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1. SCAFFOLDING TECHNICAL DESCRIPTION

1.1. Technical data for standard RAM scaffolding

- Maximum height of the standard scaffolding – 24 m
- Scaffolding length – to be configured by putting together bays with lengths 2.07; 2.57; 3.07 m
- Scaffold width (without bracket) – 0.732 m
- Height of the base frame – 2.0 m
- Platform maximum load 2.0 kN/m²; it possible to make platforms with load-bearing capacity of 4.5 kN/m²
- Possibility of using expanding brackets
- Possibility of moving scaffold axis using brackets
- Possibility of putting mesh on the scaffold
- Possibility of using scaffold hoist arm with load-bearing capacity of 150 kg
- Possibility of obstacle avoidance using truss girders

1.2. Intended use of frame scaffolding

Frame scaffolding is intended for the following works:

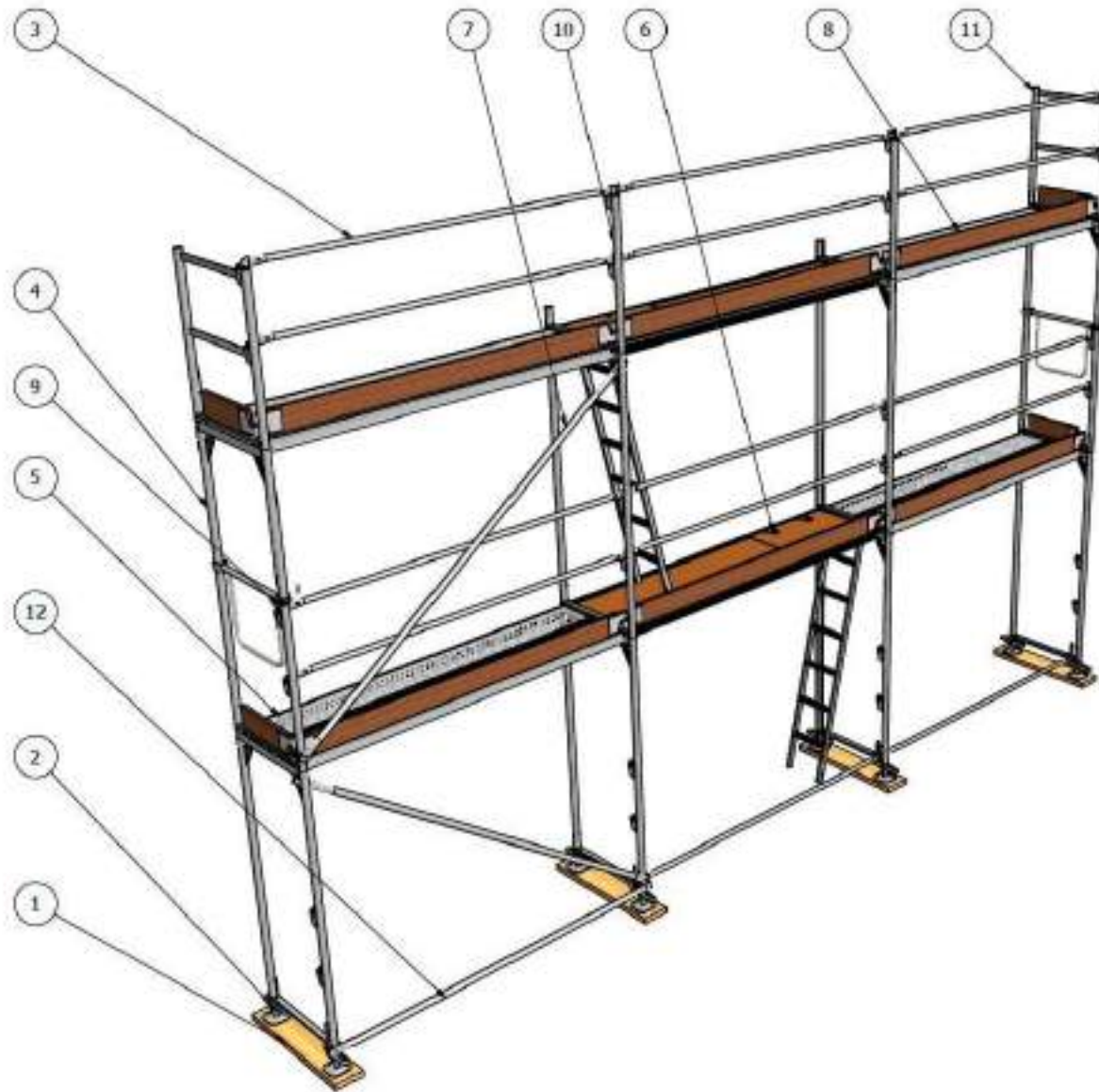
- Plastering and painting works
- Building thermal insulation works
- Renovation and maintenance of building facades
- Assembly works at elevation
- Window cleaning works
- Assembly and maintenance of industrial systems

1.3. Scaffold marking

Frame scaffold is marked permanently by the impressed manufacturer's identification and the year of manufacture. Markings are placed on the rail hooks and on the frame angle brace. The marking looks as follows:

RAM1/10

Where RAM1 is the identification of the frame system and 10 is the year of manufacture (in this case 2010).



- 1 – Sole board
- 2 – Screwed base plate (PS)
- 3 – Rail (BA)
- 4 – Frame (R 2.0)
- 5 – Platform (D)
- 6 – Catwalk platform with ladder (PP)
- 7 – Cross braces (Z)
- 8 – Toeboard (BR)
- 9 – End transom (BK)
- 10 – Upper frame L (RL 1.0)
- 11 – Upper end frame (RG 1.0)
- 12 – Horizontal brace (ZH2.57)

DRAWING 1 STANDARD SCAFFOLDING

2. GENERAL SCAFFOLDING ASSEMBLY INSTRUCTIONS

2.1. Pre-assembly works

! N O T E !

Before starting work, read carefully these instructions.

Scaffolding assembly and disassembly works should be performed by persons trained in assembly, use and disassembly of scaffolding and supervised by an authorised person.

Failure to follow Occupational Safety and Health rules on the scaffolding may result in a risk to health and life as well as posing a threat to third persons.

Failure to follow scaffolding assembly and use instructions may result in scaffolding collapse and poses a threat to health and life of people working on the scaffolding and remaining in the vicinity.

The manufacturer is not liable for any loss resulting from improper use of the scaffolding.

- Scaffolding may be used in the first wind load zone as per PN-77/B-02011.
- Prior to scaffolding assembly, check the load-bearing capacity of the ground or foundation against calculated values. Whenever the side supporting structure is required for the scaffolding, check the structure and correctness of anchor positioning and fixing.
- The value of the scaffolding tear (detaching) force may not exceed 2.5 kN per one anchor for non-faced scaffolding.
- All scaffolding components should be checked thoroughly to verify their technical condition.

N O T E !

Elements bearing traces of damage such as permanent deformation, material defects, anticorrosion coat defects, weld cracking etc. do not ensure safe use of the scaffolding and so the scaffolding must not be used any further.

- Assembly technology including the following must be in place:
 - requirements for ground load-bearing capacity and scaffold seating,
 - length of one bay,
 - number of access routes,
 - method for transport of scaffolding components to higher floors/levels,
 - distance between the scaffolding and the wall face.

2.2. Ground

2.2.1. Ground load-bearing capacity

Load-bearing capacity for ground surfaces where scaffolds are seated cannot be less than 0.1 MPa. Ground load-bearing capacity must be determined as per PN-B-03020:1981 (PN-81/-03020) or in other way justified technically.

2.2.2. Structural ground load-bearing capacity

Load-bearing capacity of structural grounds should be determined based on strength calculations. The unit pressure from the scaffolding structure may not exceed values permissible for given ground. Otherwise, reinforce the ground prior to scaffolding assembly (to be documented by strength calculations).

2.3. Foundation seating

2.3.1. Foundation seating on the ground

Use sleepers as per 2.4 before seating the scaffolding on the ground. The sleeper size should be according to 2.2.1. For scaffoldings seated on the frozen ground, level the ground with a layer of thawed sand.

! N O T E !

Use of cracked and broken planks, wedges, bricks or paving blocks as sleepers for scaffolding is strictly prohibited and may result in scaffolding collapse.

2.3.2. Scaffolding seating on the structural ground

For scaffoldings seated on structural ground, conditions specified in 2.2.2 must be met.

2.3.3. Scaffolding seating on road, street and pavement surfaces

Permitted only with consent of relevant local authorities

2.4. Sleeper placement

Place sleepers perpendicular to the building wall on the previously prepared ground ensuring even distribution of loads across the entire sleeper surface seated firmly on the ground. The face of a sleeper should be moved by 5 cm from the building base. Sleepers can be placed parallel to the wall only on the structural ground where it is necessary to distribute load away from standards.

For sleepers placed on the sloping ground with a gradient exceeding 6°, make berms with a minimum width of 0.8 m. The ground surface strip should go beyond the outer row of standards by at least 0.8 m. Rainwater should be drained from the surface outside the strip width.

2.5. Assembly of vertical access routes

Vertical access routes must be assembled along with the scaffolding assembly within the scaffolding structure or as a separate structure adjoining the main scaffolding structure, depending on the requirements.

The distance between the adjoining vertical access routes may not exceed 40 m, while the distance between the most remote workstation and the vertical access route 20 m.

2.6. Lightning arrester equipment assembly

Scaffolding structures should be equipped with lightning arresters in accordance with relevant regulations on building protection against lightning. For scaffoldings placed by the wall of the building equipped with the lightning arrester system, it is not necessary to make additional lightning arresters, provided the scaffolding is connected to the existing lightning arresting system of the building. Arresters are not required for scaffoldings assembled inside buildings.

2.6.1. Lightning rods

Vertical lightning rods should have the form of pipe sections with a length of 4 m flattened at ends fixed by longitudinal connectors to the tops of the outer row scaffolding standards. The distance between the vertical rods should not exceed 12 m.

The rods should be connected to the earth with the cable made of zinc-plated steel tape or copper tape with cross-section of 3x20 mm or zinc-plated steel wire with a diameter of 6 mm.

2.6.2. Earth

Each steel pipe structure should be earthed in accordance with requirements of the relevant regulations on earthing and neutral grounding in electric devices with voltage not exceeding 1 kV. Earth resistance measured with alternating current with a frequency of 50 Hz should not exceed 10 Ω .

The distance between earth electrodes should not exceed 12 m.

Earth electrodes can be large mass metal objects located under the ground in the building vicinity. Where earth electrodes are connected with the water supply pipe, the connection should be before the water meter. Pipelines run parallel to the façade of the building where scaffolding is seated can be used as multiple earth electrodes.

2.7. Platform assembly instructions

Platforms should be protected by main and intermediate guard rails and toeboards. In the event that the platform edge is positioned at a distance of more than 20 cm from the building wall face, it must be secured from the wall side by guard rails and toeboards or widened by inner brackets.

The highest working platform of the scaffolding cannot be positioned less than 1.80 m from the highest working point to the platform level.

Working platforms are horizontal braces and therefore must be installed in each bay.

2.8. Transport devices

Materials with weight of 150 kg or less can be transported using scaffolding hoists made of tubes and fixed to the scaffolding by means of connectors. In the hoist arm installation point, the scaffolding should be anchored at least in two places. The height from the pulley block fastening point to the nearest platform level cannot be less than 1.60 m. In places used for transport of materials, it is permitted to move rails away from each other at a distance of not more than 0.80 m. The distance between the hoists should not exceed 30 m and that from the hoist arm to the nearest end of the scaffolding 15 m.

! N O T E !

