



# Modular R+ scaffolding Assembly manual

# CERTYFIKAT BEZPIECZEŃSTWA NR B/02/011/17

Nazwa i adres podjątku/certyfikatu/  
nazwa przedsiębiorstwa wykonującego  
prace budowlane

OLAN Sp. z o.o.  
Żabokliki ul. Korczewska 57, 88-100 Siedlce

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Rodzaj prac budowlanych

Rusztowania modułowe

Właściciel obiektu budowlanego

R+OLAN

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Niniejszy certyfikat bezpieczeństwa budowlanego jest ważny do czasu wycofania z użycia. Wszelkie zmiany w projekcie budowlanym, w tym w zakresie bezpieczeństwa budowlanego, należy zgłaszać do Biura Certyfikacji. Wszelkie zmiany w projekcie budowlanym, w tym w zakresie bezpieczeństwa budowlanego, należy zgłaszać do Biura Certyfikacji.

## 2017

1. Należy przedstawić dowody na to, że wykonano prace budowlane zgodnie z projektem budowlanym i z przepisami technicznymi budowlanymi.
2. Należy przedstawić dowody na to, że wykonano prace budowlane zgodnie z projektem budowlanym i z przepisami technicznymi budowlanymi.
3. Należy przedstawić dowody na to, że wykonano prace budowlane zgodnie z projektem budowlanym i z przepisami technicznymi budowlanymi.

KIEROWNIK  
OSŁOŃKA CERTYFIKACJI

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Wyszawa dnia 3 czerwca 2017 r.

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## Scaffoldings characteristics

Modular scaffoldings of “R+” type manufactured by Olan spółka z. o. o. based in Żabokliki are the system scaffolding with cross-section spacing of 0.73m; 1.09m and lengthwise spacing of 3.07m; 2.57m; 2.07m; 1.57m, with the possibility of extension in all directions. The construction of the posts of the scaffolding system allows the assembly of elements at 0.5 m in vertical so that it is possible to create levels at any height which of course is a multiple of 0.5 m.

Due to the unique modular design, the scaffolding of “R+” type enables extremely efficient and safe execution of complex spatial constructions, which makes it possible to build large platforms such as scenes, elevated work platforms, etc. The above scaffolding can also be used successfully in the construction of bearing or supporting structures for all types of advertisings, racks, television cameras and occasional stands located at cultural and entertainment events. The nominal load of a single R+ scaffolding field in the façade configuration is:

- 3.0kN/m<sup>2</sup> for width of 1.09m
- 2.0kN/m<sup>2</sup> for width of 0.73m

The working steel platforms are the essential elements of the system in the construction of the scaffolding, because they allow free movement of users and possible transport of materials. Depending on the platforms used, the load capacity of these elements is as follows;

- Steel platforms
  - ☐ 6.0kN/m<sup>2</sup> for field of 0.73m
  - ☐ 6.0kN/m<sup>2</sup> for field of 1.09m
  - ☐ 6.0kN/m<sup>2</sup> for field of 1.58m
  - ☐ 6.0kN/m<sup>2</sup> for field of 2.07m
  - ☐ 4.5kN/m<sup>2</sup> for field of 2.57m
  - ☐ 3.0kN/m<sup>2</sup> for field of 3.07m
- Aluminium and plywood platforms
  - ☐ 3.5kN/m<sup>2</sup> for field of 2.57m
  - ☐ 2.0kN/m<sup>2</sup> for field of 3.07m

Apart from the above platforms, the scaffolding consists also of such elements as the following:

- Kerbs - Bracings - Initial element - O transoms - U transoms
- Double U transoms - R+ posts - Washers
- as well as many other equipment.

The unique scaffolding “R+” system by Olan over other types of scaffolding solutions is based on the unique design of the scaffolding that

provides specified construction connection, which allows to connect cross members, longitudinal and vertical bracings in a connection disc in the posts at a distance of 0.5 m.

The modular scaffolding R+ system by OLAN was qualified according to PN EN 12810-1:2010. The classification is shown in the table below.

	Width	
Field	0.73m	1.09m
1.57m	Scaffolding EN 12810-6D-SW06/157-H2-B-LS	Scaffolding EN 12810-6D-SW09/157-H2-B-LS
2.07m	Scaffolding EN 12810-6D-SW06/207-H2-B-LS	Scaffolding EN 12810-5D-SW09/207-H2-B-LS
2.57m	Scaffolding EN 12810-5D-SW06/257-H2-B-LS	Scaffolding EN 12810-4D-SW09/257-H2-B-LS
3.07m	Scaffolding EN 12810-4D-SW06/307-H2-B-LS	Scaffolding EN 12810-4D-SW09/257-H2-B-LS

## 1. LIST OF STANDARDS AND RULES CONCERNING SCAFFOLDING

When designing, assembling, disassembling and operating the scaffolding of “R+” type, the rules and requirements contained in the following sections must be observed:

- Regulation of the Minister of Labour and Social Policy of 26 September 1997 on the general provisions of occupational safety and health. (the Journal of Laws, no. 129/97, item 844).
- Regulation of the Minister of Economy, Labour and Social Policy of 30 September 2003. (the Journal of Laws, no. 178, item 1745)
- hereof.
- Regulation of the Minister of Infrastructure of 6 February 2003 on occupational health and safety during construction works (the Journal of Laws, no. 47/03, item 401).
- Announcement of the Minister of Economy, Labour and Social Policy of 28 August 2003 on announcing the consolidated text of Regulation of the Minister of Labour and Social Policy on general provisions of occupational health and safety (the Journal of Laws, no. 169/03, item 1650).
- PN-M-47900-1:1996 “Steel, standing working scaffoldings. Definitions, division and main parameters.”
- PN-M-47900-2:1996 “Steel, standing working scaffoldings. Pipes stand scaffoldings.”
- PN-M-47900-3:1996 “Steel, standing working scaffoldings. Frame scaffoldings.”
- PN-EN 12811-1:2007 “Temporary constructions used at the construction site. Scaffoldings.” Execution conditions and general design rules.”
- PN-EN 12810-1:2010 “Façade scaffoldings made of prefabricated elements. Technical specifications of the products.”
- PN-EN 12810-2:2010 “Façade scaffoldings made of prefabricated elements. Specific design and construction methods.”
- PN-EN 74-1:2006 “Connectors, centring pins and washers for formworks and scaffoldings - Part 1: Connections for pipes - Requirements and testing methods.”
- PN-EN 39: 2003 Steel pipes to construct scaffoldings - Delivery technical conditions

## 2. GENERAL RULES OF SCAFFOLDING ASSEMBLY



1. Refer to the assembly manual, safety regulations and generally applicable standards for scaffoldings.
2. Before proceeding to assembly the scaffolding, check the substrate that should carry loads from the scaffolding structure and the vertical forces on the scaffolding. The load-bearing capacity of the ground bases on which the scaffolding is assembled must not be less than 0.1 MPa. The load-bearing capacity of the substrate should be determined according to PN-81/B-03020. In the case of structural substrates and for strengthening of the ground, the scaffolding should comply with the requirements of PN-M-47900-2 point 4.4.
3. Prepare the necessary tools needed to set and correctly level the scaffolding structure e.g.:
  - Hammer 500g
  - Spirit level
  - Wrench 19/22
4. The scaffolding should be placed on a stable and profiled substrate that allows rainwater drainage. For the protection of the substrate, wooden washers should be used prior to the scaffolding being pierced, with at least 2 stands on one substrate.
5. The threaded pin of the washer should enter the stand pipe at least 150 mm.
6. Place the initial elements on the washers, and then connect them with the transoms by hammering the wedges with the holes in the plates.

*Only use original, undamaged elements of the scaffolding R+ system during assembly.*

### *Elements assessment criteria*

*Elements with visible signs of damage must not be used. In particular, operation is not allowed for:*

- *elements with signs of corrosion in the elements connections areas (welds),*
- *bearing posts with visible damage in the form of pipe bends and section deformation,*
- *steel platforms with damaged plating or damaged and bent hooks,*
- *aluminium and plywood platforms with damage to plywood plating in the form of delamination, cracks, swelling, losses and bent bearing beams,*
- *screw washers with damaged thread, bent pins or hard to rotate nuts.*

*Replace damaged parts with defect-free ones and provide them for repair.*

*Elements may only be straightened if there are no circular sectional deformations.*

*It is not allowed to repair the supporting elements of the construction, i. e. stands, bracings and supports.*

7. Level the basic level of the scaffolding correctly with a spirit level and a hammer.
8. The scaffolding should be positioned in such a way that the distance between the scaffolding structure and the building's façade does not exceed 0.2 m. If the distance from the building is greater than 0.2 m, handrails and longitudinal curbs protecting the working platform should be additionally assembled inside the building.
9. Bracings of the wall scaffolding are in an external plane, parallel to the wall face, by way of large planar or tower bracings. The vertical bracing must be distributed in every fifth field of the scaffolding net. One level should have at least two bracings running contrary to each other. In braced fields, longitudinal transoms should be assembled as horizontal bracing.
10. Clamp lower discs on the posts with the transoms the transverse direction, additionally fix the transverse transom so that the distance between the clamping transom, the initial element and the lower transom of the post is not greater than 0.5m.
11. The extreme ends of the platforms must be protected with transverse transoms to prevent any attempt to climb onto the field without assembled platforms.
12. In the field with the circulation path, assembly U transoms followed by the platforms for vertical circulation path.
13. The scaffoldings may be assembly only a person with appropriate permissions and having the knowledge of the assembly and operation manual of a particular type of the scaffolding. People working on the assembled and accepted scaffolding do not need to have the above mentioned permissions. The user is responsible for the operation of the accepted scaffolding.

Basic technical and operating data of the modular scaffolding of “R+” type in a typical setting:

- *load capacity - in the range of 2-6 kN/m<sup>2</sup> (nominal values of the scaffolding according to PN-EN 12811-1:2004);*
- *number of simultaneously loaded platforms - one level of the scaffolding may be loaded;*
- *field width - 0.73 m or 1.09 m;*
- *field length - 1.57 m, 2.07 m, 2.57 m and 3.07 m;*
- *scaffolding height (height of the highest working platform) - 40.5 m + 0.2 m.*
- *Maximum distance of the internal edge of the platform from the wall 0.2 m*

- *Minimum number of bracings on each storey - 2*

14. The construction of the scaffolding makes it possible to protect the stands with the cotter pins, which is not absolutely necessary because the length of the pilot exceeds the minimum requirements.
15. The scaffolding should be equipped with the circulation paths. The lines must be constructed at the same time as the scaffolding construction. The distance between the circulation paths may not exceed 40 m. The distance of the working position far away the most from the vertical circulation path may not exceed 20 m.
16. All connections of the scaffolding pipe elements must be made with the use of standard or rotary connectors according to PN-EN 74:2002. The connector screws must be tightened with a torque of 50 Nm.
17. The steel platforms should be arranged in such a way that the gap between two elements of the platform at one level does not exceed 25 mm. When assembling the extension supports for the working platforms, there is a gap to be filled with wood.
18. The scaffolding platforms may be extended using crossbars (transoms) and stands supported by vertical bracings. The platforms may be extended on the external side of the scaffolding on its last level or on any level provided that it is anchored to the wall of the level with the assembled extension and one level above and below.
19. The façade arrangement rules described herein apply to the scaffolding with a maximum height of 40.5 m and a construction length of more than 10 m.
20. The following rules must be observed when loading the scaffolding platforms:
  - a) load on the platform should be distributed evenly over its entire surface;
  - b) apply 80 kg (0.8 kN) per any person working on the scaffolding;
  - c) for the structural analysis purposes, the weight of the elements provided with the lift must be increased by 20%;
  - d) it is not allowed to apply dynamic load to the platform, e. g. jumping, throwing loads, etc.;
  - e) the platforms assembled on the supports (consoles) must be of the same load class as the primary scaffolding platforms.
21. Protective nets or tarpaulins are used to protect people against objects falling from the scaffolding.
22. The scaffolding may be used in all wind load zones according to PN-77/B-02011. The scaffoldings designed for use in wind load zone III and in locations above 1500 m above sea level must be subjected to additional static wind calculations.
23. If the scaffolding is anchored, the anchorage must be carried out with assembly



progress. The anchorage points should be located no more than 0.2 m from the scaffolding node. If it is necessary to anchor the scaffolding at a greater distance from the scaffolding node, the design for such a scaffolding must be developed.

24. The scaffolding may be disassembled if the works executed from this scaffolding have been completed and all tools and materials removed from the working platforms. Partial disassembly is possible from the top as the work progresses from the highest platform. When disassembling, it is not allowed to throw the elements from a height. After disassembly, all scaffolding elements must be cleaned, inspected and segregated into usable parts, and the parts that need to be repaired or replaced.
25. If the scaffolding is anchored, the anchoring must be disassembled along with the disassembly of the scaffolding construction. It is not allowed to disassemble more than one level of anchors below the disassembled scaffolding level. The following part hereof presents the example solutions.
26. Storage and transport of the scaffolding elements should comply with the provisions of PN-M-47900-2:1996 "Steel, standing working scaffoldings. Pipes stand scaffoldings."
27. Apply the personal protection equipment when assembling and disassembling.
28. When assembling and disassembling the scaffolding, the danger zone must be marked and protected with the handrails of a minimum height of 1.5 m. The danger zone must not be less than 1/10th of the scaffolding height and not less than 6 m in accordance with PN-M-47900-2:1996, point 4.10.4. In dense urban development, the danger zone may be reduced if other security measures are used. It is not allowed to assemble, operate and disassemble the scaffolding:
  - *at dusk if no good visibility lighting is provided;*
  - *during dense fog, rainfall, snow and glazing;*
  - *during storm or if wind speed exceeds 10 m/s.*
29. The area of the works on the scaffolding and when disassembling the scaffolding must be marked by placing warning signs at a height of up to 2.5 m above the ground level. The inscriptions on the boards should be visible from a distance of at least 10 m.
30. The scaffoldings located directly next to the roads should have protective roofs in accordance with §22 of Regulation of the Minister of Infrastructure of 6 February 2003, the Journal of Laws, no. 47, item 401.
31. The stands at the gates, clearances and passes through which vehicles are moving should be protected by bumps unrelated to the scaffolding.
32. If, during the assembly of the scaffolding, the passage (with the permission of the appropriate field authority) has been removed, a barrier and a red disc with a warning sign must be placed at the point of travelling, and a red light should be assembled on the barrier at night.

