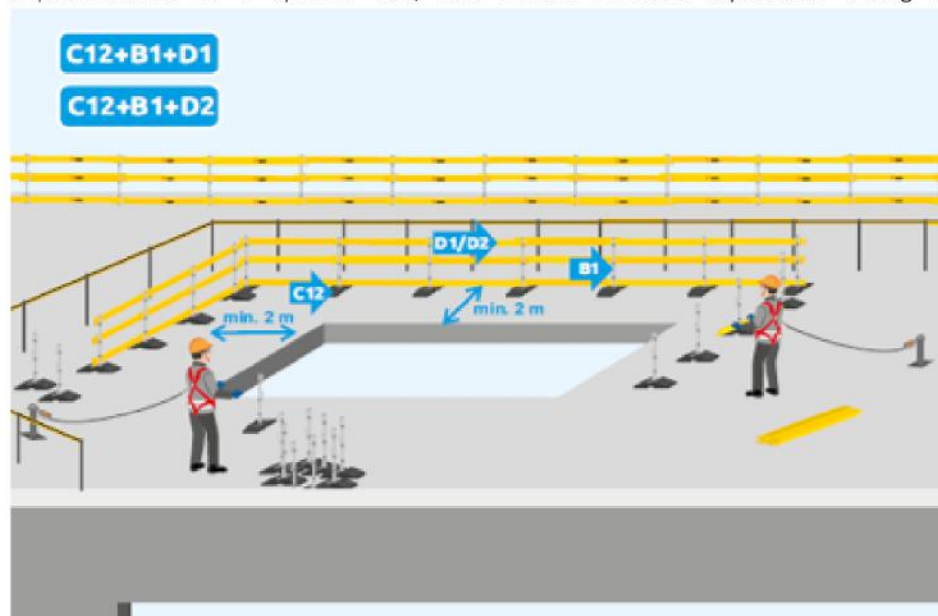




## Guidelines for securing technological openings on roofs:

- technological openings on flat roofs should be effectively protected against the possibility of falling from a height.,
- the zone must be fenced off with barriers at a distance of at least 2 m or with permanent protective barriers,
- installation of protective barriers requires the use of personal protective equipment against falls from a height.

For this purpose, it is necessary to prepare a plan for the arrangement of anchoring points for the implementation of a specific task, and ensure constant supervision during the works.



## Safety nets - general guidelines:

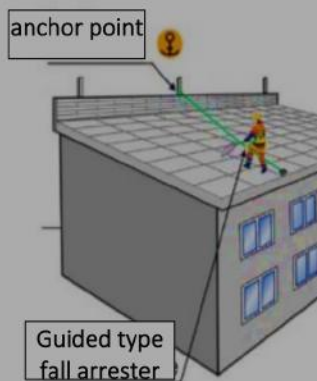
- ensure that planned and adopted types of safety nets are included in the IBWR.
- include the type of roof protection at the planning stage. When planning the type of protection, take into account the stage of roof finishing so that the applied protection does not interfere with its implementation.
- plan the appropriate rotation of the safety nets during the implementation of individual stages of the work.
- provide appropriate fall protection systems when installing safety nets.

Plan the use of safety nets - belaying nets (meeting the requirements of PN-EN 1263) to protect people against falling from a height. Safety nets made of polypropylene or polyamide fibers are used as:

- collective protection of employees against falling from a height,
- side protection of the open edges of the structure,
- protection against falling of a person working on scaffolding, platforms, communication routes located over 1 m above the ground level,
- protection of excavations and channels.

## Remember!

When planning work on flat roofs with a slope of up to 20%, with the use of personal protective equipment against falls from a height, it is necessary to take into account safe working methods, e.g. work in confinement.



The use of signs is one of the basic ways to ensure safe working conditions. Reaching for the health and safety sign "Danger of falling" with a description will therefore affect the level of safety of employees and protect them from the unpleasant consequences of such situations.