Prior to transport device installation, read carefully the user manual provided by the manufacturer

For transport of materials with a weight of more than 150 kg, make hoist towers joined to the scaffolding structure. A hoist tower should be higher than the scaffolding by at least the height of one scaffolding module and should end with a kerb forming the placement point of the ceiling beam with the pulley block. Hoist towers intended for transport of materials with a weight exceeding 250 kg should not be connected to the scaffolding structure.

2.9. Scaffolding assembly and use in the vicinity of power lines

2.9.1. Overhead power lines

Assembly and use of scaffoldings in the vicinity of overhead power lines is permitted, provided that they are positioned outside the danger zone. The danger zone is a minimum distance (measured horizontally) between the outermost swinging lines and the scaffolding and the outermost end point of scaffolding elements carried during assembly and disassembly, not less than (unless specific regulations provide for otherwise):

- **3.0 m – for power lines with voltage not exceeding 1 kV,**
- **5.0 m – for power lines with rated voltage exceeding 1 kV, but not more than 15 kV,**
- **10.0 m – for power lines with rated voltage exceeding 15 kV, but not more than 30 kV,**
- **15.0 m – for power lines with rated voltage exceeding 30 kV, but nor more than 110 kV,**
- **30.0 m – for power lines with rated voltage exceeding 110 kV.**

If the scaffolding is within the danger zone, power line must be disconnected from power supply for the scaffolding assembly and disassembly period and, if necessary, for the duration of works performed within the danger zone.

! N O T E !

Failure to follow the above instructions results in a risk to health and life.

2.9.2. Electric cables

Live electric cables located on the scaffolding or in its vicinity should be insulated as per PN-E-05100:1975 (PN/E-05100).

! NOTE !

**Prior to electric cable installation make sure that no damage to insulation is present.
Electric installation works can be performed only by qualified personnel.**

The distance between unearthed cable with voltage of 1 kV from each accessible part of the scaffolding should be 2.0 m vertically and horizontally as per PN-E-05100:1975 (PN/E-05100).

2.10. Protective roof installation instructions

Scaffoldings positioned directly by routes (pedestrian pavements, streets, roads etc) should have protective roofs installed with a gradient of 45° directed towards the façade.

The distance between the roof and the ground should not be less than 2.40 m. Roofs above pedestrian passages and crossings should be tight and made of planks with a minimum thickness of 24 mm and covered with material absorbing shocks from falling objects.

Roof width should be more than the width of the passage or crossing by at least 1.0 m and the roof itself should be joined to the building wall.

The outreach of the protective roofs should be (counting from the outer standard row):

- Min 2.20 m – for scaffoldings with a height up to 20 m,
- Min 3.50 m – for scaffoldings with a height above 20 m.

Roof supporting standards should be positioned away from the street kerbs by minimum 0.80 m.

2.11. Instructions on making scaffolding fencing and using fenders, boards and safety lights

The area where scaffold assembly and disassembly works are being performed should be fenced off. The height of the fencing should be at least 1.50 m and the distance from the scaffolding limits 1/10 of the height from which objects or materials can fall, but not less than 6 m. The standards placed within gates, clearances and by the passages should be protected by fenders not connected to the structure. Assembly and disassembly areas should be marked by notice boards of which the content should be visible from at least 10 m; they should be placed not higher than

2.5 m from the ground level. In the event that the scaffolding obstructs the passage partially or entirely (by consent of relevant local authorities), a barrier and do not pass sign or narrow passage danger sign and appropriate signal lighting should be fitted.

3. RAM FRAME SCAFFOLDING ASSEMBLY INSTRUCTIONS

! NOTE !

Prior to commencing works, read carefully these instructions.

Scaffolding assembly and disassembly works should be performed by persons trained in scaffolding assembly, use and disassembly and supervised by an authorised person.

Failure to follow Occupational Safety and Health rules on the scaffolding may result in a risk to health and life as well as posing a threat to third persons.

Failure to follow scaffolding assembly and use instructions may result in scaffolding collapse and poses a threat to health and life of people working on the scaffolding and remaining in the vicinity.

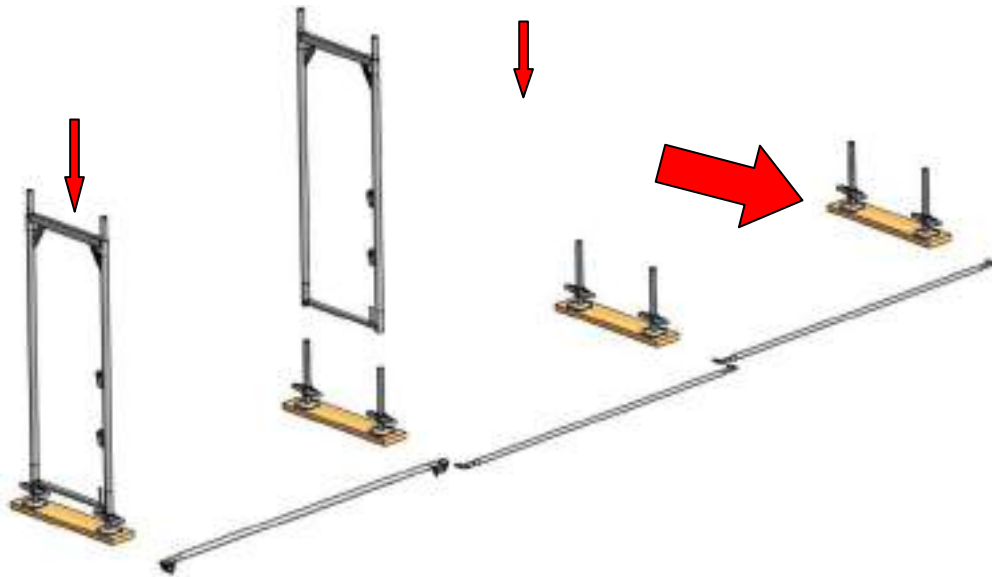
The manufacturer is not liable for any loss resulting from improper use of the scaffolding.



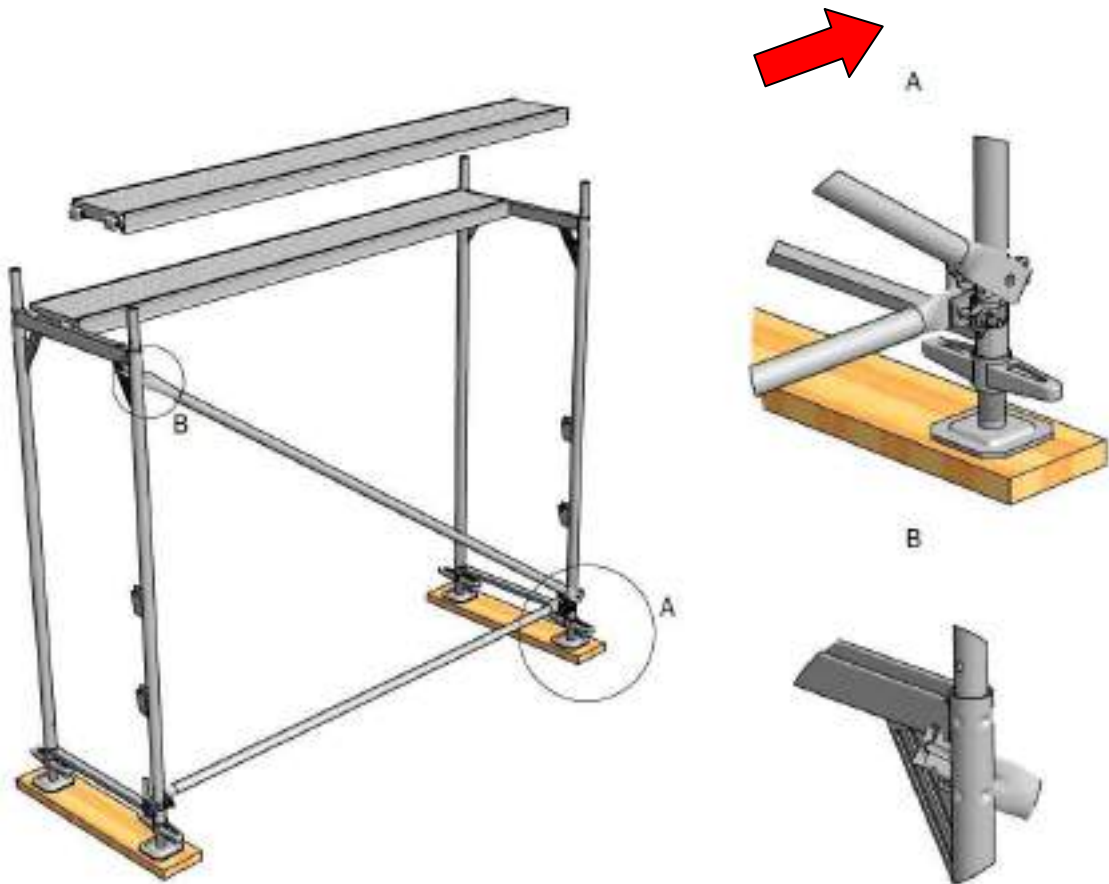
DRAWING 2 INSTALLATION OF ADJUSTABLE BASE PLATES

The assembly of the frame scaffolding starts with placement of rails on the ground along the building façade in the quantity corresponding to the number of bays and providing adjustable base plates in accordance with the guidelines in point 2.3 at intervals corresponding to respective rails lengths (Drawing 2). Adjusting nuts on the base plates can be unscrewed by $\frac{1}{4}$ of the total height. Then, put two frames into the two adjoining base plate rows (Drwg 3) and place on them the rail used as the horizontal bracing as presented in drawings 3.4A and fix the cross brace (Drwg 4A, 4B), screwing home the half-connector after levelling operation has been performed. The rails can be also installed in the frame lower pockets.

Level the scaffolding bay. For this purpose, first screw the adjusting nut on the adjustable base plate. Put two 0.32 m wide platforms on the frames (Drwg 4) or one platform with a width of 0.62 m.



DRAWING 3 FRAME ASSEMBLY ON THE BASE PLATES



DRAWING 4 SCAFFOLDING FIRST BAY

With the bay prepared in this way, the assembly of the first scaffolding level can be continued. This is done by putting respective frames on the adjustable base plates, stiffening them with rails, putting in place platforms and catwalk platforms and reinforcing them with braces according to the bracing arrangement (Drawg 5).



DRAWING 5 FIRST SCAFFOLDING LEVEL

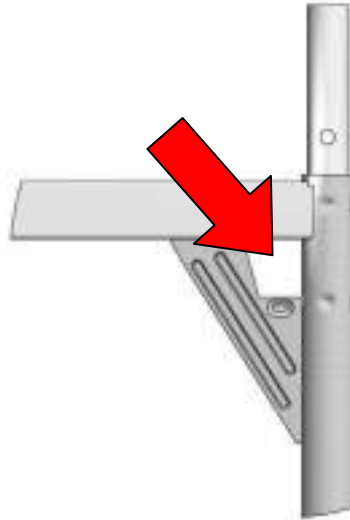
! N O T E !

When working at height, use personal protection equipment protecting against fall from height.

Access platform manhole should be closed each time.

Leaving the manhole open poses the risk of accident.

When entering the rail protected level, follow general OSH instructions concerning work at height. Use frame structural elements as protection against fall during scaffolding assembly/disassembly. The clip hook of the guard line can be fastened to the frame gusset plate (Drwg 6).



DRAWING 6

The second floor is assembled by putting frames in place and assembling rails within the vertical access route (Drwg 7). Subsequent frames should be assembled in both directions from the vertical access route. Determine frame location by means of rails and put in place the toeboards (Drwg 8).