33. Assembly, disassembly and operation of the scaffoldings in the vicinity of overhead power lines is not allowed if the scaffolding distance from the extreme electric line is less than:

- *3.0 m for lines with rated voltage above 1kV,*
- *5.0 m for lines with rated voltage above 1kV and not exceeding 15kV;*
- *10 m for lines with rated voltage above 15 kV and not exceeding 30kV;*
- *15 m for lines with rated voltage above 30 kV and not exceeding 110kV;*
- *30.0 m for lines with rated voltage above 110kV.*

If the scaffolding is assembled and disassembled under overhead electrical networks or at distances shorter than those specified above, the voltage must be switched off during the assembly work.

34. The scaffolding construction should be equipped with lightning protection devices in accordance with PN-M-47900-2:1996. "Steel, standing working scaffoldings. Pipe stand scaffolding."

35. The scaffolding may only be used after acceptance by a technical inspector or an authorised person. During the acceptance process, the scaffolding must be tested in accordance with point 7.3 of PN-M-47900-2:1996. The scaffolding acceptance must be confirmed by a protocol.

36. The scaffolding should be provided with a board indicating the permissible load capacity of the platforms. It is not allowed to load the scaffolding platforms above the load capacity of the scaffolding and gathering of workers on the platforms.

37. The scaffolding may be equipped with a material transport device on booms fixed to the scaffolding construction. The booms may be made of pipes attached to the scaffolding by means of scaffolding connectors. One may use the standard boom and the block offered by the manufacturer. The maximum weight of the lifting materials may not exceed 150 kg. When using the lifts of higher capacity and fixed to the scaffolding, it is necessary to carry out static calculations of the scaffolding. The boom must additionally anchored at least on two places. The distance between the booms should not be more than 30 m. The distance of the collective axle from the outermost scaffolding point in the lifting plane should not be greater than 0.5 m. The height from the anchor point of the block to the platform level must not be less than 1.6 m. For vertical transport, it is recommended to use winches with accessories suitable to assembly the scaffolding. These devices should be approved by the Technical Inspection Office. Assembly the winches strictly according to the instructions provided by the winch manufacturer.

38. Every time before using the scaffolding, it is necessary to check whether the construction is still correct and complete or whether there are any environmental changes affecting its safe use. In particular, whether there has been any damage of the foundation. The inspection should be carried out by the foreman using the scaffolding.

39. The scaffolding must be inspected after strong wind, heavy rainfall, hail, lightning strikes and other dangerous effects, as well as after work breaks.

40. longer than 10 days, but at least once a month. During the inspection, the following should be checked:

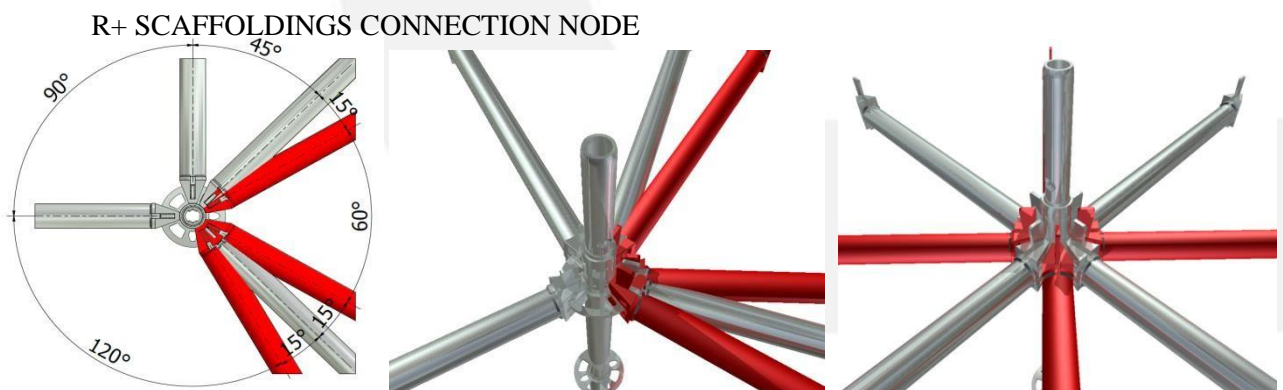
- *condition of the foundation on which the scaffolding was placed,*
- *condition of the protection (handrails, curbs),*
- *condition of the platforms (gaps between the platforms, damages, method of loading the platforms), circulation paths (fixing of ladders, correctness of opening and closing the entrance flaps),*
- *method of protection against falling from the upper platforms and the platforms on the supports,*
- *condition of the rotary connectors,*
- *anchorage force,*
- *condition of the winches and the supporting structures,*
- *condition of the lightning protection system.*

The inspection must be carried out by the site manager or another authorised person. Each inspection should be accompanied by a note, possibly an entry in the construction log.

41. In the winter, before starting works, snow must be removed from the scaffolding.

### 3. SCAFFOLDING ASSEMBLY.

#### **ASSEMBLY OF BASIC ELEMENTS OF THE SCAFFOLDING “R+” SYSTEM (PARTIAL EXAMPLES).**



Connecting discs, R+ nodes, are equipped with 8 assembly holes

*[Fig. 1- Connecting node of the “R+” system.](#)*

allowing to connect the same number of elements. There are two types of slots shapes, 4 large and 4 small. Large elements may be assembled in the large holes, which may be adjusted in a smooth manner in the range of 30°. Assembly of the small elements in the small holes allows to obtain simple rectangular scaffolding net.

The disc connection for connecting the basic elements of the system: posts, transoms and vertical bracings. [Fig. 1]

The connecting discs were welded to the post pipe every 500 mm, for this reason it is possible to assemble the scaffolding elements in a stepped manner. Thanks to this solution, we get an adjustable height of the working platform and a simple potential secondary working surfaces.

The elements are assembled by hammering a wedge in the head of the element, which is fixed to the disc hole with a 500 g hammer. [see Fig. 2]

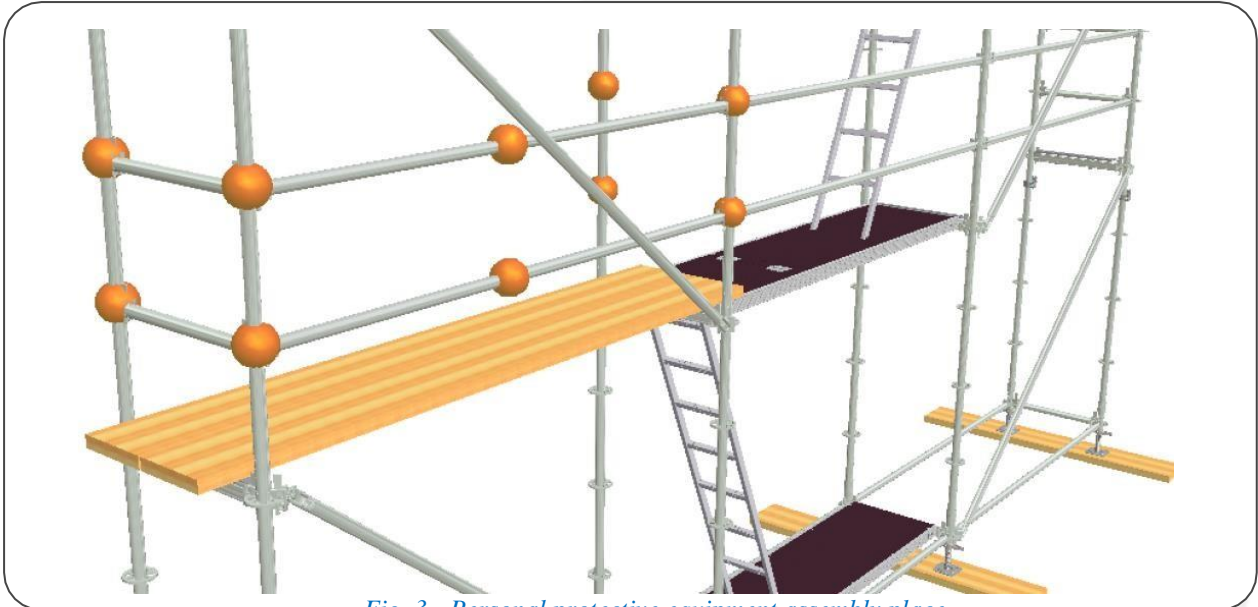


ASSEMBLY GUIDELINES TO INCREASE OPERATION SAFETY.

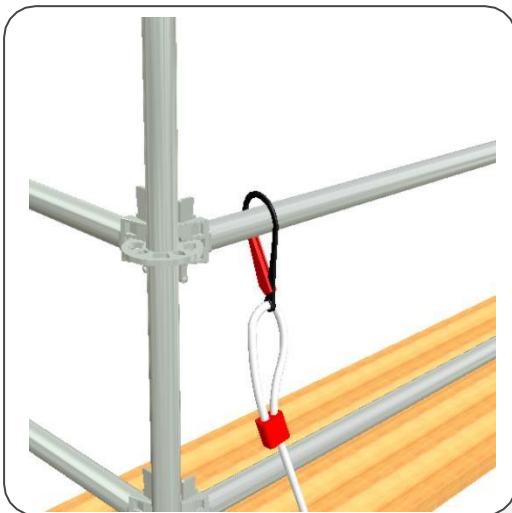
*[Fig. 2 - Assembly of transoms and bracings do connecting discs in posts.](#)*

During assembly, disassembly and use of the scaffolding, it is obliged to use personal protective equipment. For safety reasons, the following examples show the assembly place of these protective equipment.

When constructing the scaffolding, assembly an individual safety rope to the scaffolding elements located on the façade side of the scaffolding. Assembly the ropes to the transoms located above the level on which one is standing. This also applies to the anchoring discs. If the assembly level posts are not tied together, fix the safety ropes to the discs at a height of 1.0 m. It is allowed to assembly to the elements on the level on which one is standing only if there is no other possibility. It is also possible to assembly the personal protective equipment directly to the scaffolded structure. The method of execution is individual for each facility.



*[Fig. 3 - Personal protective equipment assembly place.](#)*



*[Fig. 4 - Assembly to O transom.](#)*



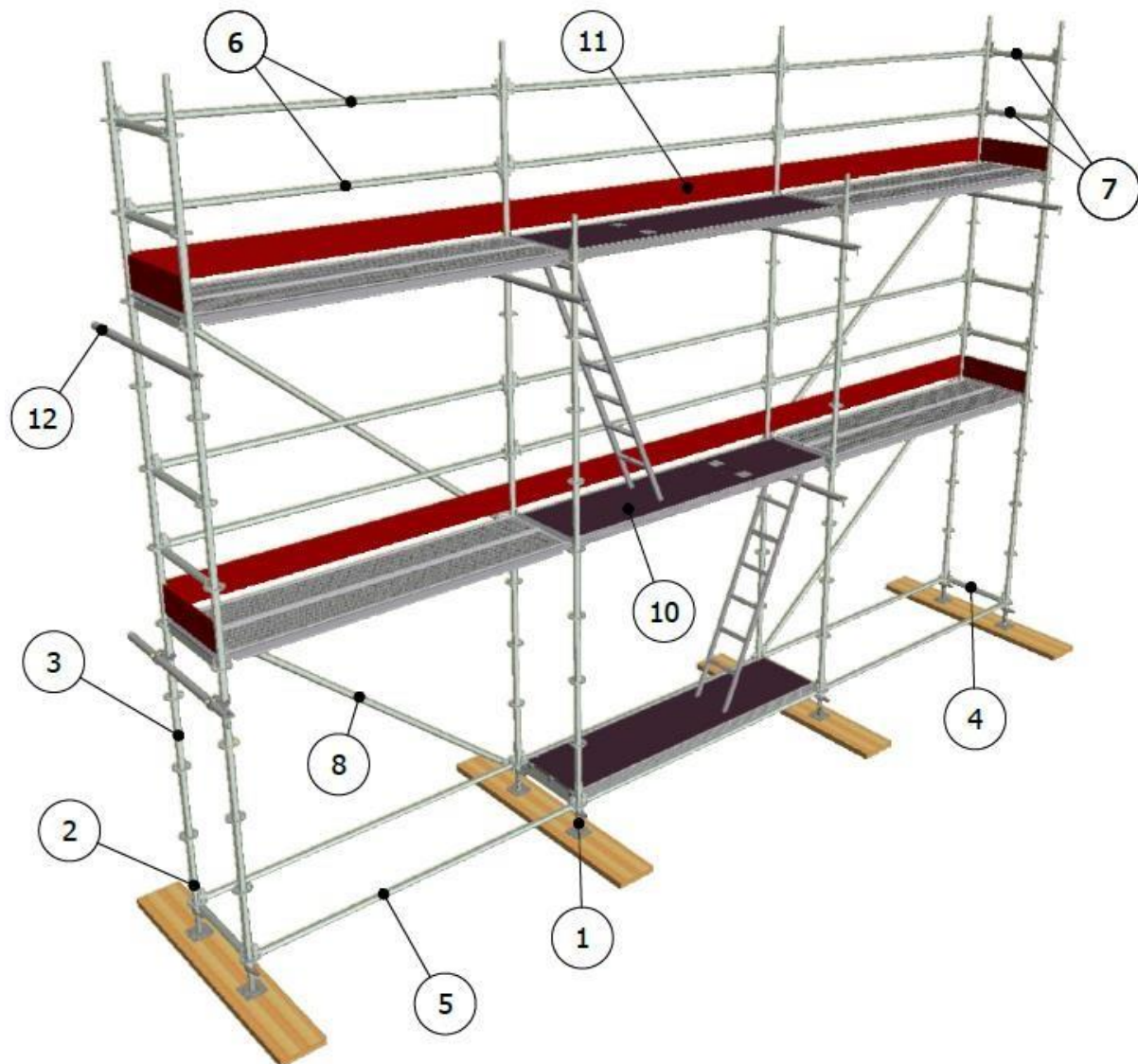
*[Fig. 5 - Assembly to the disc.](#)*

When constructing the scaffolding, assembly an individual safety rope to the scaffolding elements located on the façade side of the scaffolding. Assembly the ropes to the transoms located above the level on which one is standing. This also applies to the anchoring discs. If the assembly level posts are not tied together, fix the safety ropes to the discs at a height of 1.0 m. It is allowed to assembly to the elements on the level on which one is standing only if there is no other possibility. It is also possible to assembly the personal protective equipment

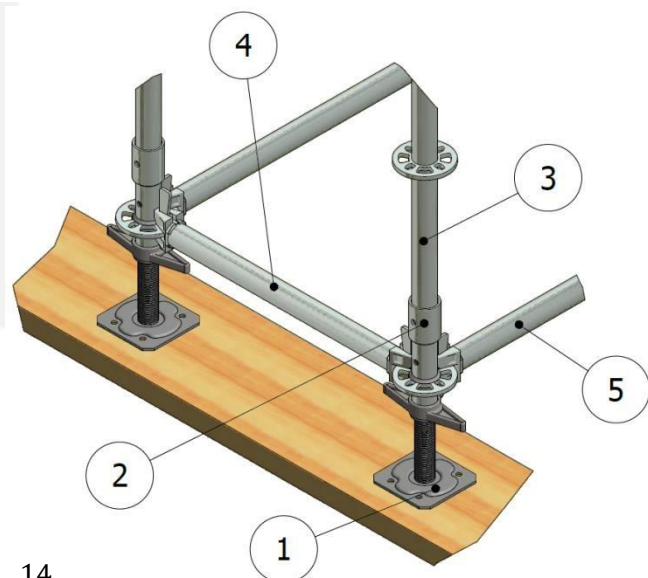


directly to the scaffolded structure. The method of execution is individual for each facility.