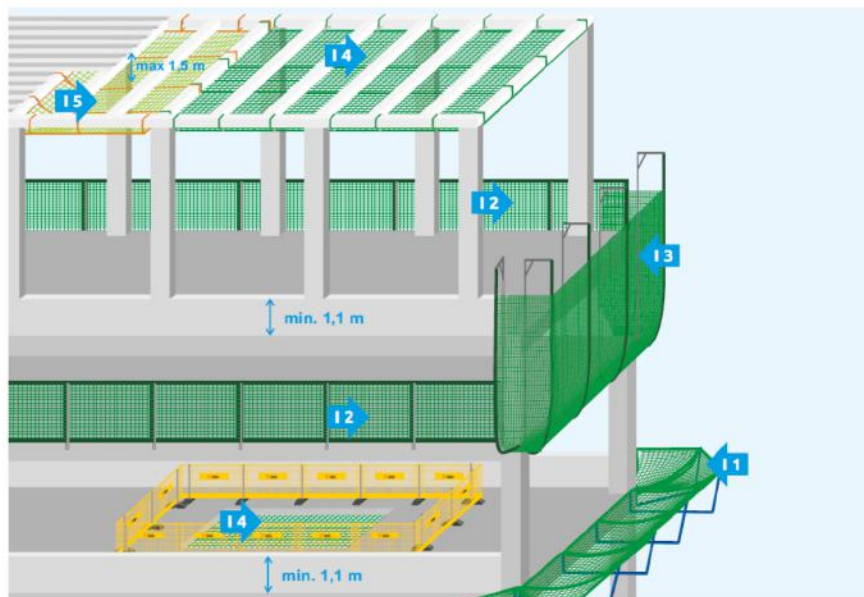


Remember that the safety nets can only be used:

- with appropriate labeling, valid inspection and warranty period.
- in accordance with the instructions for use and the assembly instructions prepared on the basis of it or according to the individual assembly design.

The nets may be installed only by persons who have an appropriate certificate confirming the training conducted by the nets supplier.

Due to the way of use, we distinguish the following types of nets: type T, U, V, S, mesh platforms - as a special type of mesh, type S.



I 1 – T-net type      I 2 – U-net type      I 3 – V-net type  
I 4 – S-net type      I 5 - working platforms

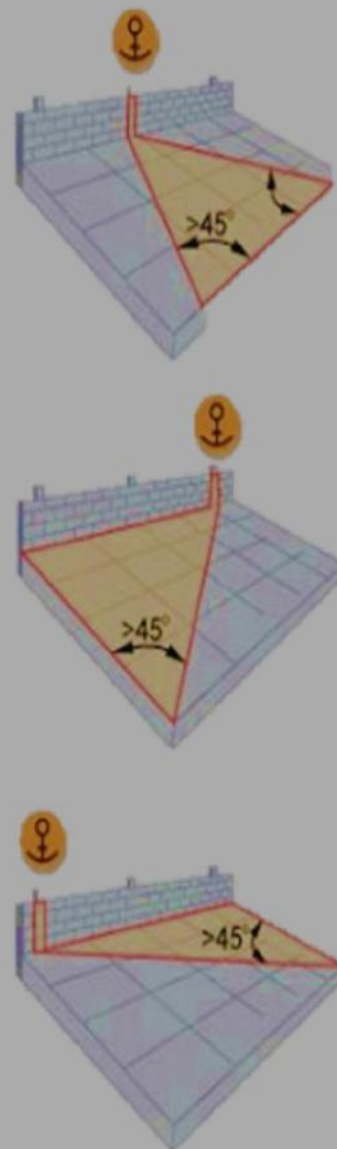
## 5. Personal protection

The regulations clearly state that anchor devices should only be used **when collective protection measures are not possible**. Anchor points are an ideal solution for securing employees working at height in places where it is not possible to use collective protection measures such as railings or safety nets. The PN EN 795 standard introduces classification into six different classes. Depending on the place and type of work at height, appropriate anchor points should be selected.