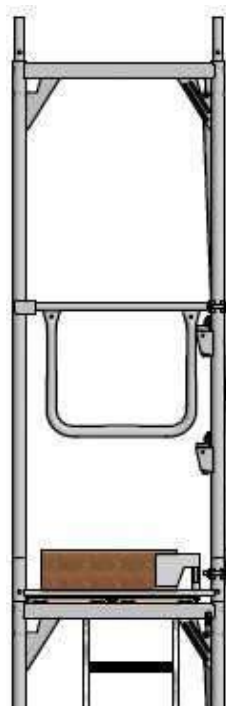
DRAWING 7 INITIAL STAGE OF SECOND FLOOR ASSEMBLY

Install cross braces in vertical access routes being braced (Drwg 8).



DRAWING 8 SECOND FLOOR BRACING, RAILS AND TOEBOARD

Secure scaffolding outermost bays with 0.73 m end rails and toeboards (Drwg 9).



DRAWING 9 SECURING OUTERMOST SCAFFOLDING BAY

After the scaffolding level has been entirely secured, place the frames on the higher floor platforms and then anchor the scaffolding in accordance with point 3.1. Perform the anchoring systematically!

DRAWING 10 SCAFFOLDING TWO FLOORS



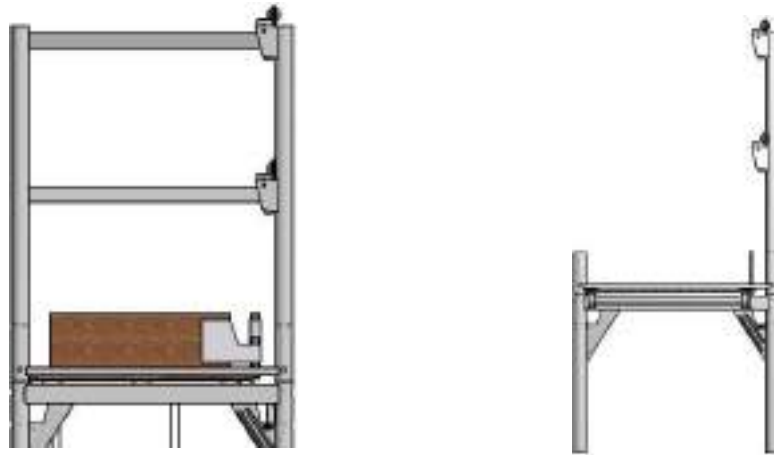
Assemble another floors in accordance with the below instructions.

The bay where vertical transport of scaffolding elements is performed by hand must be fully protected against fall from height, i.e. upper and intermediate rails must be installed along with the toeboard. In such case, at least one person should be present on each scaffolding floor.

For scaffoldings higher than 8 m, vertical transport devices can be used for assembly/disassembly works in accordance with point 2.8.

The scaffolding top floor should be secured using upper L frames, upper end frames, rails and toeboards (Drwg 11).

Drawing 12 shows fully-assembled standard scaffolding consisting of 3 horizontal bays and 2 vertical bays.



DRAWING 11 TOP FLOOR GUARD ELEMENTS – UPPER END FRAME; UPPER L FRAME



DRAWING 12 FULLY-ASSEMBLED SCAFFOLDING

Scaffolding is disassembled in a reverse order. However, remember to remove from the scaffolding all materials and work tools kept on it.

3.1. Scaffolding anchoring

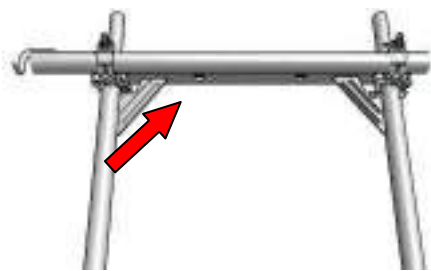
Scaffoldings with height exceeding four times the smallest of the base dimensions and scaffoldings equipped with hoist arms and cover roofs must be anchored regardless of the static calculation results.

Scaffoldings must be anchored to building parts ensuring structural stability and stiffness and enabling transfer of external forces occurring as a result of such factors as wind pressure or suction, static load from snow and ice, eccentric static load, load from transport devices, dynamic loads caused by workers as a result of performed works, forces resulting from structure subsidence. If in doubt as to the strength properties of specific part of the building, perform anchor detachment test.

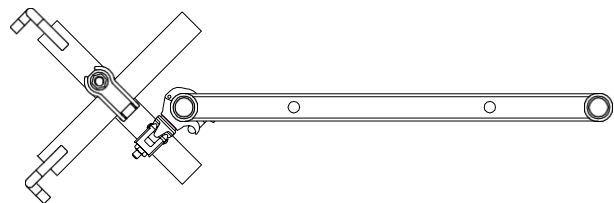
!NOTE!

Anchor positioning and their number have a direct effect on the scaffolding stability. Wrong positioning and insufficient number of anchors may result in scaffolding collapse as well as posing a threat to health and life of people remaining on the scaffolding and within its vicinity.

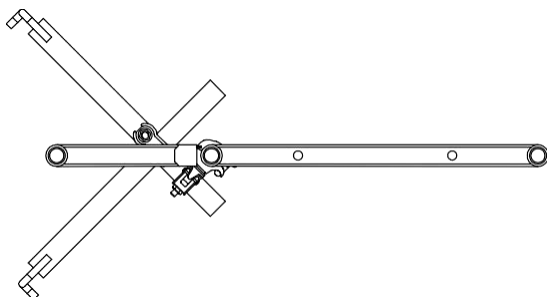
Anchoring is performed by putting the anchor hook into the eye bolt and the tube part into the two permanent cross connectors provided on the standards (outer and inner) in the gusset plates holes (Drwg 13A). If using brackets, do not fix a long anchor below gusset plates as anchors fixed in this way reduces the clearance within the frame. In such case, fit a short anchoring connector below gusset plates fixed only to one standard and, every second or third anchoring point, anchors in V arrangement. V arrangement anchoring is done using two short anchors (e.g. 0.45 m) by cross connection. Such set is fixed to the frame standard (Drwg 13B).



DRAWING 13A ANCHOR FIXING TO THE FRAME



DRAWING 13b ANCHORS IN V ARRANGEMENT



DRAWING 14 ANCHORING WITH BRACKET PROVIDED

3.2. Bracing

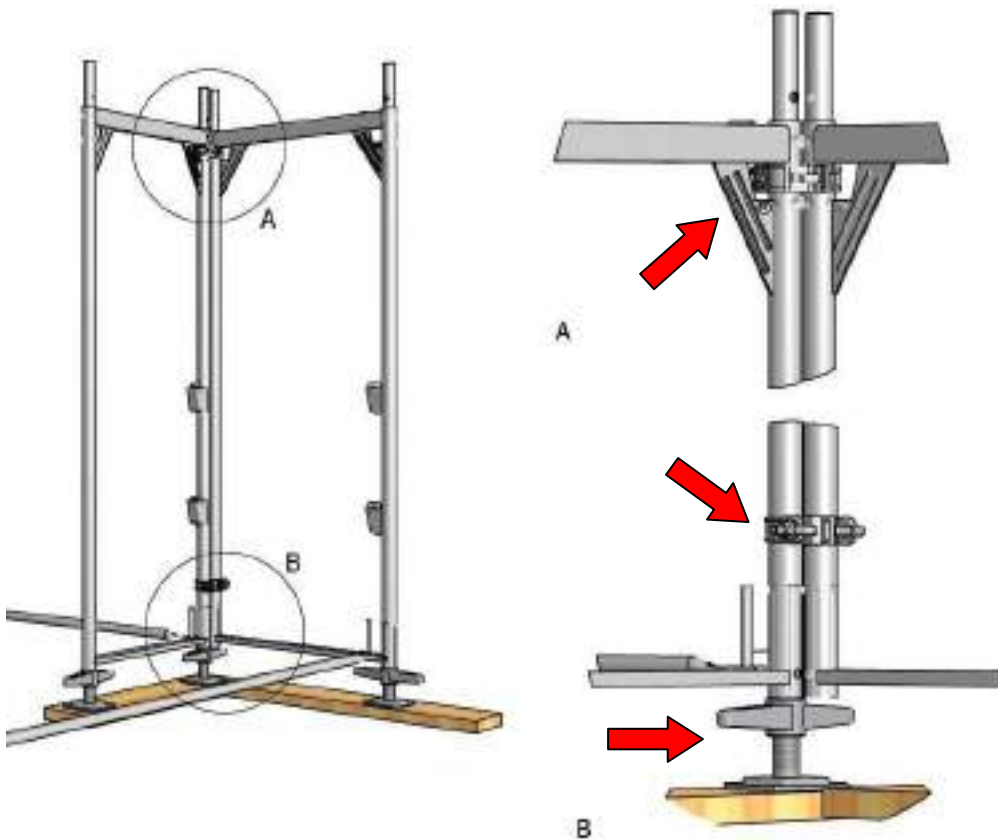
Scaffolding bracing system should ensure stability and structure kinetic constancy. Vertical bracing is installed within at least every fifth scaffolding bay, from the ground level to the top

level. Bracings can be installed as tower systems or multi-plane systems while the scaffolding is being erected. The distance between the bracing bays may not exceed 10 m.

Braces should be installed as shown in drawing 4 – put flattened part of the cross brace into the gusset plate hole and lock; put the half-connector on the other frame.

3.3. Scaffolding corners

Scaffolding bays joined with each other at an angle should be connected by means of the swivel or parallel connectors (Drwg 15). The connectors should be installed in the gusset plate hole and in the adjustable base plate area (Drwg 15 A and B). Two standards screwed with each other should be seated on one adjustable base plate only (Drwg 15 B). Position adjoining frames in such a way so that the gap between the platforms of the adjoining bays is reduced to a minimum.



DRAWING 15 INSTALLATION OF SCAFFOLDING CORNERS

3.4. Extending brackets

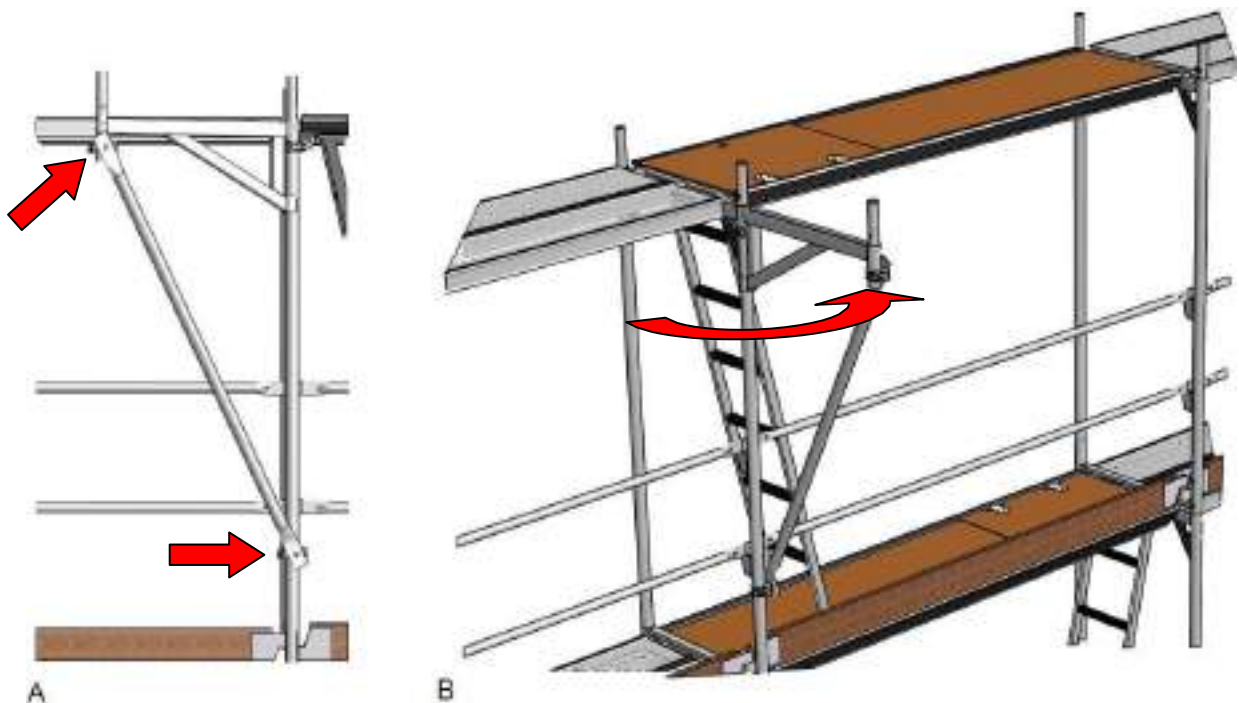
Extending brackets are used for scaffolding expansion towards the inside and outside to increase working space or adjust the scaffolding to the building shape. Scaffoldings can be extended towards the inside (using 033 brackets), outside (using 033 and 073 brackets) and in both directions at the same time.