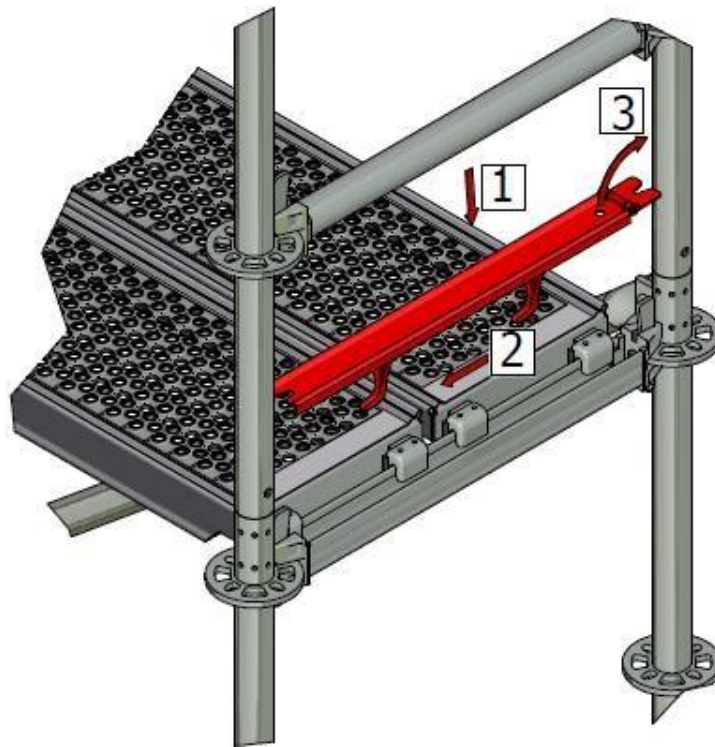
#### MAIN ELEMENTS



1. Adjustable steel washer
2. Initial element
3. Stand
4. Transverse transom of O or U type
5. Longitudinal O transom
6. Longitudinal handrail (O transom)
7. Front handrail (O transom)
8. Vertical bracing
9. Working platform
10. Circulation path platform
11. Curb
12. Anchorage



## ASSEMBLY OF PLATFORMS ON U TRANSOM



The platforms provided by the manufacturer for u-profile installation are not equipped with wind protection. They are protected with a special element as shown on the above sketches.

### PROTECTION BARRIERS

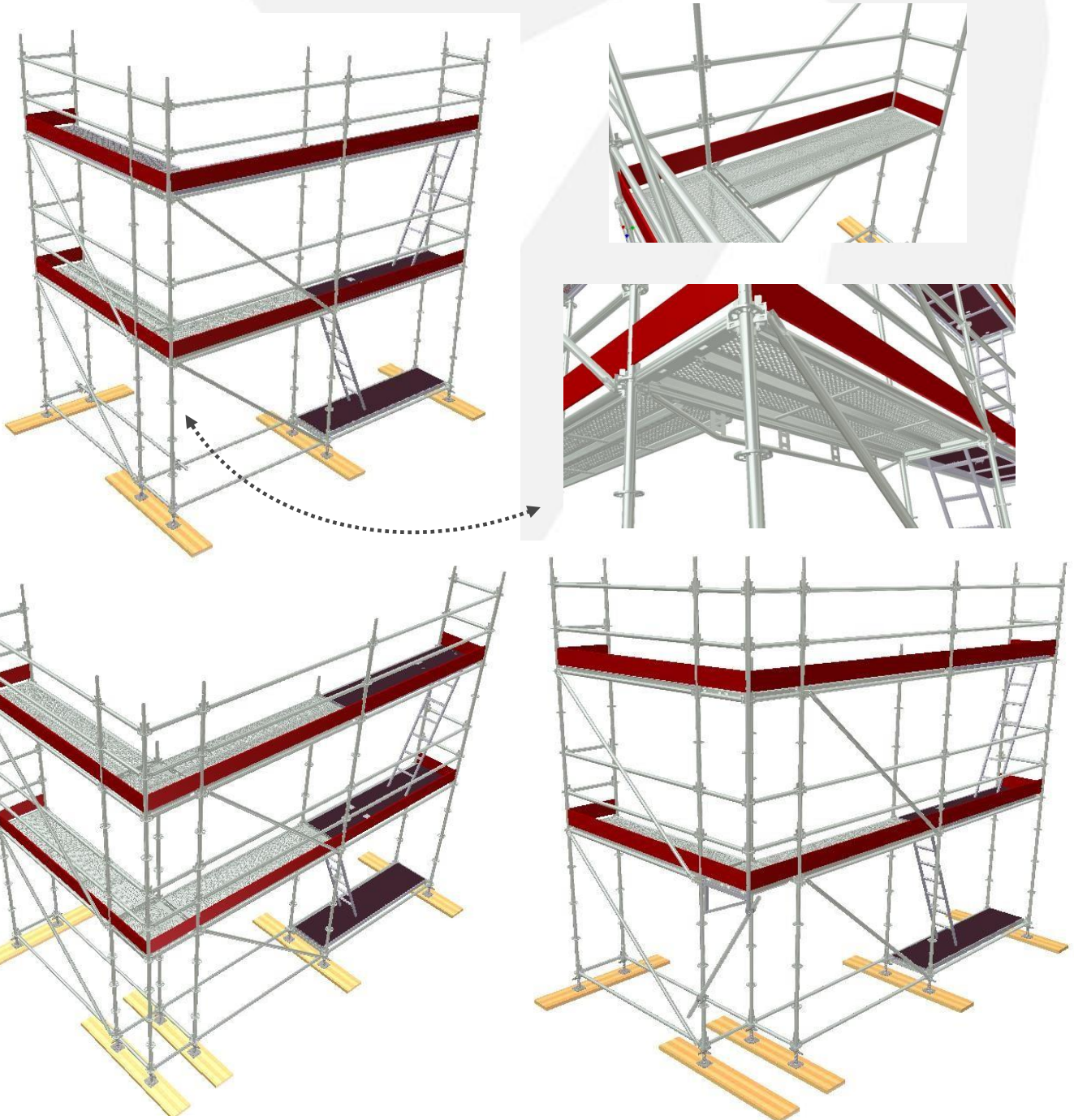
According to the legal requirements, every scaffolding section with a platform above 1m must be protected with curbs and handrails.



- o-transom should be assembled on the discs of the posts at a height of 0.5 m and 1 m above the level of the platform;
- it is allowed to omit handrails and curbs from the side of the building wall if the distance between the edge of the platform and the wall does not exceed 0.2 m and if the platform is less than 1.0 m above the ground level,
- protect the scaffolding edge platforms with a curb,
- it is not allowed to stand on the protective handrails.

#### FORMING OF CORNERS OF SCAFFOLDING

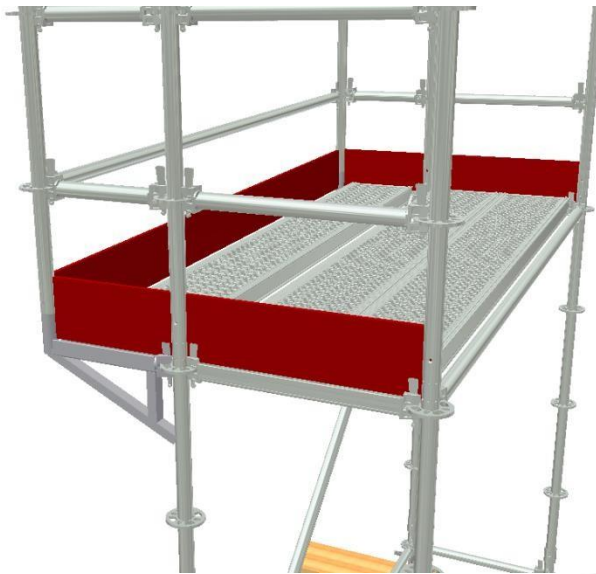
The scaffolding R+ system allows to easily create many types of corner connections. The most commonly used solutions are presented below.





## INCREASING THE WORKING AREA

If it is necessary to enlarge the working area, the consoles 0.76m or 0.36m are assembled, and the posts and transoms are attached to them. When using the 0.76 console, it must be supported with a pipe and rotating connections.

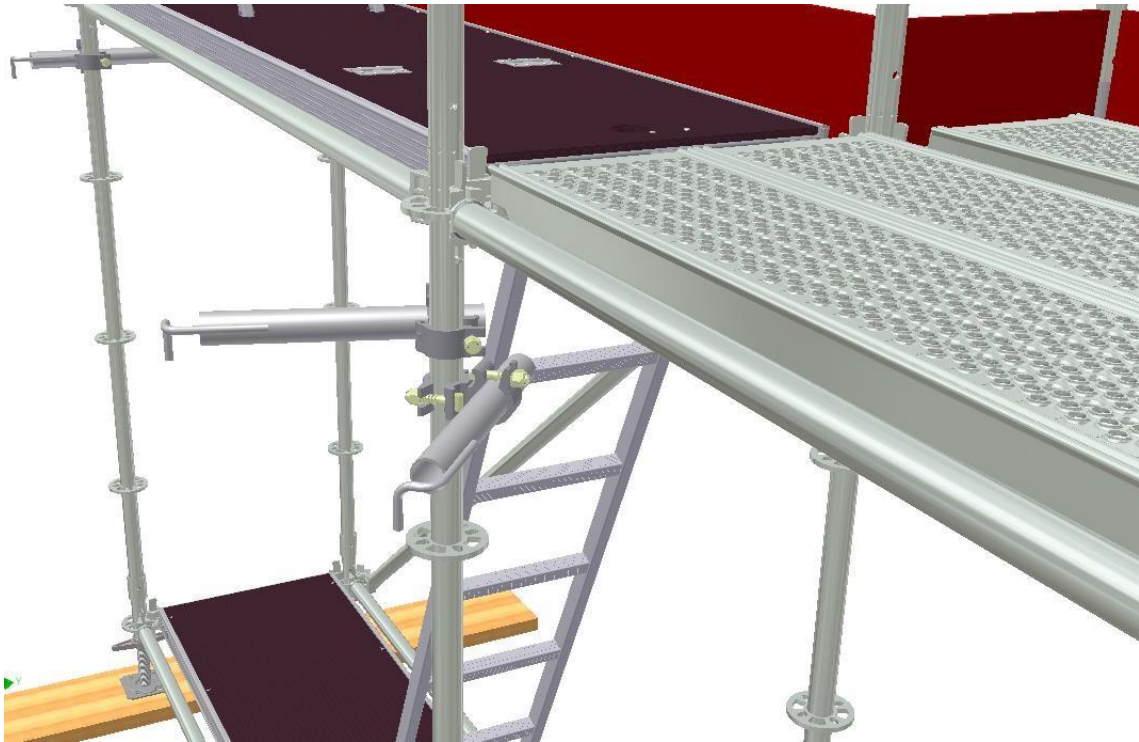


## ANCHORING OF SCAFFOLDING

In order to use the scaffolding safely, it is necessary to assembly the construction to the permanent elements of the building, starting with the anchoring process already during the preassembly stage.

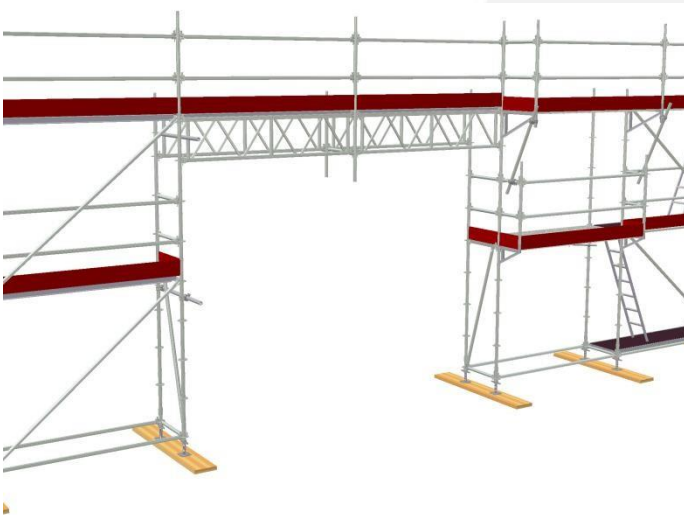
The scaffolding is assembled by means of anchor connectors, normal clamps, rotating clamps and anchor bolts as shown in the figures below.