Work in confinement consists in securing the employee against the possibility of falling by appropriately selecting the length of the safety rope, ensuring at the same time free performance of work and preventing the initiation of a fall from a height. An anchor point may be fixed or movable, organized by means of an intermediate rope.

### Remember!

When working on the roof, when there is a risk of falling through its side edges, the worker choosing the anchor point should follow the rule that the rope connecting it to the anchor point must be led at an angle greater than 45 ° in relation to the roof edge.

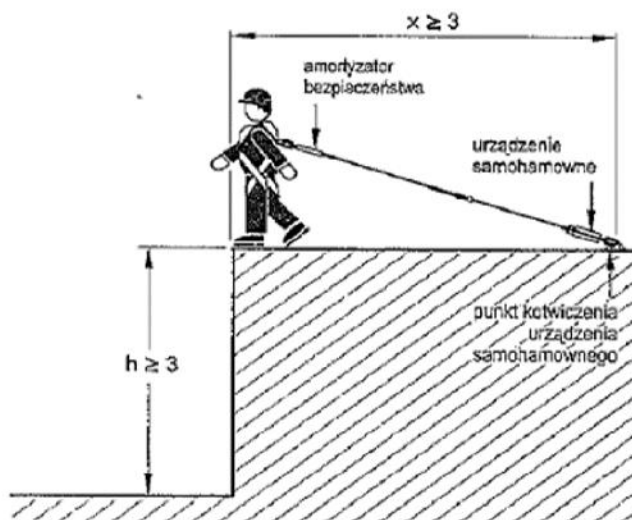




## Fall arrest using a *self-locking device* with a rope to work on the roof.

There is a separate group of self-braking devices used with the coefficient **WO = 1**. Such devices have a built-in shock absorber in the form of a friction clutch and are equipped with a steel cable with a diameter of min. 5mm. or they work with a dedicated steel cord with a shock absorber mounted directly to the employee's safety harness.

*WO – fall factor*




## Remember!







The employer is obliged to guarantee the maintenance of the employee's personal protective equipment and ensure their proper functioning. Even more so, the employer may under no circumstances allow an employee to work without personal protective equipment (Articles 2373-10 of the Labor Code).

When climbing or descending the roof using ladders, the worker should be secured against falling from a height by using e.g. a fall arrest device attached to a guide anchored to a fixed point of the structure.

The table shows the requirements for the use of appropriate accessories for security systems for work at heights, including those on the roof and at the edge of the slab, along with the applicable standards.

Equipment name:	Requirements:
Safety harness	PN-EN 361:2005 
Safety rope with shock absorber	PN-EN 355 
Self-locking device	PN-EN 360:2005, 



Guided type fall arrest device	<p>PN-EN 353-2</p> 
Anchor point	<p>PN-EN 795/A</p> 
Anchor points indirect system	<p>PN-EN 795:1999 PN-EN 795:1999/A1/2002</p> 
Anchor devices	<p>PN-EN 795/C</p> 
Portable anchor points	<p>PN-EN-795/B</p> 
Alsiperch's system	<p>PN-EN-795:2012</p> 

## Remember!

During the visual inspection, all elements of the equipment should be checked, paying particular attention to any damage, excessive wear, corrosion, abrasions, cuts and incorrect operation.

Particular attention should be paid to:

- in safety harnesses and belts with buckles, adjustment elements, attachment points, tapes, seams, belt loops;
- in safety shock absorbers for hook loops, strap, seams, casing, rope (if any), connectors;
- in ropes and textile guides for rope, loops, thimbles, connectors, adjustment elements;
- in ropes and steel guides for rope, wire, clamp, loops, thimbles, connectors, adjustment elements;
- in self-locking devices - on a rope or a strap, proper operation of the retractor and the locking mechanism, housing, shock absorber, connector;
- in guided fall arrest devices on the device body, correct stroke on the guide, locking mechanism, rollers, bolts and rivets, fasteners, safety shock absorber;
- in fasteners: load bearing body, riveting, main latch, operation of the locking mechanism.