Brackets are fixed to the standard frame using half-connectors from a lower safe level in such a way so that the bracket trough is at the same level as the frame trough and perpendicular to the main plane of the scaffolding (Drwg 16).



DRAWING 16 INSTALLATION OF 033 BRACKET

For 073 brackets, vertical bracing must be provided. To do this, turn the bracket already fixed to the standard towards the inside (Drwg 17A), screw the vertical brace to the bracket and the frame, turn the bracket back and position it as described above (Drwg 16B).



DRAWING 17 INSTALLATION OF 073 BRACKET WITH VERTICAL BRACE

Assemble other brackets in the same way. Then put the platforms from the level where the brackets were installed – one row for 033 brackets and two rows for 073 brackets. With the level prepared in this way, put the upper L frames on the brackets, upper end L frames at ends of the extension and fit the platform guards in the main vertical access route. Finally, install rails and toeboards within the bays.

3.5. Required assembly tools

- 19/22 flat wrench (torque for flange nuts – 50 Nm)
- Level
- Hammer

4. SCAFFOLDING USE INSTRUCTIONS

4.1. Scaffolding acceptance

The most important as far as the assembly and use of the scaffolding is concerned is its technical acceptance. After the scaffolding assembly is finished, the scaffolding is inspected in the presence of the orderer and approved (or not) as suitable for use. An acceptance certificate is drawn up following inspection.

I N O T E !

Scaffolding cannot be used prior to acceptance.

Scaffolding inspection comprises:

- checking ground condition – ground tests performance must be confirmed in a certificate issued by the site manager in accordance with point 2.2,
- checking scaffolding seating – by visual inspection,
- checking structural arrangement – i.e. dimensions of the assembled scaffolding (spacing of frames in longitudinal and transverse direction and the height of levels), taking into account permissible deviations,
- checking the bracing – by visual inspection,
- checking the anchoring – anchor detachment/pull out tests must be performed using a special device; test should be performed with regard to 10% of randomly selected anchors,
- checking working and safety platforms – by visual inspection,
- checking communication routes – by visual inspection; load-bearing capacity of hoist arms should be verified by applying 2.0kN load,
- checking lightning arrester equipment – by resistance measurements,
- checking scaffolding positioning in relation to power lines – by visual inspection and distance measurements,

- checking scaffolding guards/safety elements – by visual inspection

4.2. Scaffolding periodic inspections

When in use, scaffolding must be inspected:

- daily,
- every ten days,
- on an ad hoc basis.

4.2.1. Daily inspections

Daily inspections should be performed by scaffolding users, i.e. workers working on the scaffolding. Daily inspection checks comprise:

- checking the scaffolding against damage or deformation,
- checking whether the scaffolding is anchored correctly,
- checking whether electric cables are well fixed, insulated and do not touch the scaffolding structure,
- checking whether the condition of working and access platform surfaces is correct (whether platforms are clean and have anti-skid protection in the winter)
- whether no circumstances/events occurred affecting scaffolding safety

4.2.2. Inspection performed every ten days

These inspections should be performed by a scaffold maintenance technician or other technician, e.g. foreman or site manager. These inspections are aimed to check whether or not there are changes within the entire scaffolding structure which may result in the constructional collapse or pose a threat to safe use of the scaffolding.

4.2.3. Ad hoc basis inspections

Ad hoc basis inspections should be performed always following an operational break lasting in excess of two weeks and after each thunderstorm with wind power exceeding 6° on the Beaufort scale (i.e. 12 m/s). Inspection activities are similar to those used for daily and every ten days inspections. Inspections should be conducted in the presence of a foreman, master workman and construction inspector. Moreover, inspections can be ordered by the construction supervision authority at any given time.

Prior to work commencement, all revealed defects must be removed following each inspection. The person responsible for inspection is a site manager or a person authorised by the same. Results of every-ten-days and ad hoc basis inspections should be recorded in the construction site log by persons who perform inspections.

4.3. Storage and maintenance of scaffolding elements

Scaffolding elements can be transported by any given means of transport, provided they are properly immobilised and secured against damage.

Scaffolding elements must be stored in rooms providing protection against rain and soil contact.

! N O T E !

Incorrect securing of scaffolding in transport may result in damage to scaffolding elements.

Permanent mechanical damage resulting in scaffolding element deformation excludes damaged elements from further use. Damage excluding from use – table 1.

4.4. Occupational safety and health during scaffolding erection and use

During scaffolding assembly and use, follow OSH instructions provided below:

- Scaffolding assembly and disassembly can be conducted only by authorised persons trained in the scaffolding construction, assembly and disassembly – assemblers holding relevant qualifications.
- Scaffolding assembly and disassembly must be performed under supervision of an authorised person who must inform the assemblers about the type of structure as well as the assembly/disassembly method and conditions in accordance with the engineering documentation.
- Assemblers and workers performing work on the scaffolding must hold valid medical certificates stating their fitness for work at height. In addition, these workers should be familiar with first aid administration.
- Prior to commencing work on the scaffolding, check whether or not conditions specified in point 4.1 have been met. It is prohibited to use the scaffolding without prior technical acceptance.
- Inspection dates must be met.
- Working platforms should be kept clean and load evenly distributed.
- It is allowed to perform works on the scaffolding assembled within a distance exceeding 20 cm from the wall face, provided that additional guard rails and toeboards are used or the working platform is extended by inner brackets.
- Workers should wear working clothes, anti-skid footwear and hard hats.
- With the wind exceeding 10m/s, i.e. when thicker tree branches and thinner tree trunks begin to move, work should be stopped immediately and the scaffolding vacated.

! NOTE !

Scaffolding can be used respectively for the selected group of scaffoldings.

Excessive operating load may result in scaffolding damage.

It is prohibited to climb the scaffolding structure. Workplaces can be accessed only via safe access routes intended for this purpose.

It is prohibited to jump and run on the scaffolding and dropping objects from it.

It is prohibited to drop scaffolding elements even from a small height.

It is prohibited to erect scaffolding that is higher than specified in the engineering documentation.

It is prohibited to put materials and tools on the working platform in a way that obstructs passage and work performance.

4.5. Exclusion criteria for used or damaged materials

After the scaffolding has been disassembled, perform visual inspection of the scaffolding to verify potential used or damaged elements. Basic criteria are provided below:

TABLE 1 EXCLUSION CRITERIA FOR USED OR DAMAGED ELEMENTS

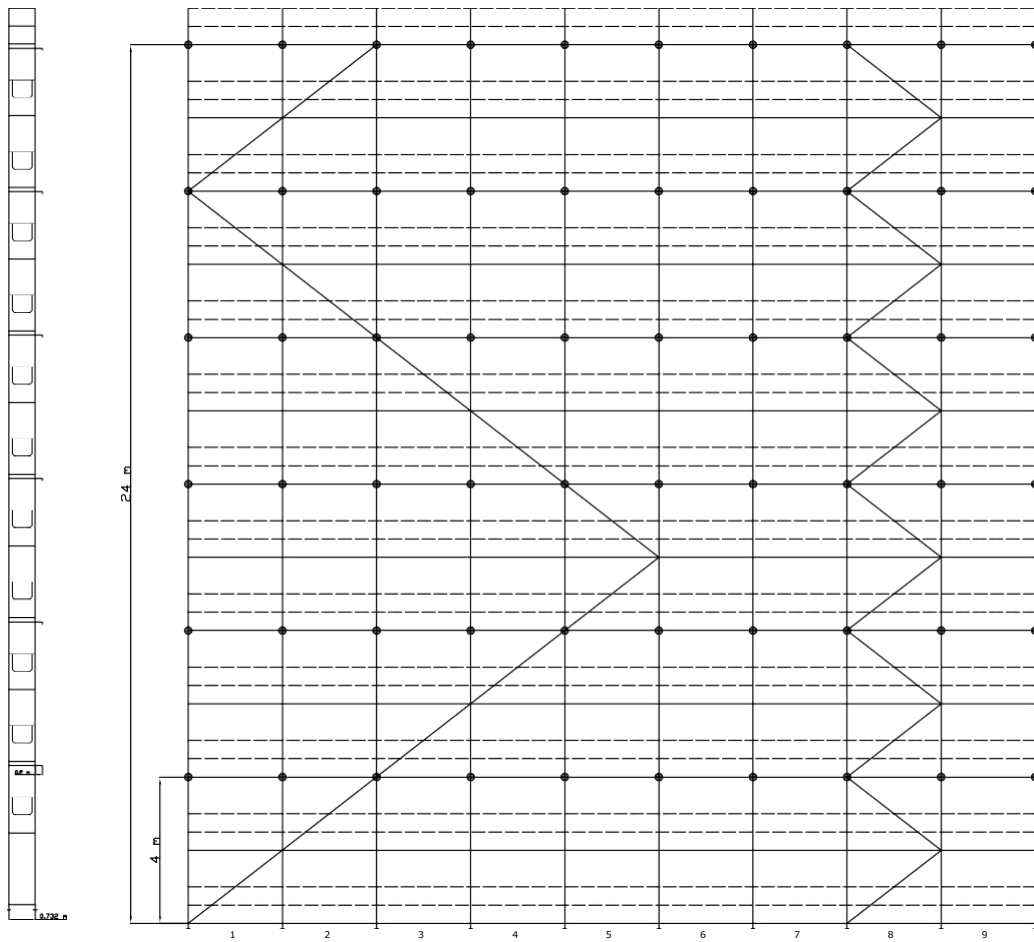
Element	Refers to	Damage description	Procedure
Steel platform	Welded joints	Weld crack	Exclude from use
	Anti-skid perforation	Cracks on the hole edges, cracks between the holes	Exclude from use
		Perforation impurities affecting anti-skid properties	Remove impurities
	Plank profile	Permanent deformations	Exclude from use
	Hardware, hooks	Deformations, cracks	Exclude from use
Access platform	Welded joints	Cracked welds	Exclude from use
	Plywood	Cracks, lamination	Exclude from use
	Safety locks	Manhole or ladder cannot be secured	Exclude from use temporarily and regenerate
	Longitudinal sections	Permanent deformation	Exclude from use
	Hardware, hooks	Deformation, cracks	Exclude from use
Frames, brackets	Welded joints	Cracked welds	Exclude from use
	Shape	Permanent deformations, different diagonal lengths (of the frame)	Exclude from use
	Frame guide pin and its connection with the standard	Lack of alignment with the standard tube	Exclude from use
Braces and rails	Welds (of the rail)	Cracked welds	Exclude from use
	Shape	Permanent	Exclude from use

		deformations	
	Joint (of the brace)	Damage to screw or nut	Replace damaged element
End rail	Welded joints	Cracked welds	Exclude from use
	Joint	Damage to screw or nut	Replace damaged element
Toeboards	Hardware	Bent, cracked, loose	Exclude from use
	Plank	Cracked, laminated	Exclude from use
Anchors	Welds	Cracked welds	Exclude from use
	Hook	Deformed hook	Exclude from use
Adjustable base plate	Welded joints	Cracked welds	Exclude from use
	Thread safety element (securing the nut against unscrewing)	Damaged or missing	Exclude from use
Swivel and cross connector	Connector condition	Wrinkled, cracked, deformed	Exclude from use
		Traces of deformation – cavities on the clamping ring surface in the nut fitting point with depth in excess of 0.5 mm	Exclude from use
		Clamping ring fork width exceeding 15.5 mm in the T-bolt fitting point underneath the nut	Exclude from use
		Wrinkles and material loss on the bolt or nut surface and on threads	Exclude from use
		Too high play between riveted bodies exceeding 0.8 mm (swivel connections)	

5. SCAFFOLDING ANCHORING AND BRACING ARRANGEMENT

Further drawings show options of the standard frame scaffolding. Straight anchors connecting two standards are marked with black round points, anchors in V arrangement are marked with black triangles and joints are marked with circles.