#### GATE PASSAGE

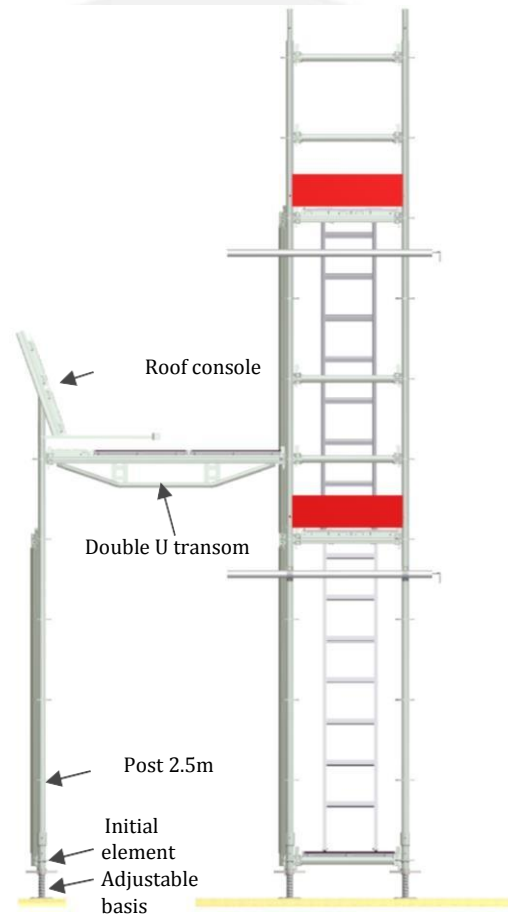
It is often necessary to carry out passages to the interior of buildings during renovation works. The solution to the problem is presented in the sketches below. The sketch does not show the protective roof required for passing. Clamp for cable clamping complete spring +





## PASSAGES UNDER SCAFFOLDING

When carrying out the construction works along urban pavements, it is necessary to carry out a safe transport route for pedestrians. An example of such a solution is shown in the sketch below.



The scaffolding must be anchored at the level of the platforms below and above the protective roof.

## ENTRANCES ON SCAFFOLDING

Traffic on the scaffolding is carried out by means of 3.07 and 2.57m temporary aluminium platforms.



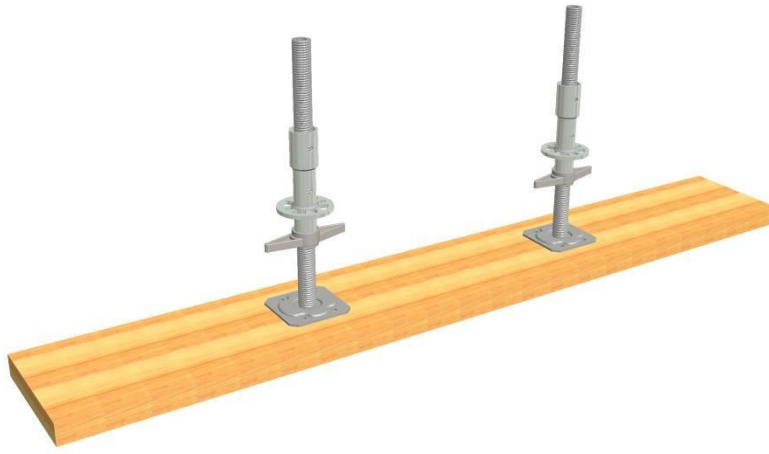
## ASSEMBLY PROCEDURE OF R+ SCAFFOLDING IN THE FAÇADE ARRANGEMENT

1. Start assembly of the scaffolding by laying wooden washers under adjustable bases [min. 2 bases on one washer] at the highest point of the ground at a distance corresponding to the future position of the posts.

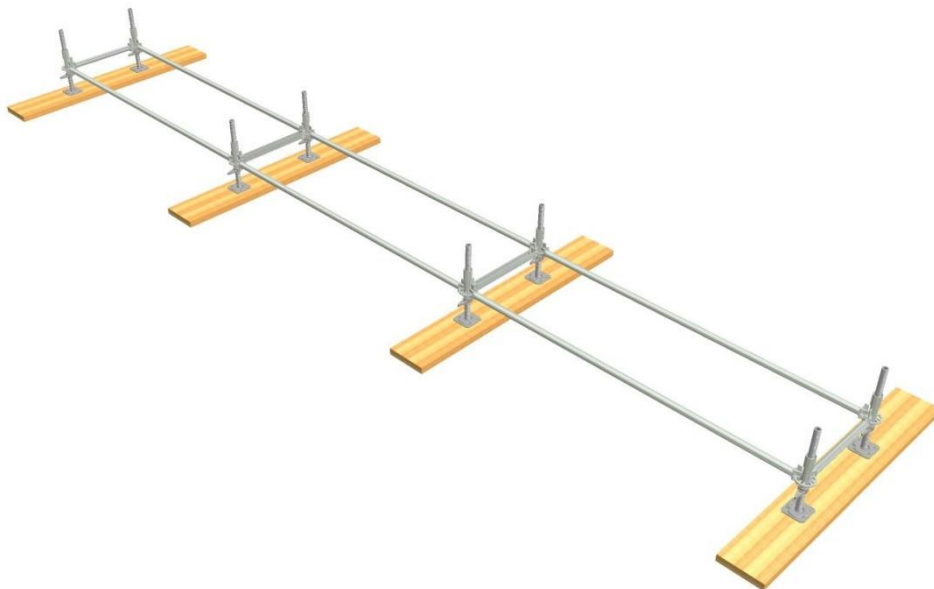


2. Insert the initial elements facing upwards into the adjustable bases.

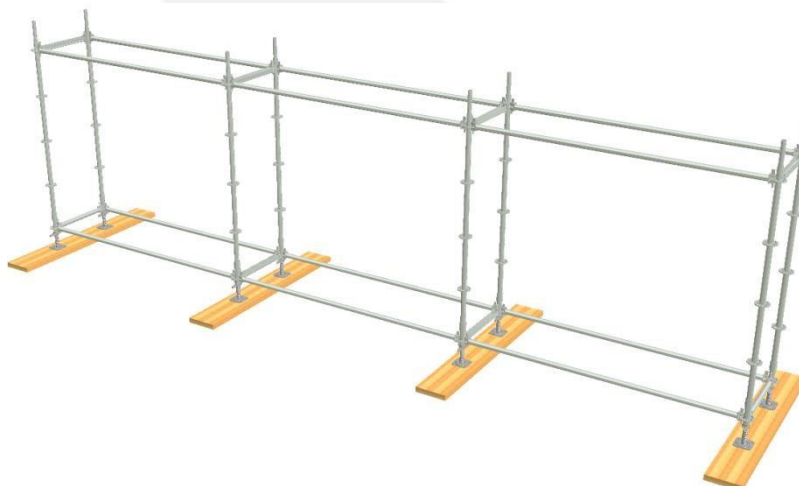




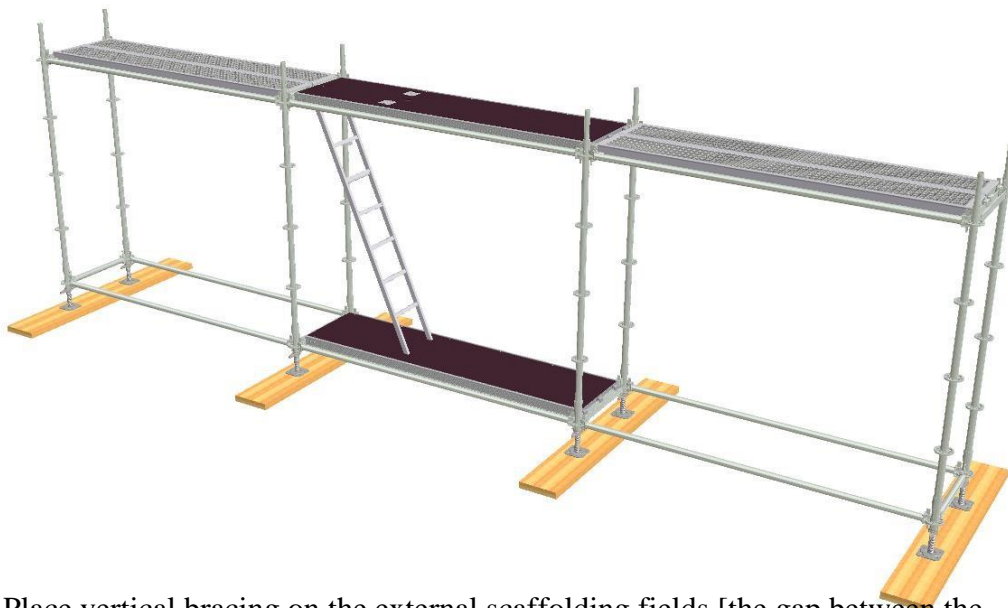
3. The initial elements are connected along the future scaffolding line by means of single O transoms [1,57m; 2,07m; 2,57m; 3,07m] and by O transoms or U transoms in case of planning of temporary platforms in the sections. Assembly of the transom is by hammering the wedge in the discs in the initial element. The first level should be perfectly levelled.



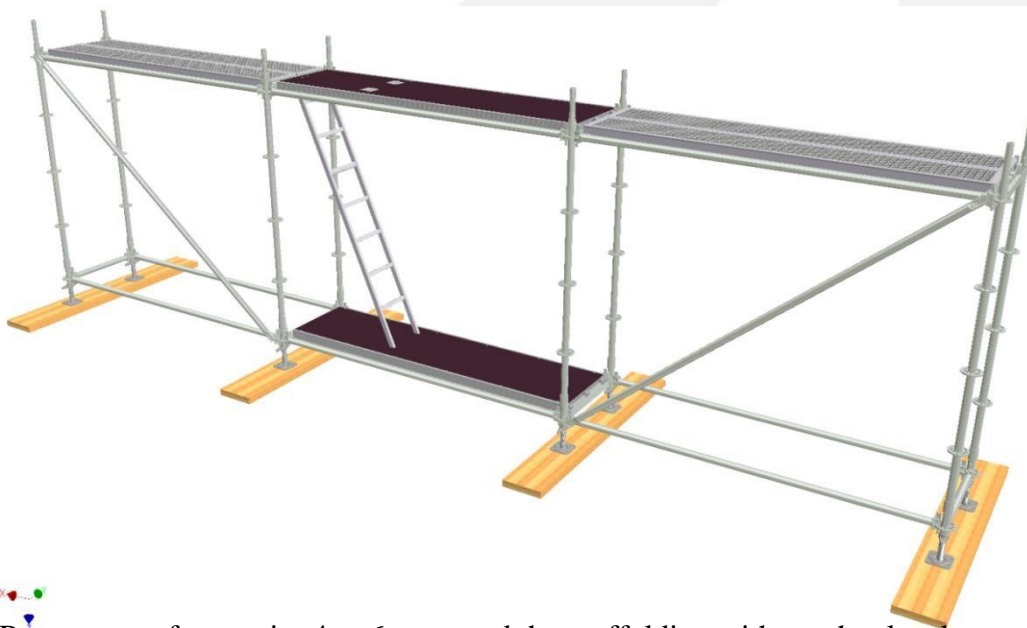
4. Insert posts in the initial elements at the desired height of the future section of the scaffolding and then clamp with O transoms at the height of 2 m, the same way as in step 3. [U transoms for assembly of future platforms].



5. Assembly the platforms on U transoms. Each platform, for safety reasons, should be protected as shown on page 10. [if there are no platforms to be assembled in the fields, use the horizontal bracing to the fields with vertical bracing].

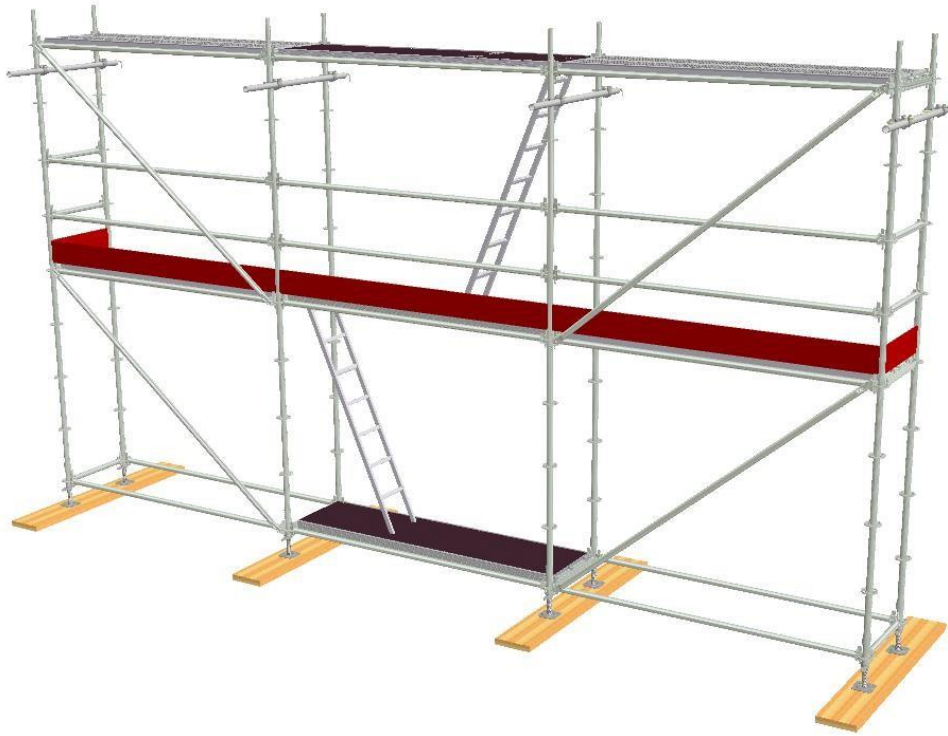


6. Place vertical bracing on the external scaffolding fields [the gap between the bracings may not be more than 3 fields].



7. Repeat steps from point 4 to 6 to extend the scaffolding with another level.
8. Starting from the second level [at a height of 4 m], anchor the scaffolding to the façade using anchoring connectors, normal connectors and eye screws. Anchoring must be carried out in real time as the next levels of the scaffolding are constructed.
9. Assembly horizontal O transoms at a height of 500 and 1000 mm above the level of the platforms to act as protective handrails.
10. Assembly the protective curbs of the scaffolding.





11. If necessary, protective roofs may be assembled at a height of the first level by extending the platforms and assembling a protective roof console. See page 14.
12. At the last level, assembly the posts with a length of 1m, and then clamp using O transoms at a height of 0.5 ore and 1.0m to form the protective handrails.