Option 1

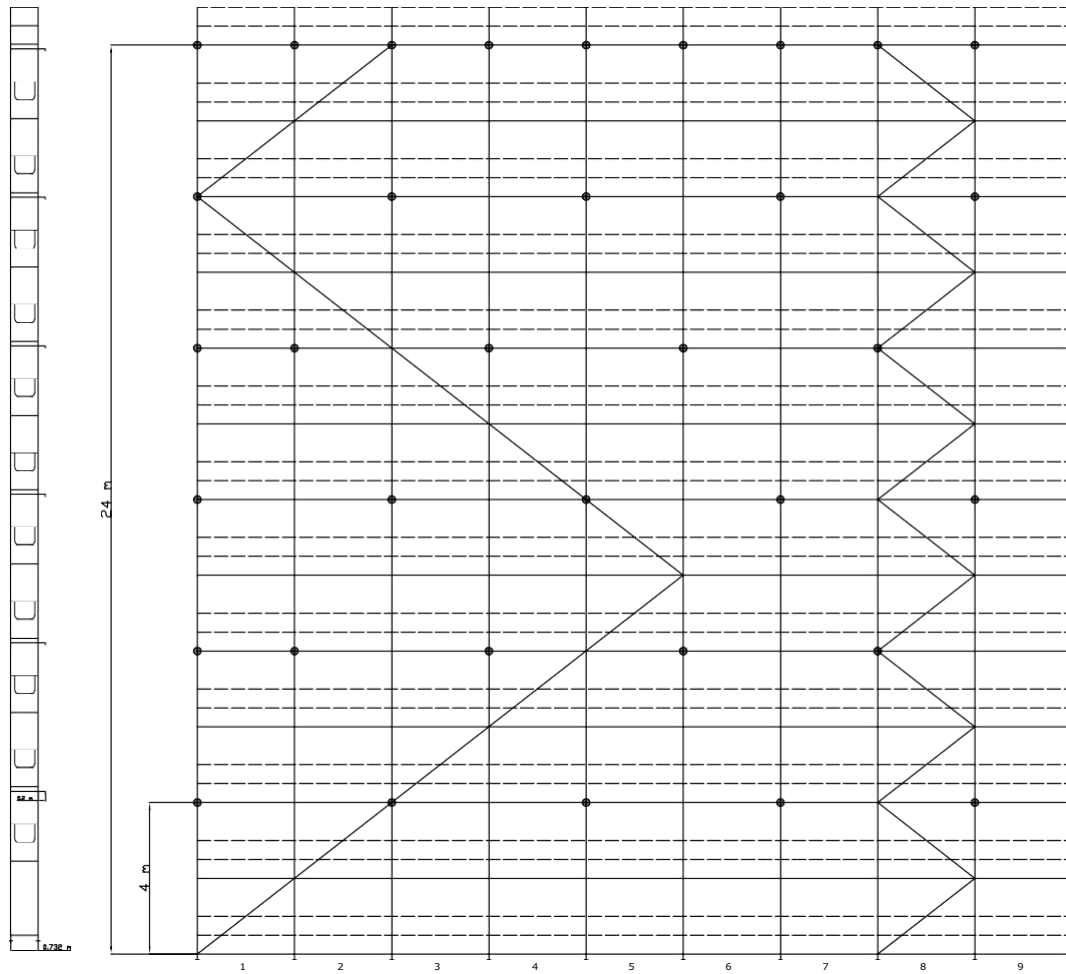


DRAWING 18 ANCHORING ARRANGEMENT **OPTION 01** GW FO NO

TABLE 2: TABLE FOR DRAWING 18.

Scaffolding type	RAM1 frame scaffolding
Scaffolding height	24.2 m
Level/floor height	2.0 m
Working platform width	0.64 m
Bay length	2.07; 2.57; 3.07
Service load	2.0 kN/m ²
Façade type	Partially open (60% evenly distributed holes)
Bracing arrangement	Multi-plane or tower-type
Maximum distance from the wall	0.2 m
Scaffolding facing	No
Brackets	No
COMMENTS Steel platforms, rails installed in each bay, each level/floor. No subsidence, nut unscrewing: 0.20 m. Top level anchored in each bay. Long anchors, fixed to two standards. Ground load at $\gamma_f = 1.5$ per one screw base: 17.1 KN. Required anchoring force at $\gamma_f = 1.5$ per one anchor: Force parallel to the wall – 3.86 KN Force perpendicular to the wall – 1.48 KN.	

Option 2

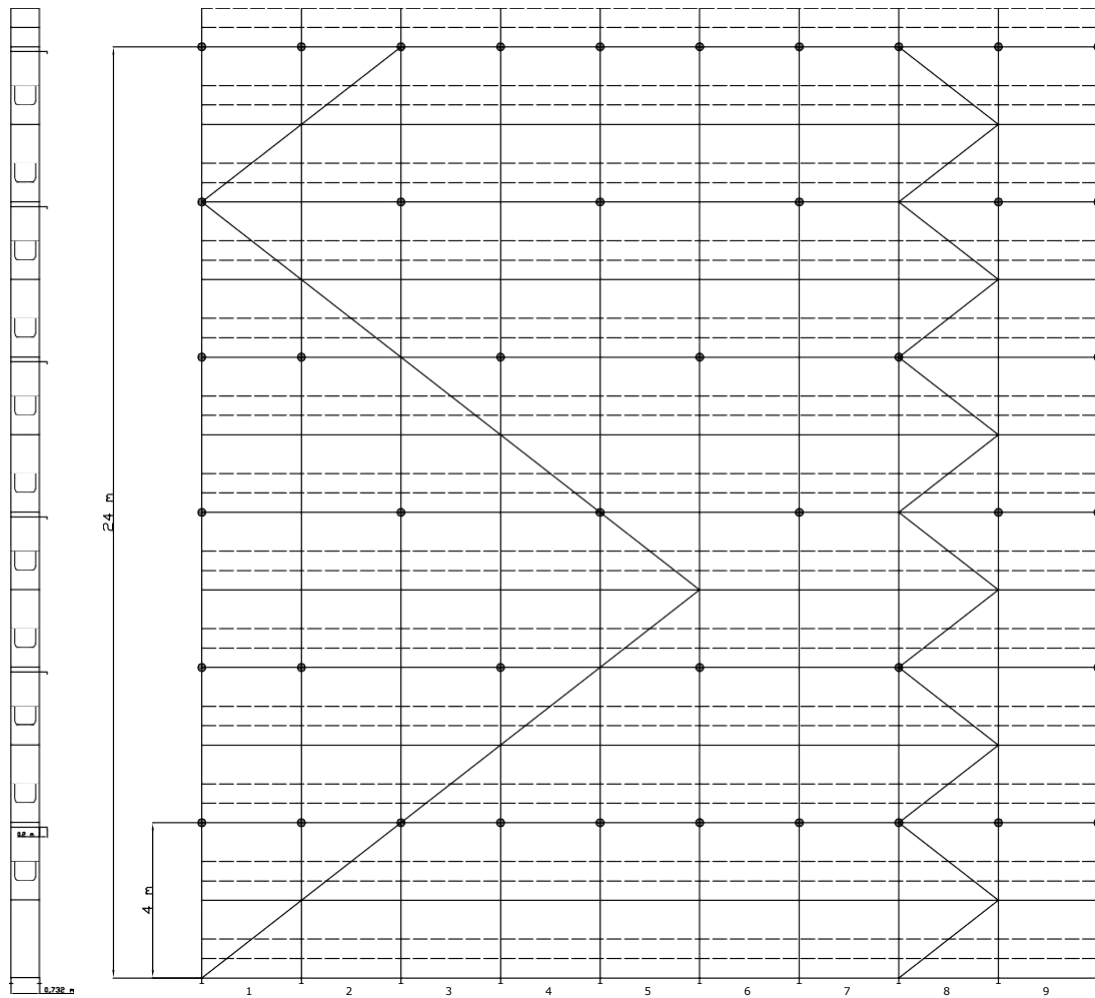


DRAWING 19 ANCHORING ARRANGEMENT **OPTION 02 GW FZ NO**

TABLE 3: TABLE FOR DRAWING 19.

Scaffolding type	RAM1 frame scaffolding
Scaffolding height	24.2 m
Level/floor height	2.0 m
Working platform width	0.64 m
Bay length	2.07; 2.57; 3.07
Service load	2.0 kN/m ²
Façade type	Closed
Bracing arrangement	Multi-plane or tower-type
Maximum distance from the wall	0.2 m
Scaffolding facing	No
Brackets	No
COMMENTS Steel platforms, rails installed in each bay, each level/floor. No subsidence, nut unscrewing: 0.20 m. Top level anchored in each bay. Long anchors, fixed to two standards. Ground load at $\gamma_f = 1.5$ per one screw base: 17.1 KN. Required anchoring force at $\gamma_f = 1.5$ per one anchor: Force parallel to the wall – 2.85 KN Force perpendicular to the wall – 2.14 KN.	