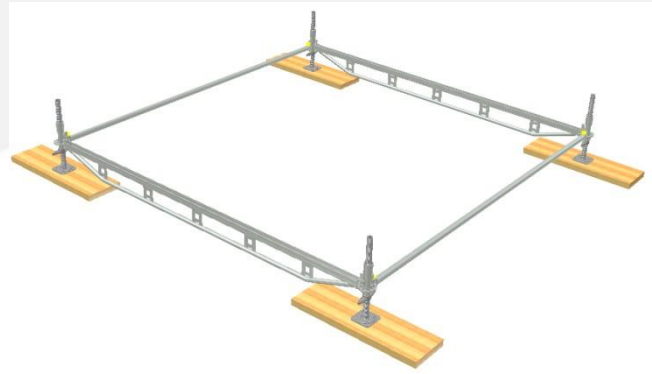


## TOWER SCAFFOLDING

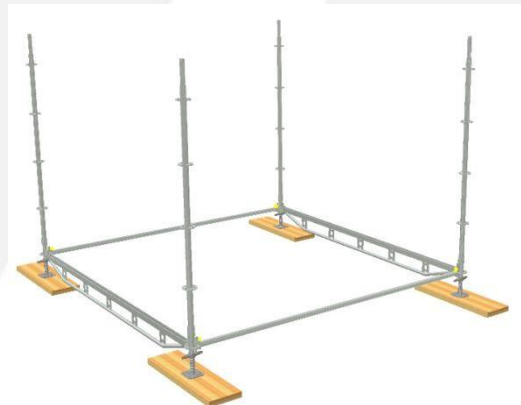
This type of scaffolding is often used as a surveillance scaffold or as a scaffolding for light installation works. It is also often used as a supporting structure for camera stands or as a bearing structure for loudspeakers during entertaining events. The scaffolding equipment may be used as a mobile scaffolding (drive-in).

Before assembly, make sure that the substrate has sufficient load capacity.

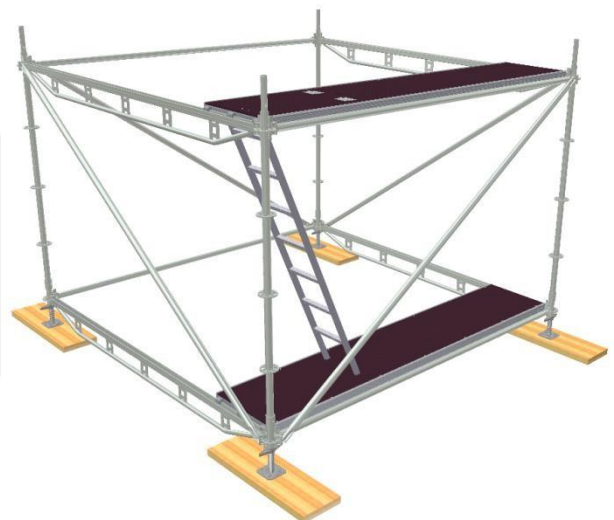
1. Place the articulated bases on the future spacing of the scaffolding together with the wooden washer.
2. Place the initial elements on the articulated bases and then clamp them with U transoms [in the case of planning the construction of platforms] or O transoms.
3. Level the resulting scaffolding frame.



4. Insert the posts.



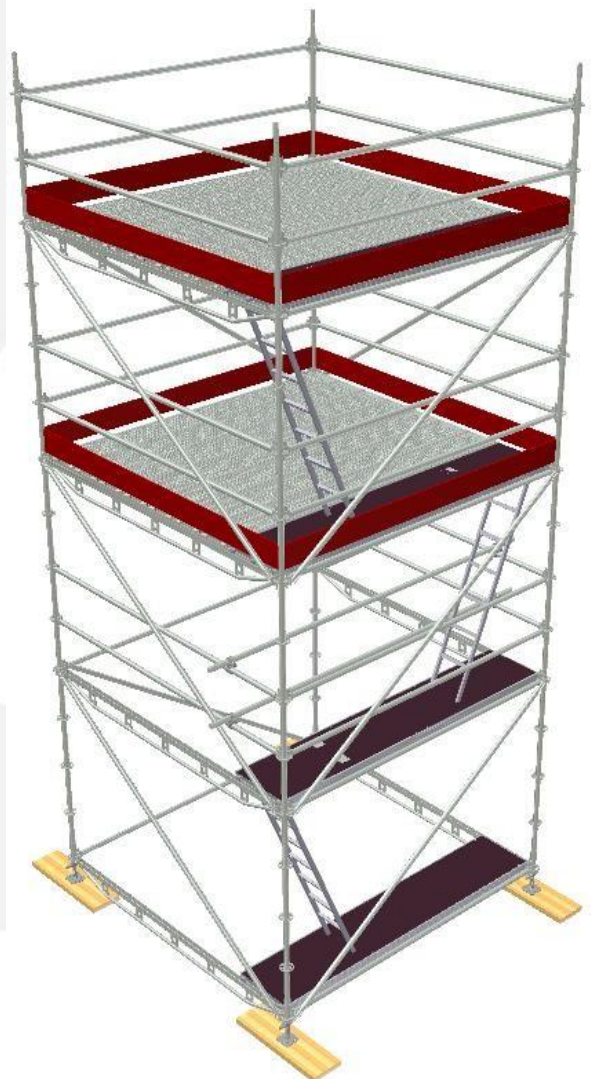
5. Insert the aluminium and plywood platform.
6. Assembly the O transoms and double U transoms, and then brace the scaffolding from 4 sides according to the requirements shown in the next figure.
7. Assembly the transport platform with the ladder.



8. Repeat the steps in the same way as in points 4,6,7
9. Assembly the handrails in the area of the temporary platform [internal handrail with a pipe and cross connections or rotating connections].
10. Carry out the next level of the scaffolding.
11. Assembly all platforms, curbs and protective handrails [O transoms] and the posts of a height of 0.1 m on the last level.

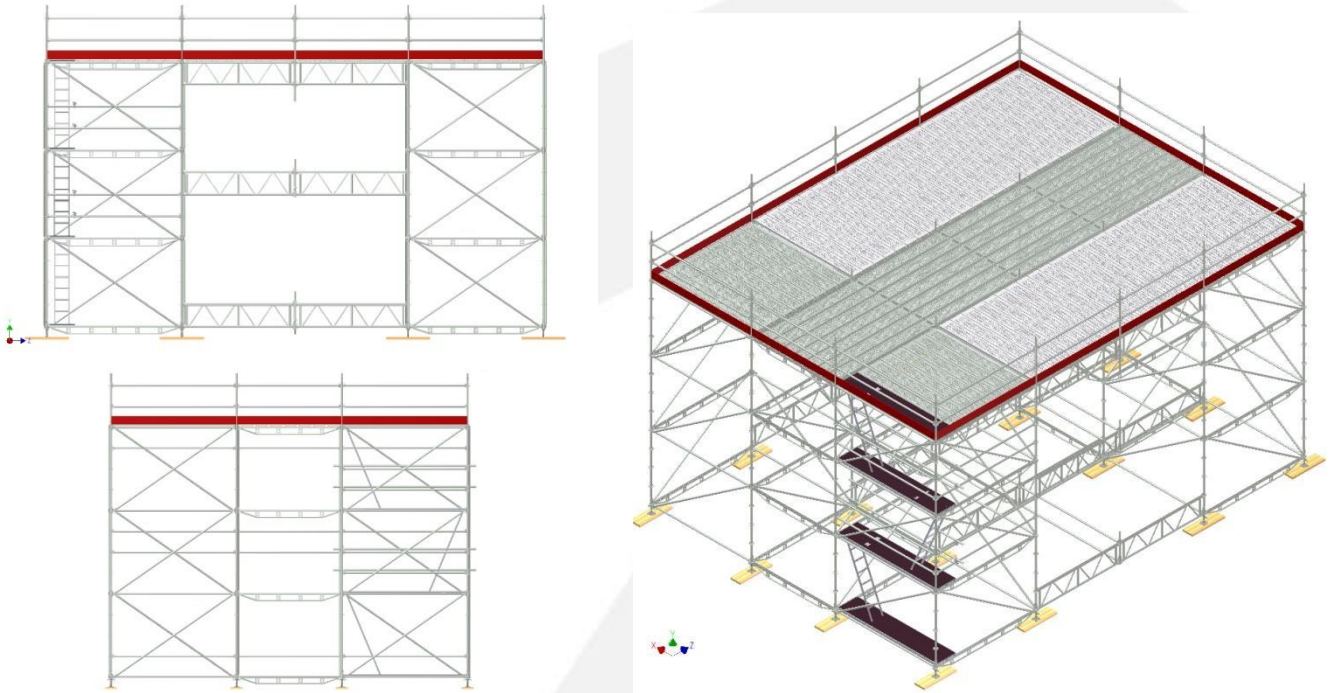
**When setting up the tower scaffolding, observe the rules:**

- When setting up the scaffolding outside the buildings, the ratio of the scaffolding height  $H$  to the smallest dimension of the base  $B$  must be less than or equal to 3.
- When setting the scaffolding inside buildings, the ratio of the scaffolding height  $H$  to the smallest dimension of the base  $B$  must be less than or equal to 4.
- Setting up a higher scaffolding requires a static design calculation.



## ELEVATED WORK PLATFORMS

The platforms are constructed in the same way as the tower scaffoldings, except that with the increase of the working area of the platform, we use the girders and connecting bolts to connect each tower. When constructing platforms, it is essential to follow the same rules as when constructing towers.

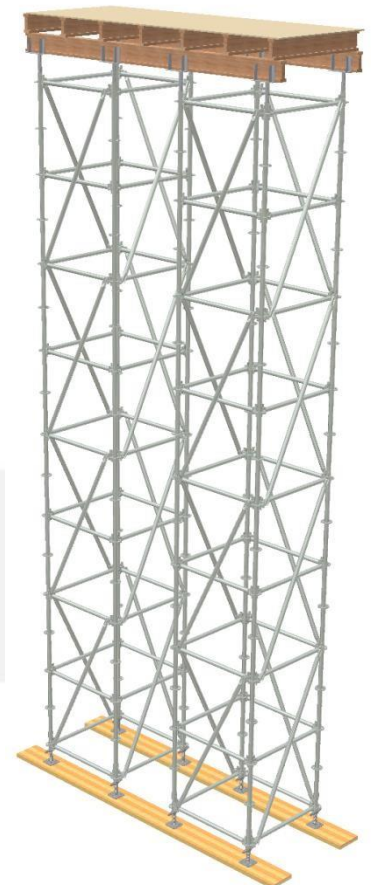


## BEARING SCAFFOLDING

Spatial bearing scaffoldings are load bearing supporting structures, perfect to support ceilings. They are assembled in a similar way to the tower scaffolding, with particular attention paid to the stiffening of the construction, the load capacity of the substrate and the distribution of loads from floors or other supported elements. Place wooden washers under each scaffolding foot to distribute pressure on the ground. Due to the transferred forces, the scaffolding must be braced at least every 4 fields. The bracings distribution should block the possibility of the scaffolding net displacement under load in each direction. If the scaffolding is used in this way, the posts without a pilot pipe should be used for the top row of the stands.

The pressure from the formwork girders must be centrally directed to the screw bases with the head. Protect the formwork girders against tipping.

The threaded heads supporting the wooden girders are placed on the top row of the stands, without the pilot caps. Assembly the

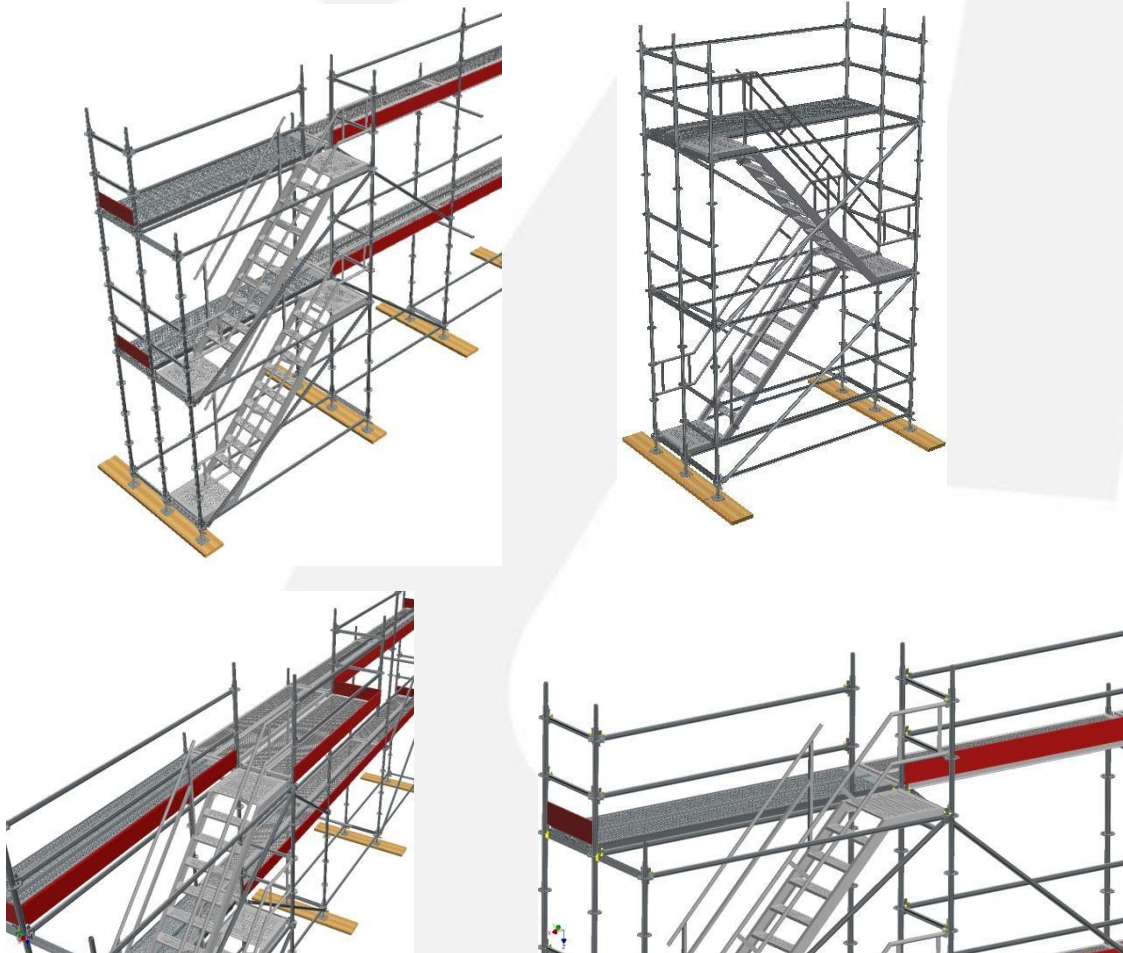




heads in order to extend the threaded screw so that it is sufficient to lower the heads and thus remove the elements of formwork and scaffolding. The screw bases should be removed at the lowest possible height for easy adjustment and subsequent dismantling of the scaffolding.

#### 4. EXTERNAL STAIRCASES

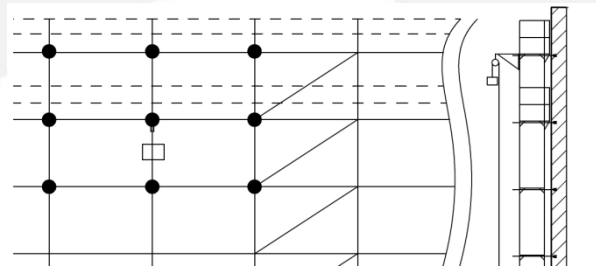
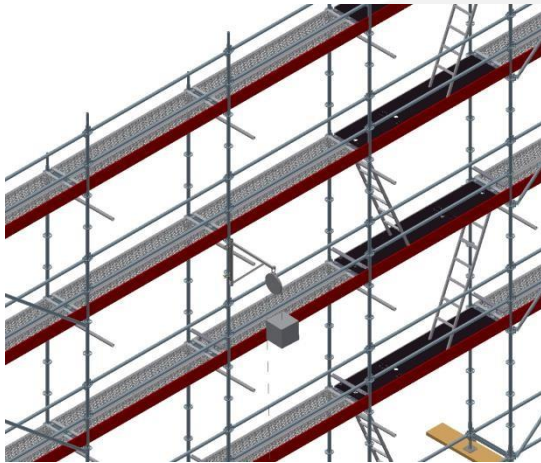
The staircases are used to provide comfortable vertical transport on the scaffolding. The staircase system requires a system of aluminium stairs and external and internal handrails. The stair panels are assembled instead of the temporary platforms; the stairs handrails are assembled instead of single handrails. Below, there are examples of assembled staircases.



Example 1 - the exit from the staircase is extended to a working platform carried out with a support of 0.73 m, supported by a bracing and steel platforms. Example 2 - the exit from the staircase is on the working platform, on which a pipe connector, post and handrails are used.

## 5. VERTICAL TRANSPORT OF MATERIALS

Materials required for work may be provided to the scaffolding using a block boom, a block and a winch. These elements must be assembled on the scaffolding, and the scaffolding must be anchored in accordance with the rules described in chapter 3, section 37. The maximum weight of the lifting elements may not exceed 150 kg. Below, there is a sketch showing the assembled winch. Be sure to anchor two adjacent stands on each side of the boom in the level and one below and above.

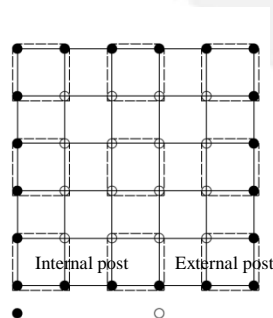
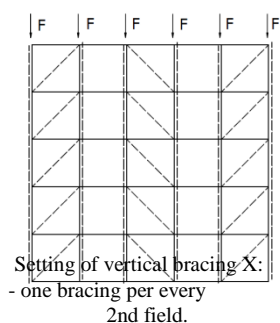


## 6. LOAD AND LOAD CAPACITY

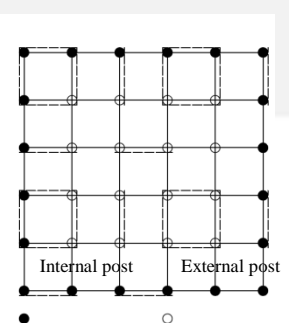
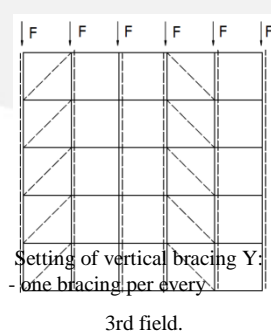
Maximum load capacity of the posts in the scaffolding space structure.

External posts												
Field length	0.73m		1.09m		1.57m		2.07m		2.57m		3.07m	
Bracing method	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y
Allowed load [kN]	34.2	29.4	41.0	38.6	40	39.3	39.5	39.4	38.5	38.1	38.1	37.6

Internal posts												
Field length	0.73m		1.09m		1.57m		2.07m		2.57m		3.07m	
Bracing method	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y
Allowed load [kN]	34.2	29.4	43.1	38.6	45	43.1	45.3	43.3	44.8	43.5	43.2	40.5



28





## Transoms load capacity

Name	Length	Concentrated load [kN]	Load evenly distributed [kN]
O transom	0.39m	14.9	84
O transom	0.73m	7.29	20
O transom	1.09m	5.76	6.1
O transom	1.40m	4.58	5
O transom	1.57m	2.95	2.5
O transom	2.07m	2.24	1.5
O transom	2.57m	1.8	0.72
O transom	3.07m	1.51	0.65
U transom	0.39m	16.1	60.3
U transom	0.73m	9.1	16.65
Reinforced U transom	1.09m	11.18	13.72
Reinforced U transom	1.40m	8.7	8.31
Double U transom	1.57m	12.6	16.15
Double U transom	2.07m	9.6	9.5
Double U transom	2.57m	7.8	6
Double U transom	3.07m	6.5	4.29
Girder	0.5x2.57m	15.5*	-
Girder	0.5x3.07m	11.5*	-
Girder	0.5x2.57m	27.5**	13.5***
Girder	0.5x3.07m	21.5**	11.1***
Girder	0.5x4.14m	17.3**	7.72***
Girder	0.5x5.14m	15.5**	5.4***
Girder	0.5x5.614m	10.8**	4.31***

\* No lateral stability of the girders on the upper line.

\*\* Transverse stabilization of the girders at half the length of the upper line.

\*\*\* Transverse stabilisation of girders with typical upper line over the entire length.

## Allowed load of module R+ scaffolding node

Type of load	Allowed value
Bending moment $M_{y,r,d}$ [kN/cm]	+/-94
Vertical lateral force $V_{z,r,d}$ [kN]	+/- 29.3
Bending moment $M_{z,r,d}$ [kN/cm]	+/-21.8
Horizontal lateral force $V_{z,r,d}$ [kN]	+/-9.27
Turning moment $M_{t,r,d}$ [kN/cm]	+/-50.2
Normal force $N_{r,d}$ [kN]	+/-29.2

## Platform load

Platform load class acc. to EN12811						
Platform type	3.07m	2.57m	2.07m	1.57m	1.09m	0.73m
Steel platform 0.32	Cl. 4 3.0KN/m2	Cl. 5 4.5KN/m2	Cl. 6 6KN/m2	Cl. 6 6KN/m2	Cl. 6 6KN/m2	Cl. 6 6KN/m2
Aluminium and plywood platform 0.61	Cl. 3 2.0KN/m2	Cl. 3 2.0KN/m2	Cl. 3 2.0KN/m2	Cl. 3 2.0KN/m2	Cl. 3 2.0KN/m2	Cl. 3 2.0KN/m2

### Connectors load capacity.

Index	Name	Allowed connectors load capacity.
ZNN-ZB02CH	CROSS CONNECTOR SET.	$F < 9.1 \text{ kN}$
ZNN-ZB01	ROTATING CONNECTOR SET.	$F < 5.9 \text{ kN}$
RSR-22001	DOUBLE WEDGE CONNECTOR	$F < 4.0 \text{ kN}$
	NORMAL WEDGE CONNECTOR	$F < 6.8 \text{ kN}$
	DISC CONNECTOR	$\sum F < 11.1 \text{ kN}$







### Allowed span for wooden or board transition platforms.


Allowed span [m] for wooden or board transition platforms acc. to tab. 8, DIN 4420,T1						
Load class	Platform or board width [cm]	Platform or board thickness				
		3.0	3.5	4.0	4.5	5.0
1,2,3	20	1.25	1.50	1.75	2.25	2.5
	24/28	1.25	1.75	2.25	2.5	2.75
4	20	1.25	1.5	1.75	2.25	2.5
	24/28	1.25	1.75	2.00	2.25	2.5
5	20/24/28	1.25	1.25	1.5	1.75	2.0
6	20/24/28	1.00	1.25	1.25	1.5	1.75


### Load capacity of adjustable washers


Allowed vertical load	Washer height	Allowed unscrewing of the nut from the base plate				
		20cm	30cm	40cm	50cm	60cm
	0.4m	40kN	-	-	-	-
	0.6m	40kN	29kN	22kN	-	-
	0.8m	40kN	29kN	22kN	17kN	15kN


## 7. LIST OF ELEMENTS OF R+ SCAFFOLDING

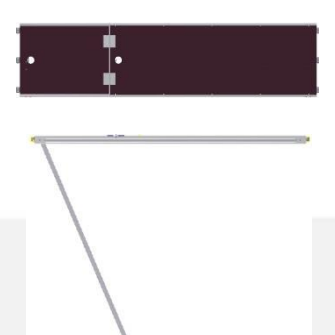
Element name	Index	Weight	
INITIAL ELEMENT	RSR-03000	1.5	
DOUBLE O TRANSOM 1.57m	RSR-01157	9.3	
DOUBLE O TRANSOM 2.07m	RSR-01207	12.1	
DOUBLE O TRANSOM 2.57m	RSR-01257	15	
DOUBLE O TRANSOM 3.07m	RSR-01307	17.9	
HORIZONTAL O TRANSOM 0.73m ST.	RSR-02073	3.4	
HORIZONTAL O TRANSOM 1.09m ST.	RSR-02109	4.7	
HORIZONTAL O TRANSOM 1.57m ST.	RSR-02157	6.2	
HORIZONTAL O TRANSOM 2.07m ST.	RSR-02207	7.9	
HORIZONTAL O TRANSOM 2.57m ST.	RSR-02257	9.7	
HORIZONTAL O TRANSOM 3.07m ST.	RSR-02307	11.5	
TRANSVERSE U TRANSOM 0.73m	RSR-03073	3.1	
REINFORCED TRANSVERSE U TRANSOM 1.09m	RSR-03109	6.4	
DOUBLE U TRANSOM 1.57m	RSR-03157	9.8	
DOUBLE U TRANSOM 2.07m	RSR-03207	12.8	
DOUBLE U TRANSOM 2.57m	RSR-03257	15.9	
DOUBLE U TRANSOM 3.07m	RSR-03307	18.9	
POST 1.0m R+	RSR-04100	5.4	
POST 1.5m R+	RSR-04150	7.8	
POST 2.0m R+	RSR-04200	10	
POST 3.0m R+	RSR-04300	14.6	
POST 4.0m R+	RSR-04400	19.1	
VERTICAL BRACING 0.73x2.00m	RSR-05073	8.2	
VERTICAL BRACING 1.09x2.00m	RSR-05109	8.6	
VERTICAL BRACING 1.57x2.00m	RSR-05157	9.4	
VERTICAL BRACING 2.07x2.00m	RSR-05207	10.5	
VERTICAL BRACING 2.57x2.00m	RSR-05257	11.6	
VERTICAL BRACING 3.07x2.00m	RSR-05307	12.8	


PROTECTION OF PLATFORMS 0.36m	RSR-09036	0.6	
PROTECTION OF PLATFORMS 0.73m	RSR-09073	1.3	
PROTECTION OF PLATFORMS 1.09m	RSR-09109	1.9	

STEEL PLATFORM 0.32x0.73m	RFS-84073	5.8	
STEEL PLATFORM 0.32x1.09m	RFS-84109	8.0	
STEEL PLATFORM 0.32x1.57m	RFS-84157	11.0	
STEEL PLATFORM 0.32x2.07m	RFS-84207	14.3	
STEEL PLATFORM 0.32x2.57m	RFS-84257	16.3	
STEEL PLATFORM 0.32x3.07m	RFS-84307	18.9	

STEEL PLATFORM 0.32x2.07m + CROSSBAR	RFS-85207	14.8	
STEEL PLATFORM 0.32x2.57m + CROSSBAR	RFS-85257	16.8	
STEEL PLATFORM 0.32x3.07m + CROSSBAR	RFS-85307	19.4	

ALUMINIUM PLATFORM WITH PLYWOOD 1.09x0.61m	RFA-61109	10.5	
ALUMINIUM PLATFORM WITH PLYWOOD 1.57x0.61m	RFA-61157	14.7	
ALUMINIUM PLATFORM WITH PLYWOOD 2.07x0.61m	RFA-61207	17.9	
ALUMINIUM PLATFORM WITH PLYWOOD 2.57x0.61m	RFA-61257	20.8	
ALUMINIUM PLATFORM WITH PLYWOOD 3.07x0.61m	RFA-61307	24.0	

ALUMINIUM AND PLYWOOD PLATFORM, TEMPORARY WITH LADDER 2.57x0.61m	RFA-60257	27.7	
ALUMINIUM AND PLYWOOD PLATFORM, TEMPORARY WITH LADDER 3.07x0.61m	RFA-60307	30.7	

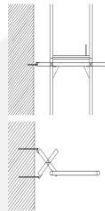
ANCHORING CONNECTOR WITH HOOK 0.4 m	RFS-17040	1.5	
ANCHORING CONNECTOR WITH HOOK 1.3m	RFS-17130	4.9	
ANCHORING CONNECTOR WITH HOOK 3.0 m	RFS-17300	11	

## 8. ASSEMBLY SCHEME OF R+ SCAFFOLDING

THE ANCHORS AND BRACKETS LAYOUT FOR THE MODULAR R+ SCAFFOLDING NOT COVERED, TO  
A HEIGHT OF 34 M.

Scaffolding without cover, façade closed\*  
Variant: Consoles 0.39m from the inside. Load  
on the working platform 2 kN/m<sup>2</sup>. Allowed  
screwing out of the based 0.2m.