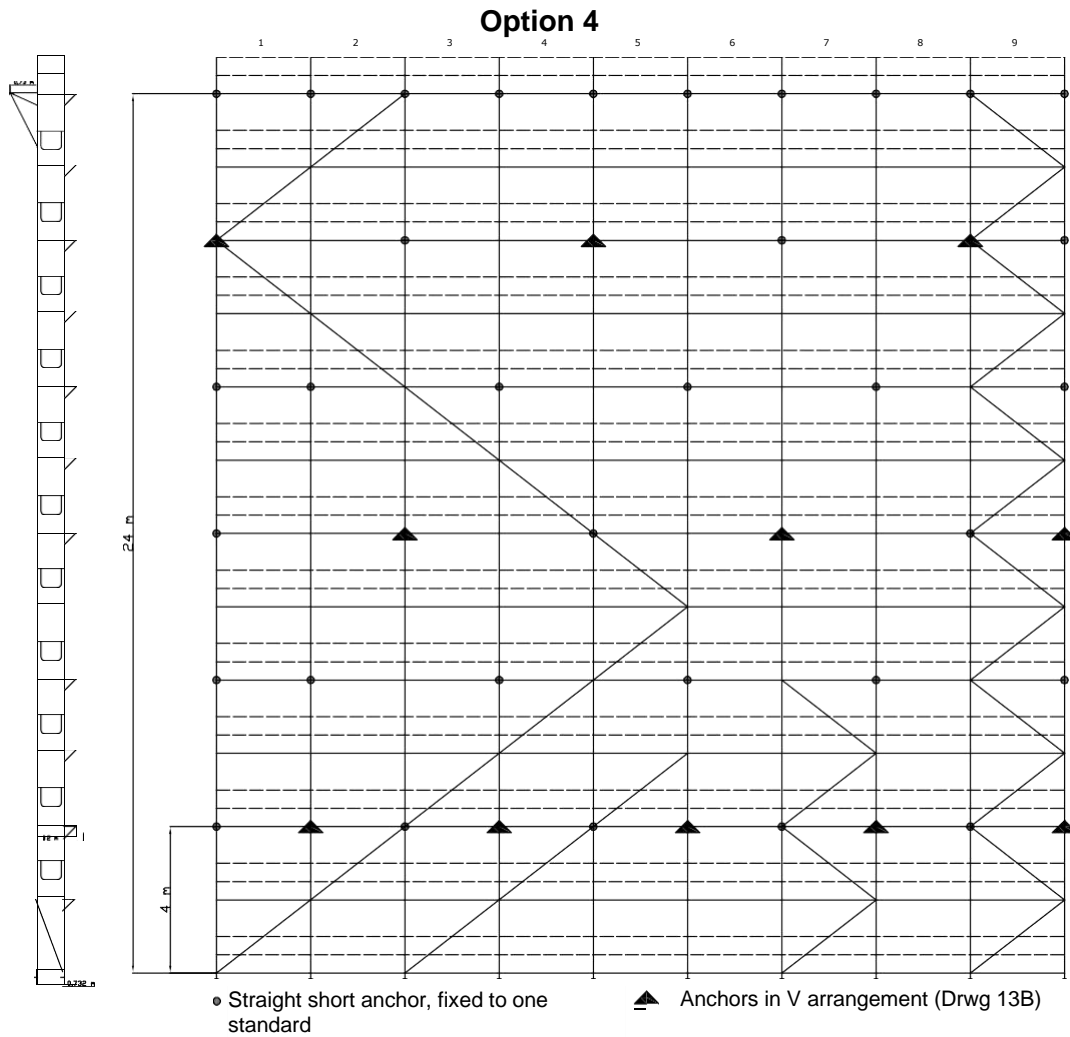
Option 3



DRAWING 20 ANCHORING ARRANGEMENT **OPTION 03 GW FZ PS**

TABLE 4: TABLE FOR DRAWING 20.

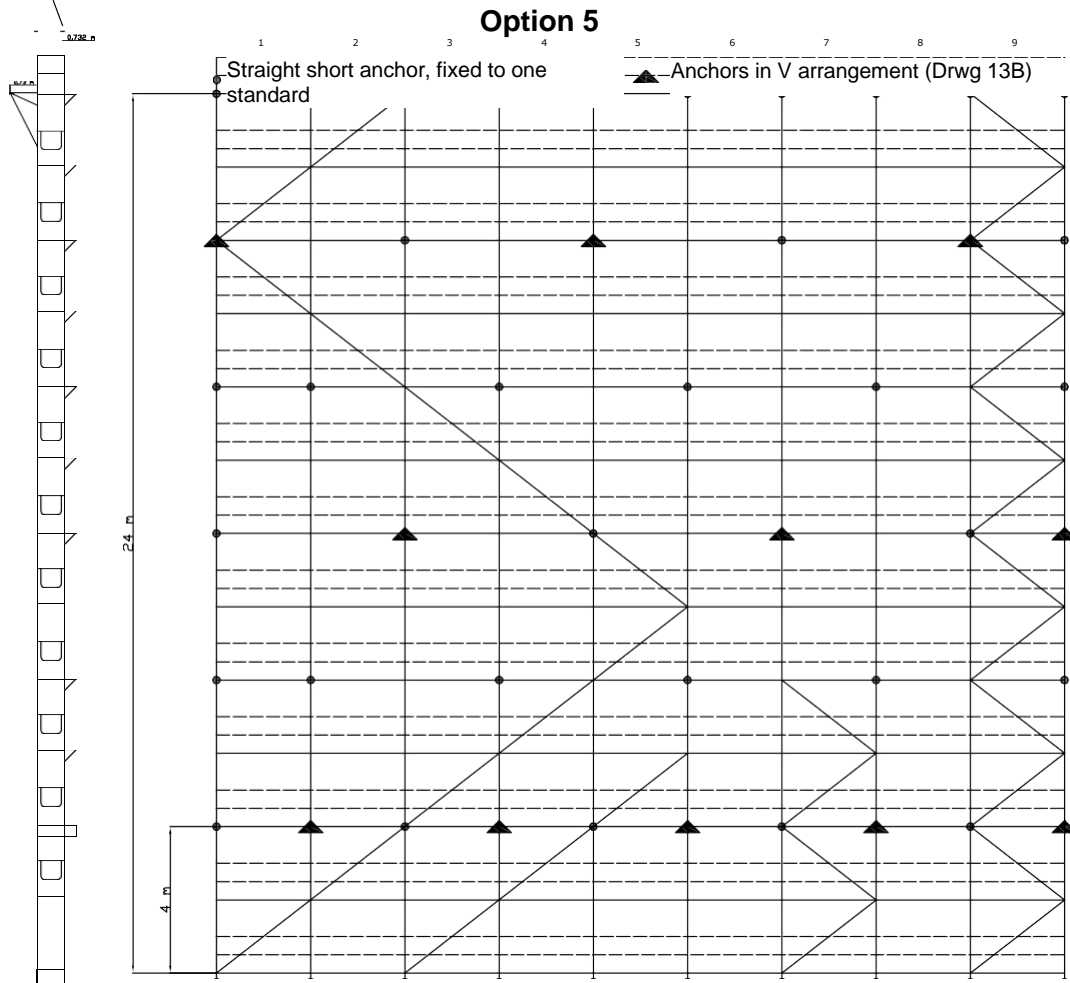
Scaffolding type	RAM1 frame scaffolding
Scaffolding height	24.2 m
Level/floor height	2.0 m
Working platform width	0.64 m
Bay length	2.07; 2.57; 3.07
Service load	2.0 kN/m ²
Façade type	Closed
Bracing arrangement	Multi-plane or tower-type
Maximum distance from the wall	0.2 m
Scaffolding facing	Mesh
Brackets	No
COMMENTS Steel platforms, rails installed in each bay, each level/floor. No subsidence, nut unscrewing: 0.20 m. Top level anchored in each bay. Long anchors, fixed to two standards. Required anchoring force at $\gamma_f = 1.5$ per one anchor: Force parallel to the wall – 1.70 kN Force perpendicular to the wall – 4.20 kN.	



DRAWING 21 ANCHORING ARRANGEMENT **OPTION 04 KWS FO NO**

TABLE 5: TABLE FOR DRAWING 21.

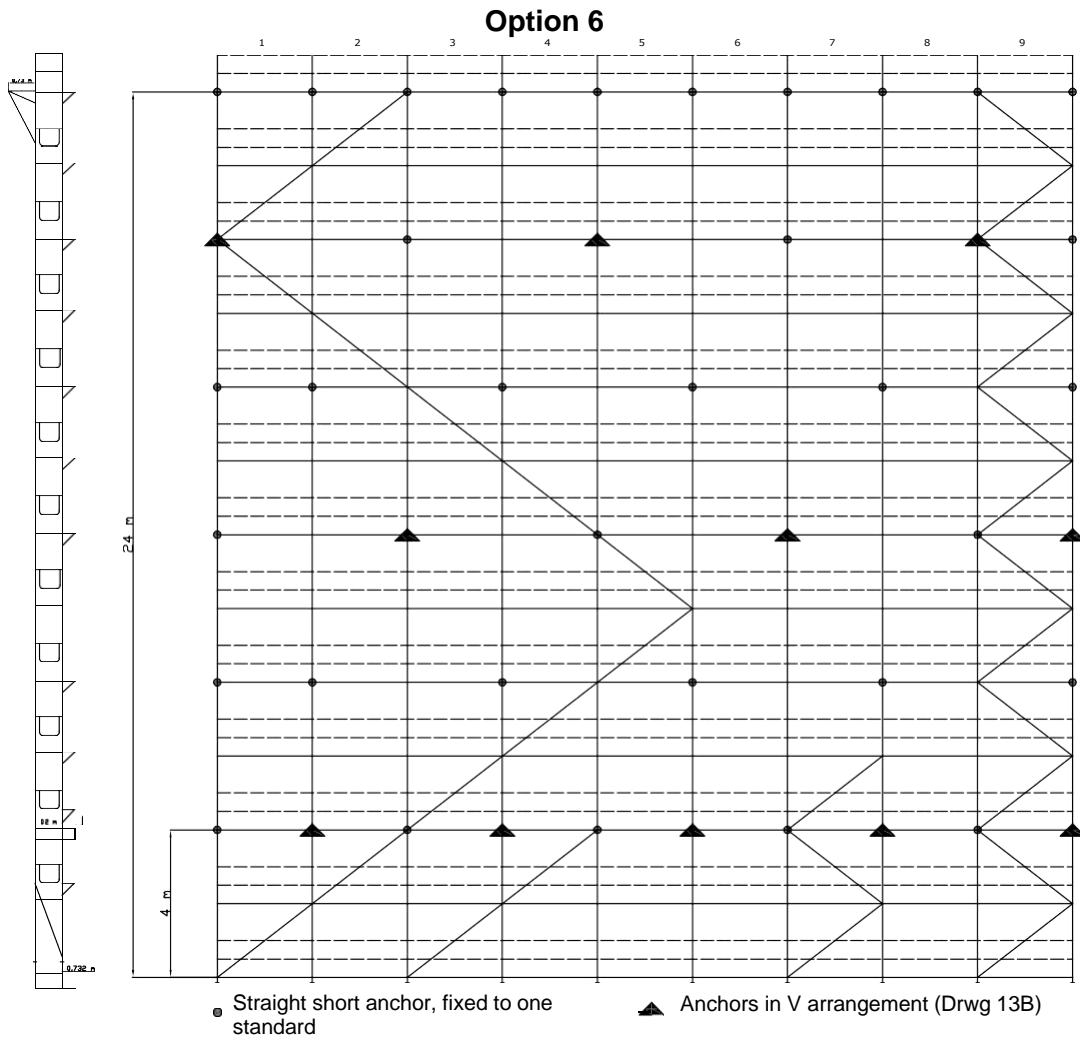
Scaffolding type	RAM1 frame scaffolding
Scaffolding height	24.2 m
Level/floor height	2.0 m
Working platform width	0.64 m
Bay length	2.07; 2.57; 3.07
Service load	2.0 kN/m ²
Façade type	Partly open (60% holes)
Bracing arrangement	Multi-plane or tower-type
Maximum distance from the wall	0.2 m
Scaffolding facing	No
Brackets	Yes – narrow in each bay, wide in each bay on the top level/floor
COMMENTS Steel platforms, rails installed in each bay, each level/floor. No subsidence, nut unscrewing: 0.20 m. Top level anchored in each bay. Long anchors, fixed to two standards, anchors in V arrangement Required anchoring force at $\gamma_f = 1.5$ per one anchor: Force parallel to the wall – 1.70 kN Force perpendicular to the wall – 4.20 kN.	



DRAWING 22 ANCHORING ARRANGEMENT **OPTION 05 KWS FZ NO**

TABLE 6: TABLE FOR DRAWING 22.