Façade filling type	Closed façade		
Anchors vertical distance	8m		
Anchors horizontal distance	Every second field.		
Maximum anchor force		2.54	
		5.66	
Maximum post force	Internal post	17.1	01
	External post	17.1	



- Anchor connecting two stands

- Double anchor V



- Single anchor



- Double anchor V, one for every 5 fields, horizontally



- Vertical bracing



- Vertical bracing from the wall

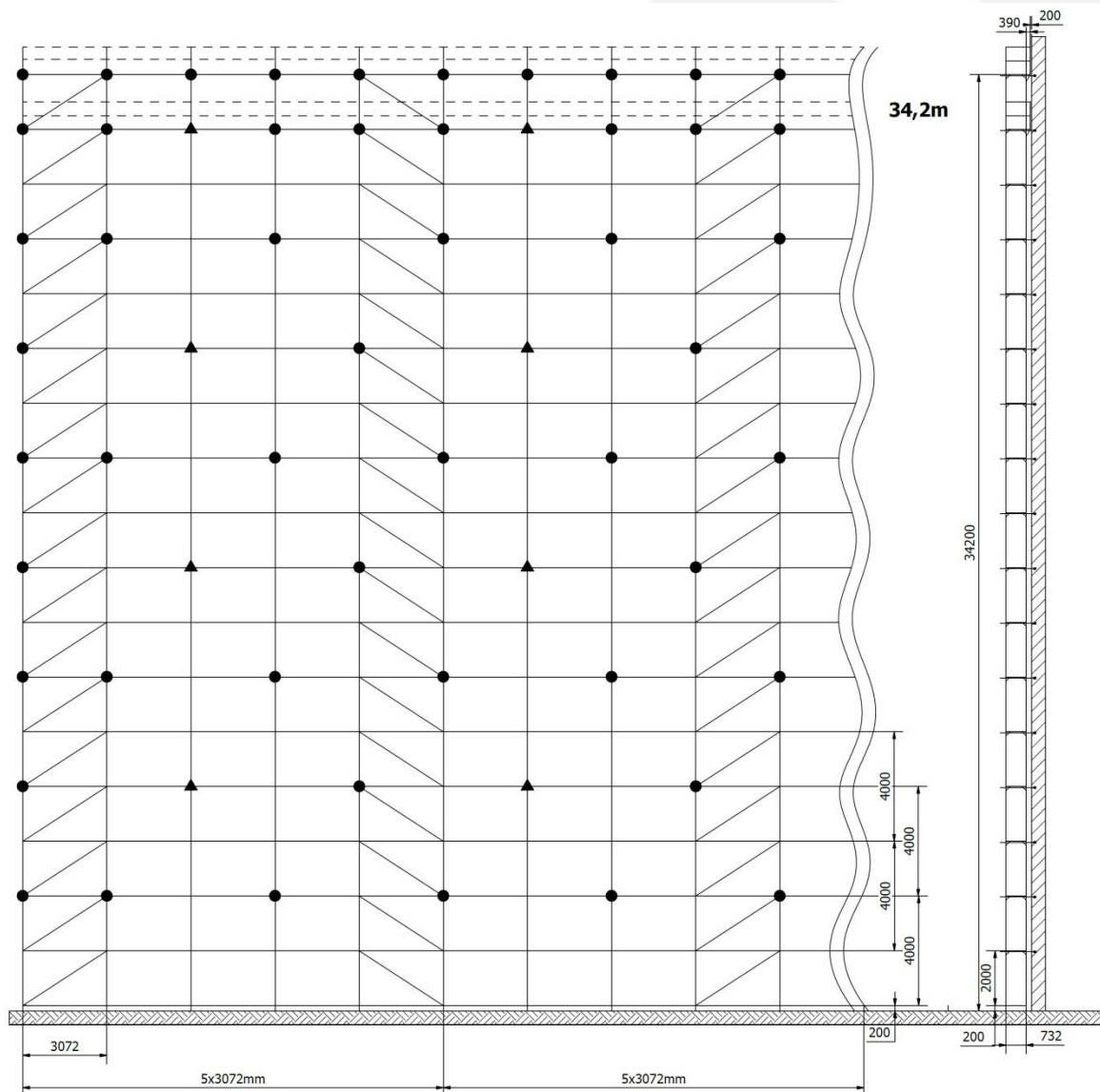


- Horizontal transom



- Protective handrails

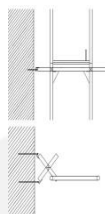
\* The façade is closed when the number of holes is less than 20% of the façade surface area.





## THE ANCHORS AND BRACKETS LAYOUT FOR THE MODULAR R+ SCAFFOLDING NOT COVERED, TO A HEIGHT OF 34 M.

Scaffolding without cover, façade open\*  
Variant: Consoles 0.39m from the inside. Load  
on the working platform 2 kN/m<sup>2</sup>. Allowed  
screwing out of the based 0.2m.



- Anchor connecting two stands

- Double anchor V



- Single anchor



- Double anchor V, one for every 5 fields, horizontally



- Vertical bracing



- Vertical bracing from the wall



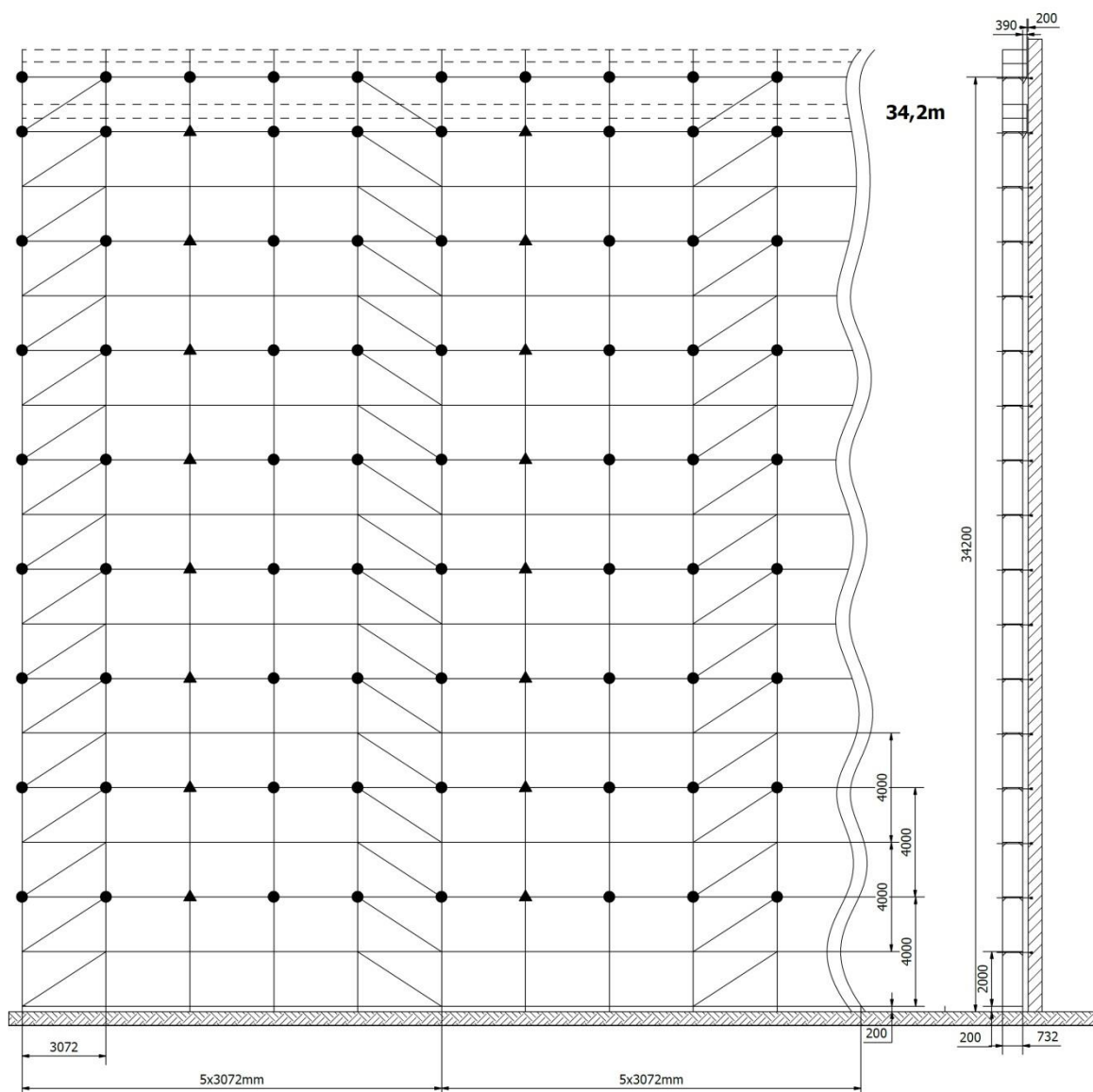
- Horizontal transom



- Protective handrails

Façade filling type	Open façade		
Anchors vertical distance	4m		
Anchors horizontal distance	In every field		
Maximum anchor force		1.55	
	— —	6.91	
Maximum post force	Internal post	17.1	02
	External post	17.1	

\* The façade is open when the number of holes is less than 60% of the façade surface area.

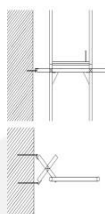


## THE ANCHORS AND BRACKETS LAYOUT FOR THE MODULAR R+ SCAFFOLDING NOT COVERED, TO A HEIGHT OF 34 M.

Façade filling type	Closed façade		
Anchors vertical distance	4m		
Anchors horizontal distance	In every field		
Maximum anchor force		1.50	
		3.34	
Maximum post force	Internal post	17.1	03
	External post	17.1	

Scaffolding without cover, façade closed\*  
Variant:

Consoles 0.39m from the inside, field 1.09m. Load on the working platform 2 kN/m<sup>2</sup>. Allowed screwing out of the based 0.2m.



- Anchor connecting two stands

- Double anchor V

\* The façade is closed when the number of holes is less than 20% of the façade surface area.



- Single anchor



- Double anchor V, one for every 5 fields, horizontally



- Vertical bracing



- Vertical bracing from the wall



- Horizontal transom



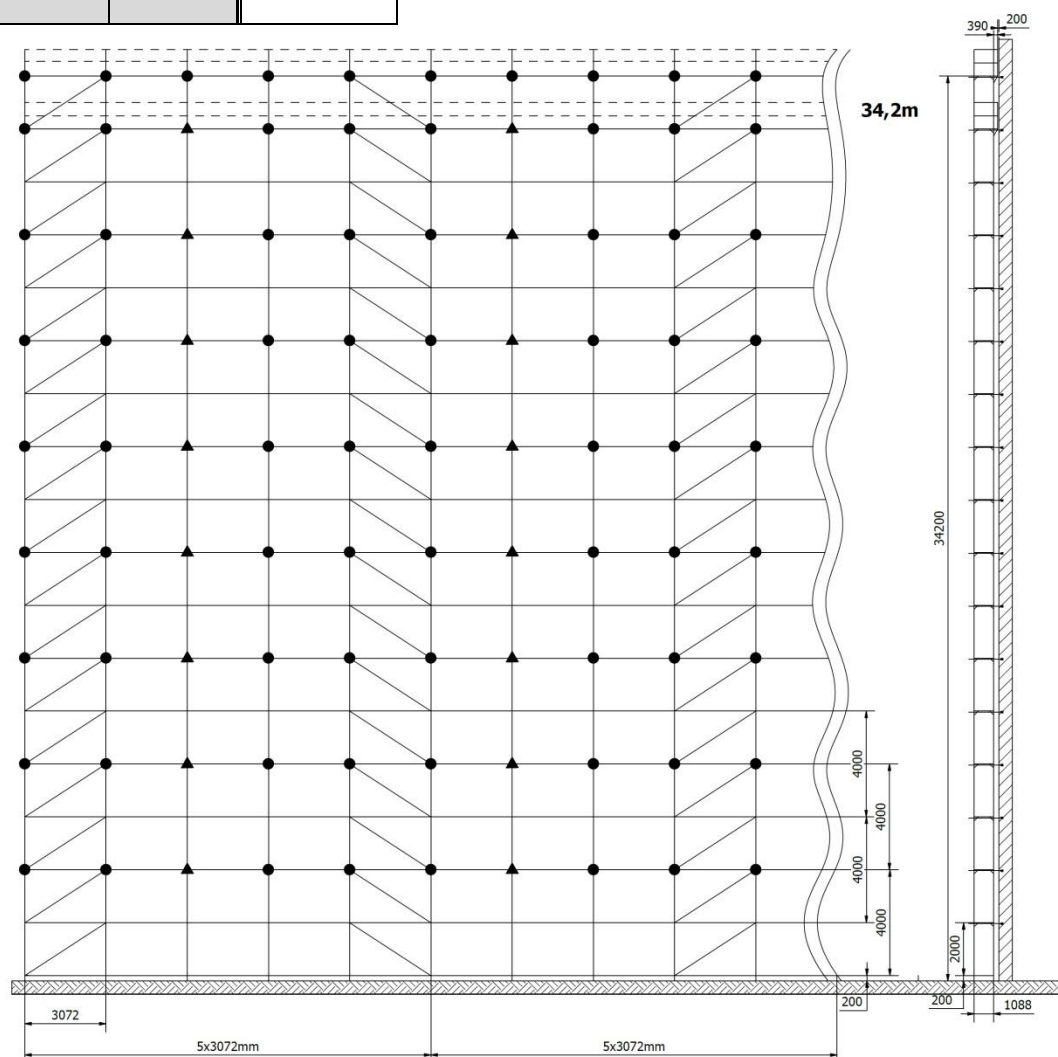
- Protective handrails

Façade filling type	Open façade		
Anchors vertical distance	4m		
Anchors horizontal distance	In every field		
Maximum anchor force		1.5	
		6.73	

Scaffolding without cover, façade open\* Variant: Consoles 0.39m from the inside, field 1.09m. Load on the working platform 2 kN/m<sup>2</sup>. Allowed screwing out of the based 0.2m.

\* The façade is open when the number of holes is less than 60% of the façade surface area.

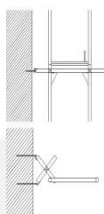
Maximum post force	Internal post	26.9	04
	External post	26.9	



## THE ANCHORS AND BRACKETS LAYOUT FOR THE MODULAR R+ SCAFFOLDING TO A HEIGHT OF 34 M.

Façade filling type	Closed façade		
Anchors vertical distance	4m		
Anchors horizontal distance	In every field		
Maximum anchor force		2.28	
	⊥	8.85	
Maximum post force	Internal post	13.6	
	External post	13.6	05

Scaffolding covered with net, façade closed\*  
Variant: Consoles 0.39m from the internal side field 0.73m. Load on the working platform 2 kN/m<sup>2</sup>. Allowed screwing out of the based 0.2m.



- Anchor connecting two stands

- Double anchor V



- Single anchor



- Double anchor V, one for every 5 fields, horizontally



- Vertical bracing



- Vertical bracing from the wall



- Horizontal transom



- Protective handrails

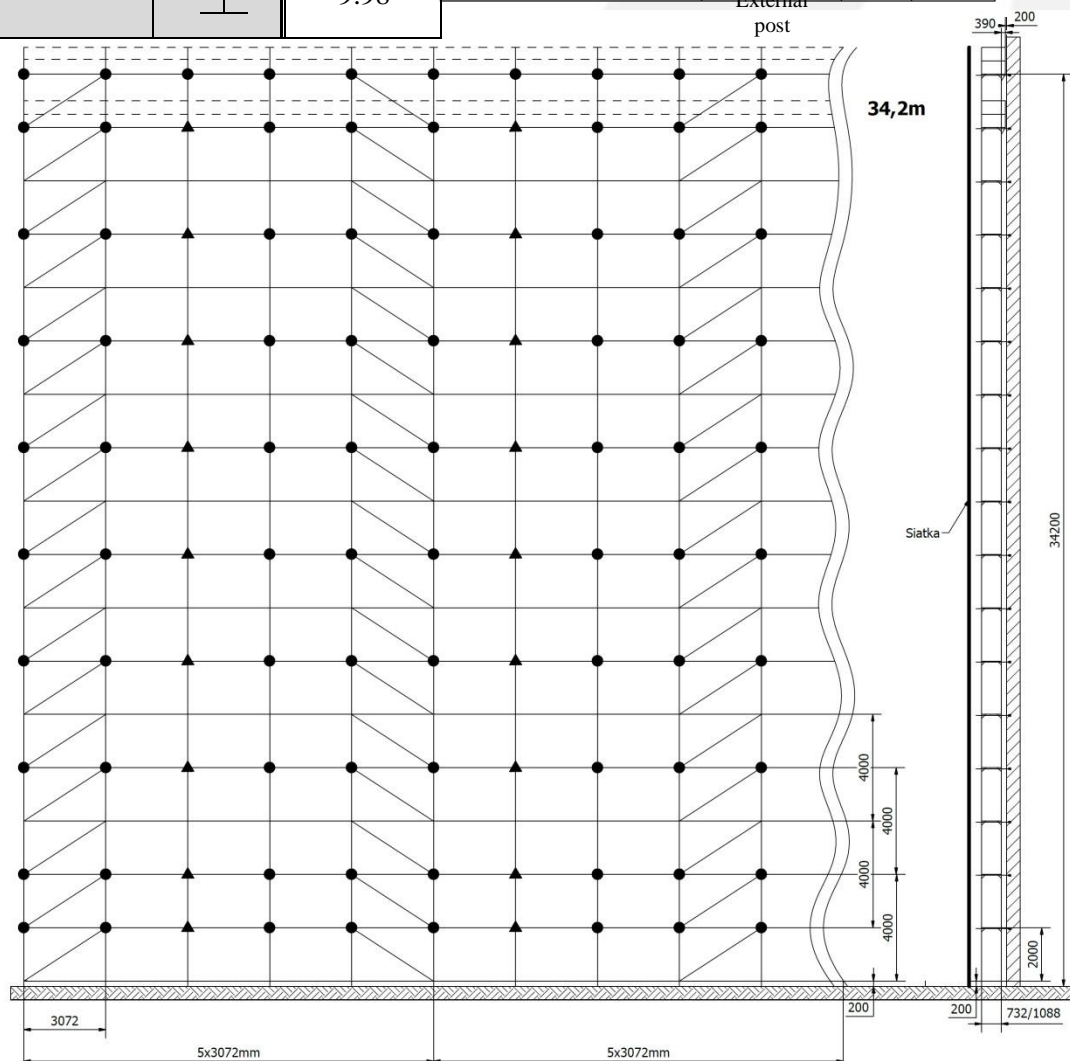
\* The façade is closed when the number of holes is less than 20% of the façade surface area.

Façade filling type	Closed façade		
Anchors vertical distance	4m		
Anchors horizontal distance	In every field		
Maximum anchor force		2.32	
	⊥	9.98	

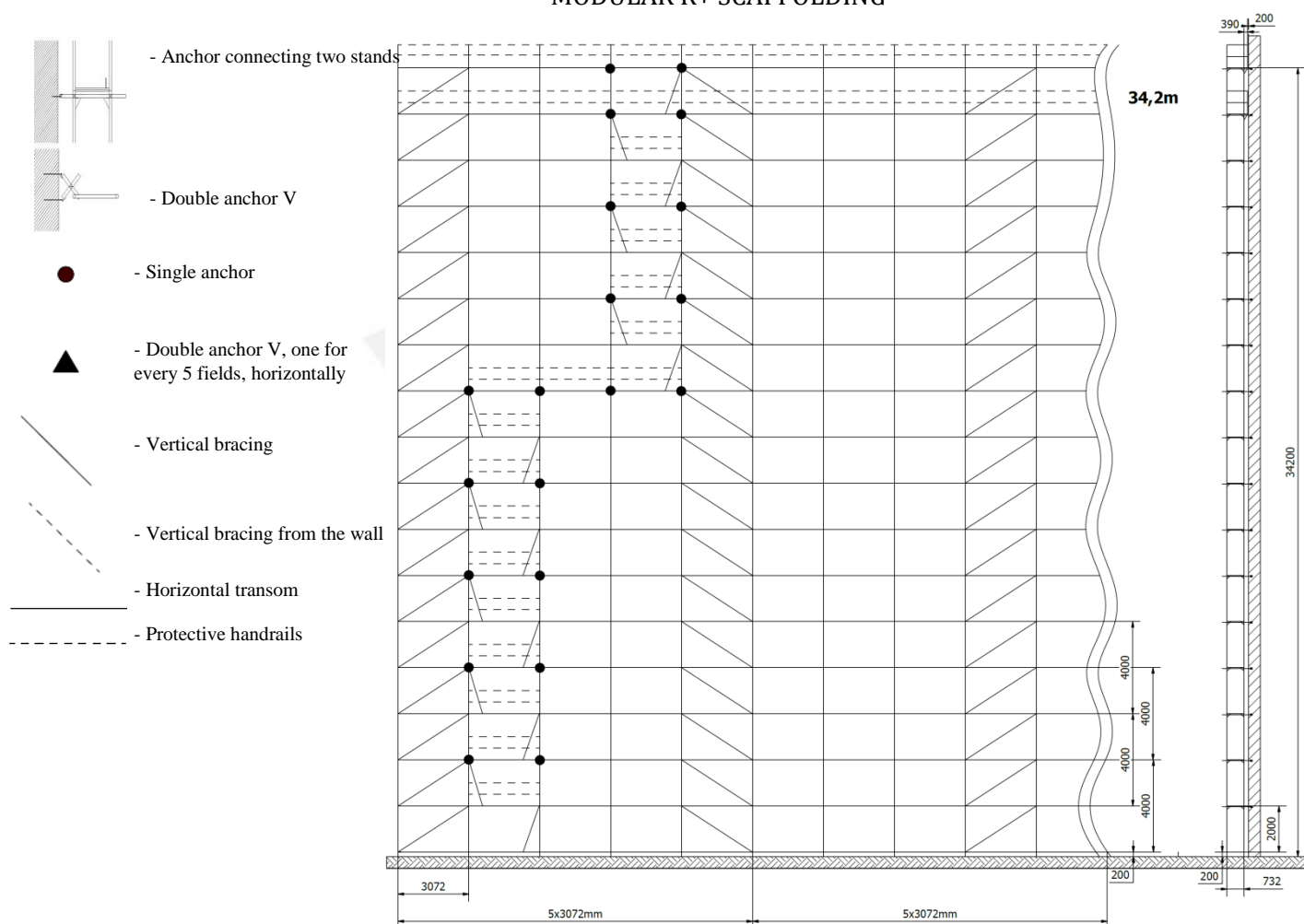
Scaffolding covered with net, façade closed\*  
Variant: Consoles 0.39m from the internal side field 1.09m. Load on the working platform 2 kN/m<sup>2</sup>. Allowed screwing out of the based 0.2m.

Maximum post force

Internal post	25.4	
External post	25.4	06



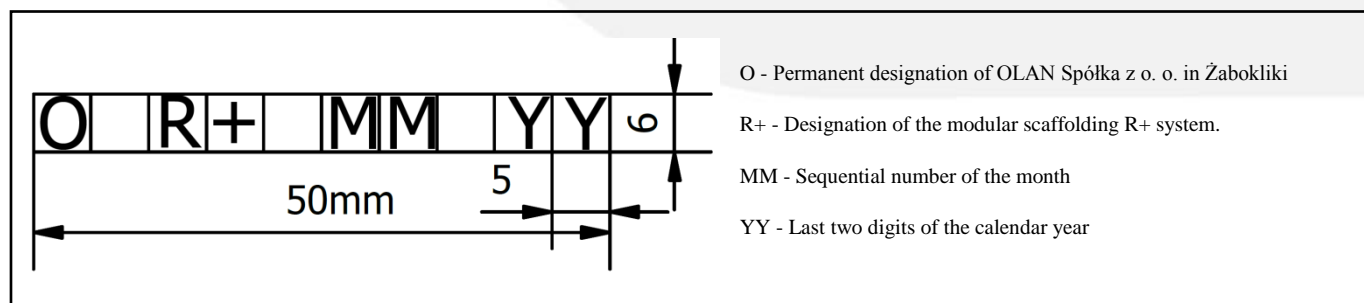
## THE LAYOUT OF THE ANCHORS AND THE BRACINGS FOR CIRCULATION PATHS FOR THE MODULAR R+ SCAFFOLDING



**Note:** Static calculations of the setting variants shown on the sketches have been made taking into account the loads according to PN-EN 1004. Setting versions with the net include loads according to EN12811:2007. The elements were dimensioned according to PN-EN 1993. The force values given in the diagrams below are calculation values and contain safety factors.

## 9. MARKING SYSTEM FOR THE MODULAR R+ SCAFFOLDING

OLAN Spółka z o.o. marks all manufactured products in order to identify the product in the use phase [characteristics imprint to a depth of approximately 0.7 mm], in addition, manufacturer's or customer's labels are stuck on the products according to individual arrangements. The scheme of designation is shown below.





## 11. PROTOCOL OF ACCEPTANCE OF SCAFFOLDING

.....  
city, date

### PROTOCOL OF ACCEPTANCE OF SCAFFOLDINGS

Scaffolding characteristics			
Scaffolding type			
Address of a construction site:		Scaffolding location:	
Scaffolding dimensions:			
Scaffolding purpose:			
Allowable load on the scaffolding working platforms [kN/m <sup>2</sup> ]			
Scaffolding user:			
Scaffolding assembly			
Assembling company name:			
Assembler full name:			
Assembler permission no.:		Assembler telephone number:	
The assembly was carried out in accordance with the requirements of:	<input type="checkbox"/> Operation and maintenance manuals	<input type="checkbox"/> Individual design:	
Earthings measurement results			
Scaffolding acceptance and permission for use			
Full name of a person entitled to accept:			
Company:		Member number of the Chamber of Construction Engineers:	
Date of provision the scaffolding for use:			

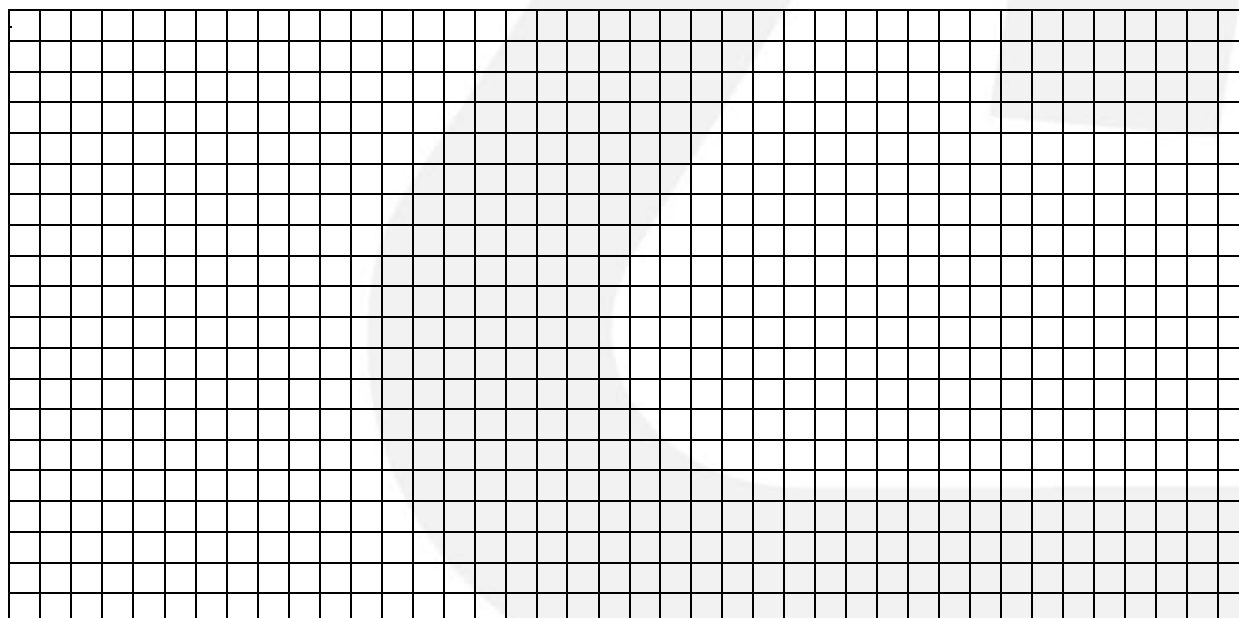
The signatures below confirm that the scaffolding has been assembled in accordance with all legal requirements and Polish Standards.

Assembler	Accepting person:

Scaffolding inspection table\*:

No.	Date	Inspection type	Signature

Scaffolding location sketch:



\*Regulation of the Minister of Infrastructure of 6 February 2003 on occupational health and safety during construction works § 127. 1. The scaffolding and mobile working work platforms should be always checked by the construction manager or authorized person, after a strong wind, precipitation and other factors posing a risk to the safety of the work and working breaks longer than 10 days and periodically, at least once a month. 2. The scope of the activities covered by the inspection referred to in section 1 is specified in the manufacturer's manual or individual design.



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