Scaffolding type	RAM1 frame scaffolding
Scaffolding height	24.2 m
Level/floor height	2.0 m
Working platform width	0.64 m
Bay length	2.07; 2.57; 3.07
Service load	2.0 kN/m ²
Façade type	Closed
Bracing arrangement	Multi-plane or tower-type
Maximum distance from the wall	0.2 m
Scaffolding facing	No
Brackets	Yes – narrow in each bay, wide in each bay on the top level/floor
COMMENTS Steel platforms, rails installed in each bay, each level/floor. No subsidence, nut unscrewing: 0.20 m. Top level anchored in each bay. Long anchors, fixed to two standards, anchors in V arrangement Required anchoring force at $\gamma_f = 1.5$ per one anchor: Force parallel to the wall – 1.70 KN Force perpendicular to the wall – 1.50 KN.	

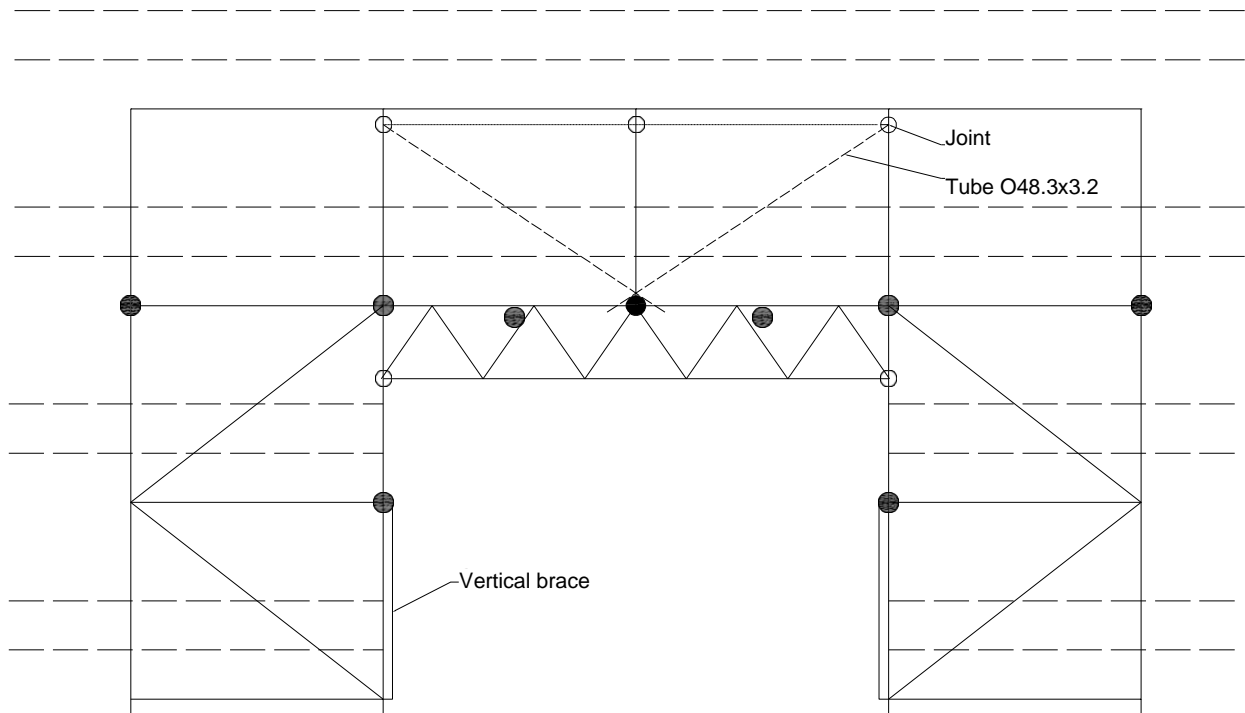


DRAWING 23 ANCHORING ARRANGEMENT OPTION 06 KWS FZ PS

TABLE 7: TABLE FOR DRAWING 23.

Scaffolding type	RAM1 frame scaffolding
Scaffolding height	24.2 m
Level/floor height	2.0 m
Working platform width	0.64 m
Bay length	2.07; 2.57; 3.07
Service load	2.0 kN/m ²
Façade type	Closed
Bracing arrangement	Multi-plane or tower-type
Maximum distance from the wall	0.2 m
Scaffolding facing	Mesh
Brackets	Yes – narrow in each bay, wide in each bay on the top level/floor
COMMENTS Steel platforms, rails installed in each bay, each level/floor. No subsidence, nut unscrewing: 0.20 m. Top level anchored in each bay. Long anchors, fixed to two standards, anchors in V arrangement Required anchoring force at $\gamma_f = 1.5$ per one anchor: Force parallel to the wall – 1.70 KN Force perpendicular to the wall – 1.50 KN.	

Option 7

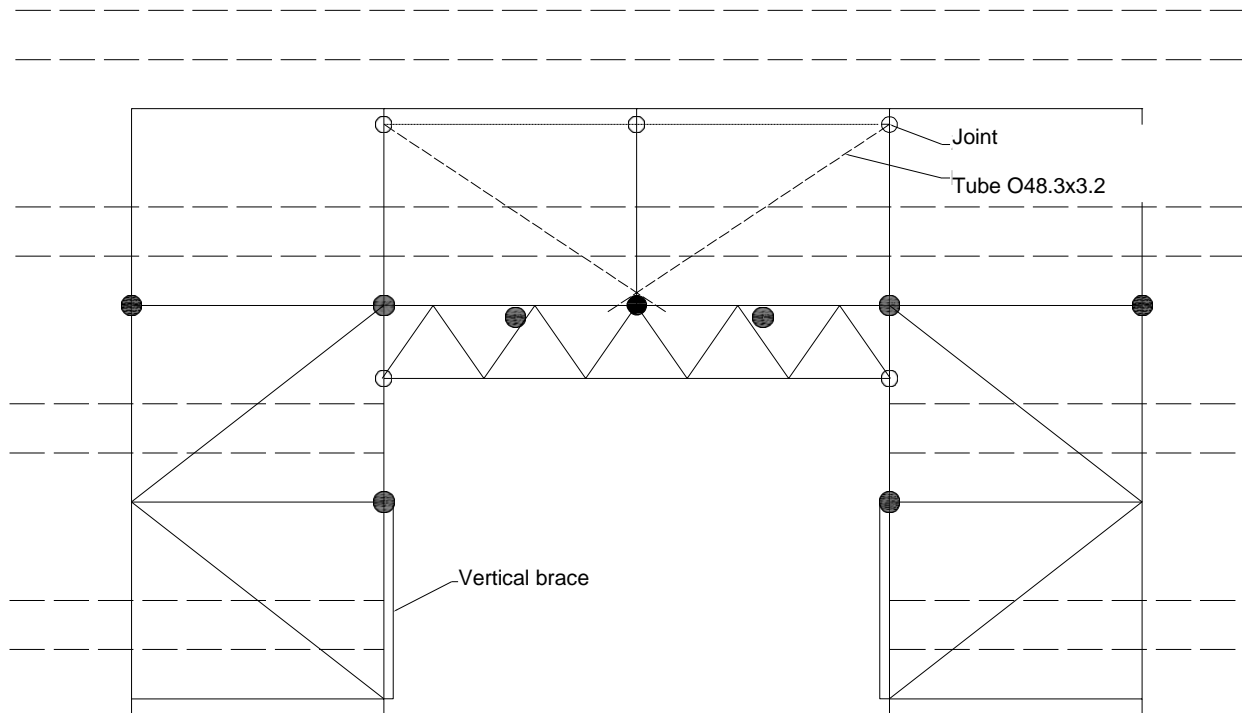


DRAWING 24 ANCHORING ARRANGEMENT **OPTION 07 KWS PB FZ PS**

TABLE 8: TABLE FOR DRAWING 24.

Scaffolding type	RAM1 frame scaffolding
Scaffolding height	24.2 m
Level/floor height	2.0 m
Working platform width	0.64 m
Bay length	2.07; 2.57; 3.07
Service load	2.0 kN/m ²
Façade type	Closed
Bracing arrangement	Multi-plane or tower-type
Maximum distance from the wall	0.2 m
Scaffolding facing	No
Brackets	Yes – narrow in each bay, wide in each bay on the top level/floor
COMMENTS Steel platforms, rails installed in each bay, each level/floor. Scaffolding with overhangs made with truss girders No subsidence, nut unscrewing: 0.20 m. Top level anchored in each bay. Long anchors, fixed to two standards.	

Option 8

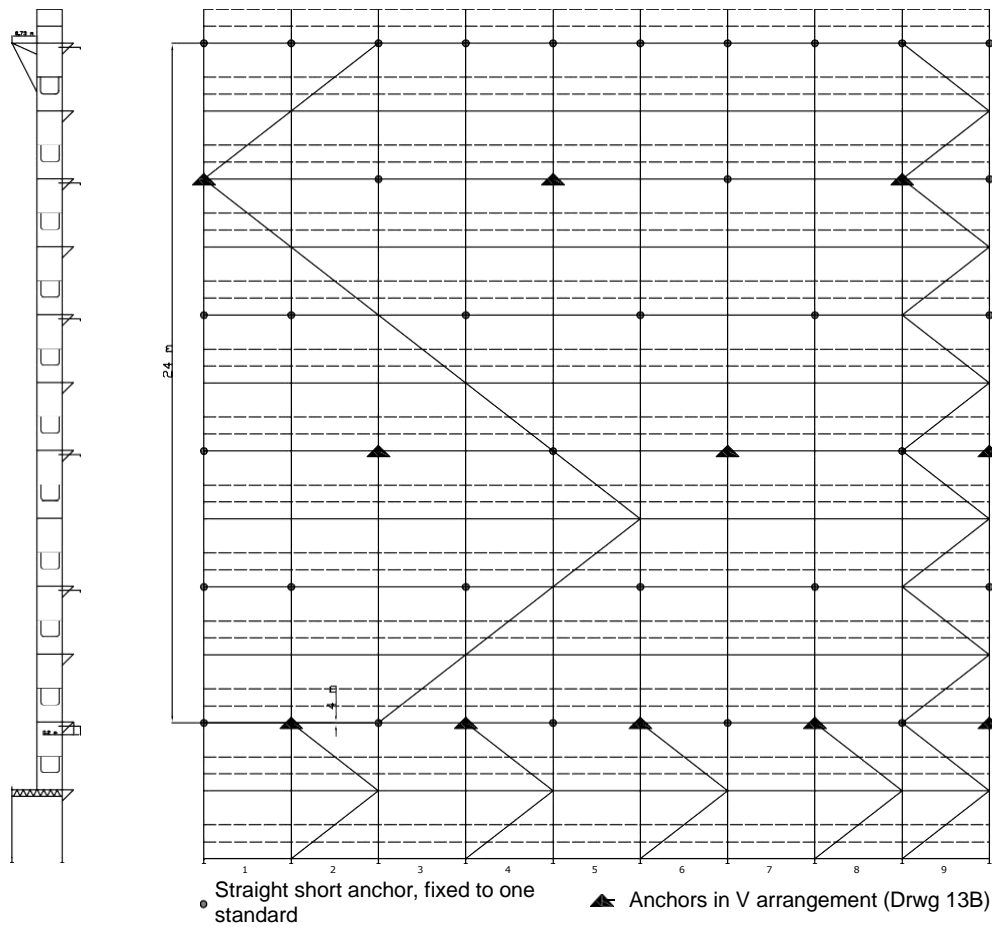


DRAWING 25 ANCHORING ARRANGEMENT **OPTION 08 KWS PB FZ PS**

TABLE 9: TABLE FOR DRAWING 25.

Scaffolding type	RAM1 frame scaffolding
Scaffolding height	24.2 m
Level/floor height	2.0 m
Working platform width	0.64 m
Bay length	2.07; 2.57; 3.07
Service load	2.0 kN/m ²
Façade type	Closed
Bracing arrangement	Multi-plane or tower-type
Maximum distance from the wall	0.2 m
Scaffolding facing	Mesh
Brackets	Yes – narrow in each bay, wide in each bay on the top level/floor
COMMENTS Steel platforms, rails installed in each bay, each level/floor. Scaffolding with overhangs made with truss girders No subsidence, nut unscrewing: 0.20 m. Top level anchored in each bay. Long anchors, fixed to two standards.	

Option 9

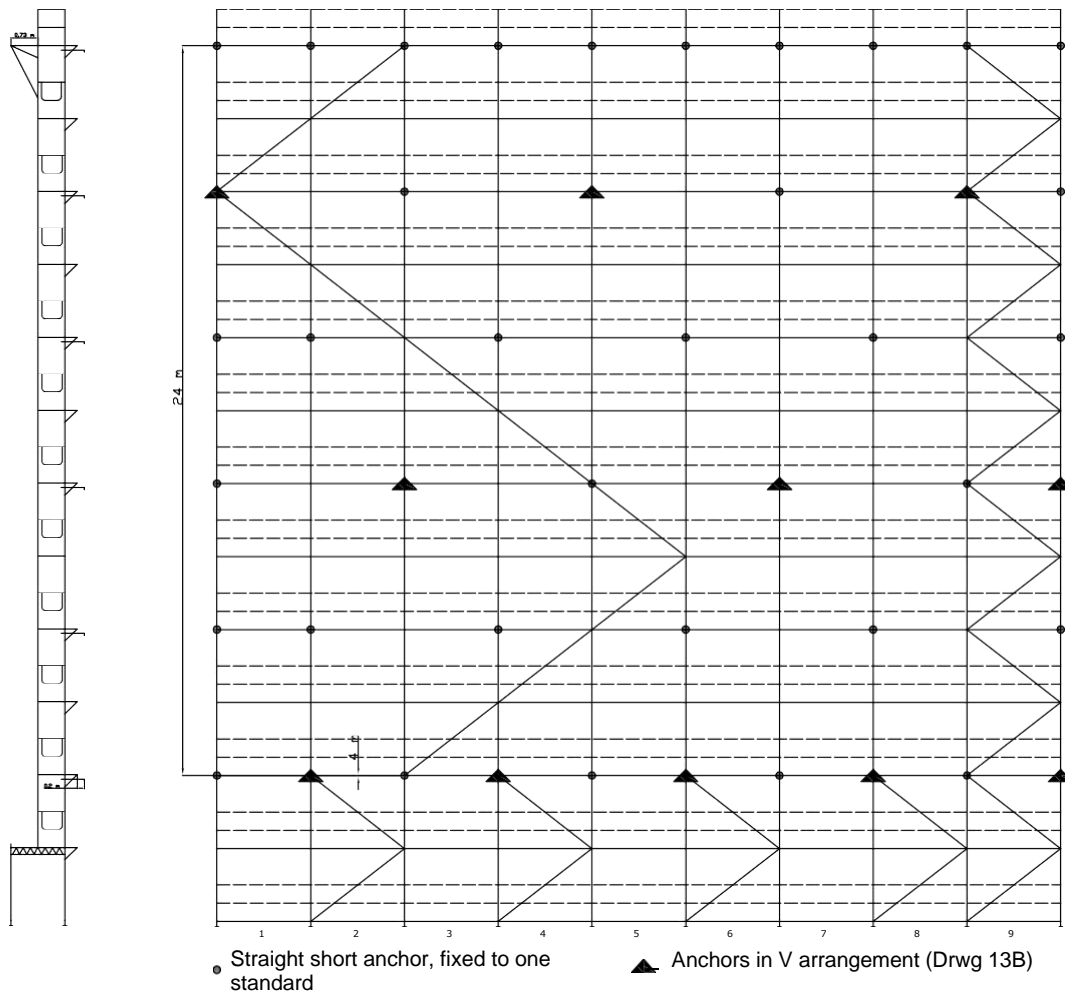


DRAWING 26 ANCHORING ARRANGEMENT **OPTION 09 KWS PB FZ NO**

TABLE 10: TABLE FOR DRAWING 26.

Scaffolding type	RAM1 frame scaffolding
Scaffolding height	24.2 m
Level/floor height	2.0 m
Working platform width	0.64 m
Bay length	2.07; 2.57; 3.07
Service load	2.0 kN/m ²
Façade type	Closed
Bracing arrangement	Multi-plane or tower-type
Maximum distance from the wall	0.2 m
Scaffolding facing	No
Brackets	Yes – narrow in each bay, wide in each bay on the top level/floor
COMMENTS Steel platforms, rails installed in each bay, each level/floor. Intermediate frames No subsidence, nut unscrewing: 0.20 m. Top level anchored in each bay. Long anchors, fixed to two standards.	

Option 10



DRAWING 27 ANCHORING ARRANGEMENT **OPTION 10 KWS PB FZ PS**

TABLE 11: TABLE FOR DRAWING 27.

Scaffolding type	RAM1 frame scaffolding
Scaffolding height	24.2 m
Level/floor height	2.0 m
Working platform width	0.64 m
Bay length	2.07; 2.57; 3.07
Service load	2.0 kN/m ²
Façade type	Closed
Bracing arrangement	Multi-plane or tower-type
Maximum distance from the wall	0.2 m
Scaffolding facing	Mesh
Brackets	Yes – narrow in each bay, wide in each bay on the top level/floor
COMMENTS Steel platforms, rails installed in each bay, each level/floor. Intermediate frames No subsidence, nut unscrewing: 0.20 m. Top level anchored in each bay. Long anchors, fixed to two standards.	

6. STANDARDS

K/0812-72/1/08 – *Product safety assessment criteria. Stationary working scaffolding systems.*

PN-EN 12810-1 – *Façade scaffolds made of prefabricated components. Part 1: Product specifications.*

PN-EN 12810-1 – *Façade scaffolds made of prefabricated components. Part 3: Particular methods of structural design.*

PN-EN 12811-1 – *Temporary works equipment. Scaffolds. Part 1: Performance requirements and general design.*

PN-EN 12811-1 – *Temporary works equipment. Part 2: Material requirements.*

PN-M-47900-1 – *Standing metal working scaffolding. Terms, division and main parameters.*

PN-M-47900-3 – *Standing metal working scaffolding. Frame scaffolding.*

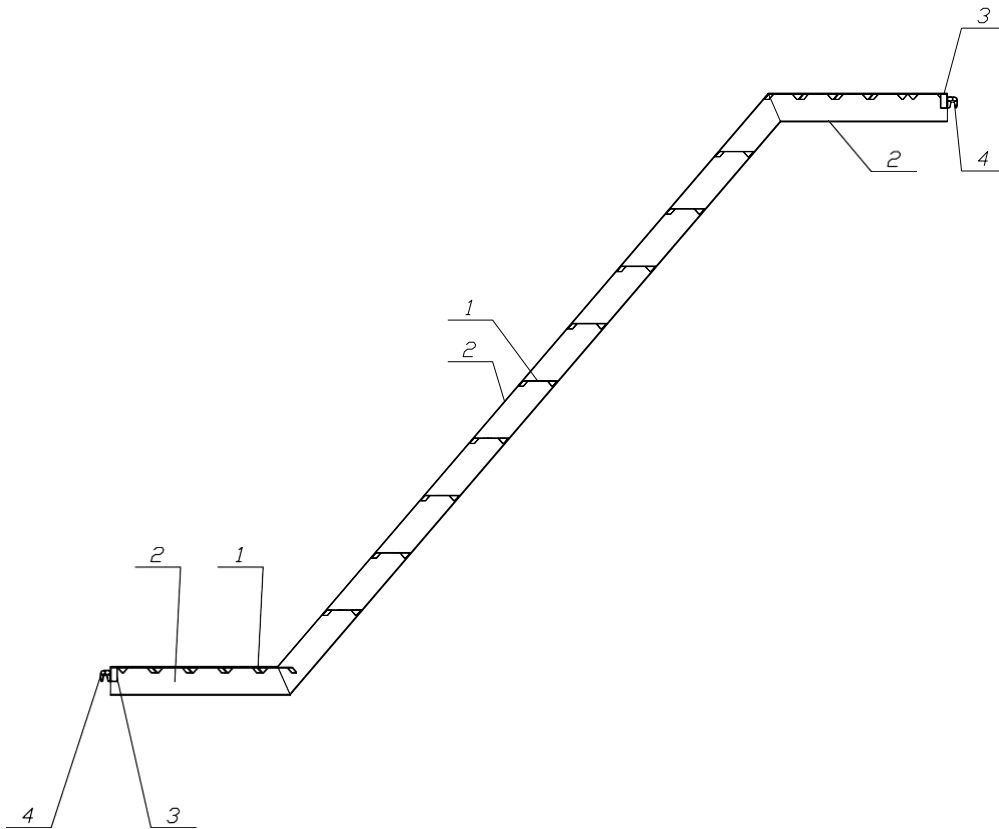
7. APPENDICES

7.1. Component List

Item	Component Name
1.	Steel frame, 0.73x2.00 m
2.	Aluminium frame, 0.73x2.00 m
3.	Steel frame, 0.73x1.50 m
4.	Steel frame, 0.73x1.00 m
5.	Steel frame, 0.73x0.50 m
6.	Newel post with safety lock, 0.73x1.00 m
7.	Newel post with safety lock, 0.73x2.00 m
8.	Steel platform, 3.07x0.32 m
9.	Steel platform, 2.57x0.32 m
10.	Steel platform, 2.07x0.32 m
11.	Steel platform, 1.57x0.32 m
12.	Steel platform, 1.09x0.32 m
13.	Steel platform, 0.73x0.32 m
14.	Aluminium and plywood access platform with ladder, 3.07 m
15.	Aluminium and plywood access platform with ladder, 2.57 m
16.	Aluminium access platform with ladder, 0.61x3.07 m
17.	Aluminium access platform with ladder, 0.61x2.57 m
18.	Guardrail, 3.07 m
19.	Guardrail, 2.57 m
20.	Guardrail, 2.07 m
21.	Guardrail, 1.57 m
22.	Guardrail, 1.09 m
23.	Front guardrail, 0.73 m
24.	Bracing, 3.07 m
25.	Bracing, 2.57 m
26.	Bracing, 2.07 m
27.	Bracing with wedge, 3.07 m
28.	Bracing with wedge, 2.57 m
29.	Bracing with wedge, 2.07 m
30.	Guardrail post, 1.00 m
31.	Toe board, 3.07 m
32.	Toe board, 2.57 m
33.	Front toe board, 0.73 m
34.	Crossbeam
35.	End frame, 0.73x1.00 m
36.	Console, 0.36 m
37.	Console, 0.73 m

38.	Aluminium and plywood platform, 0.61x3.07 m
39.	Aluminium plywood platform, 0.61x2.57 m
40.	Aluminium platform, 0.61x2.57 m
41.	Aluminium platform, 0.61x3.07 m
42.	Aluminium stairs, 2.57 m
43.	Aluminium stairs, 3.07
44.	Double aluminium guardrail for stairs, 2.57 m
45.	Double aluminium guardrail for stairs, 3.07 m

7.2. Staircase



Drawing 1 - Staircase module

Description of components:

The staircase module consists of side beams (ledgers) - **Drawing 2, Item 2**; as well as vertical beams, which are connected with the side beams and act as landings.

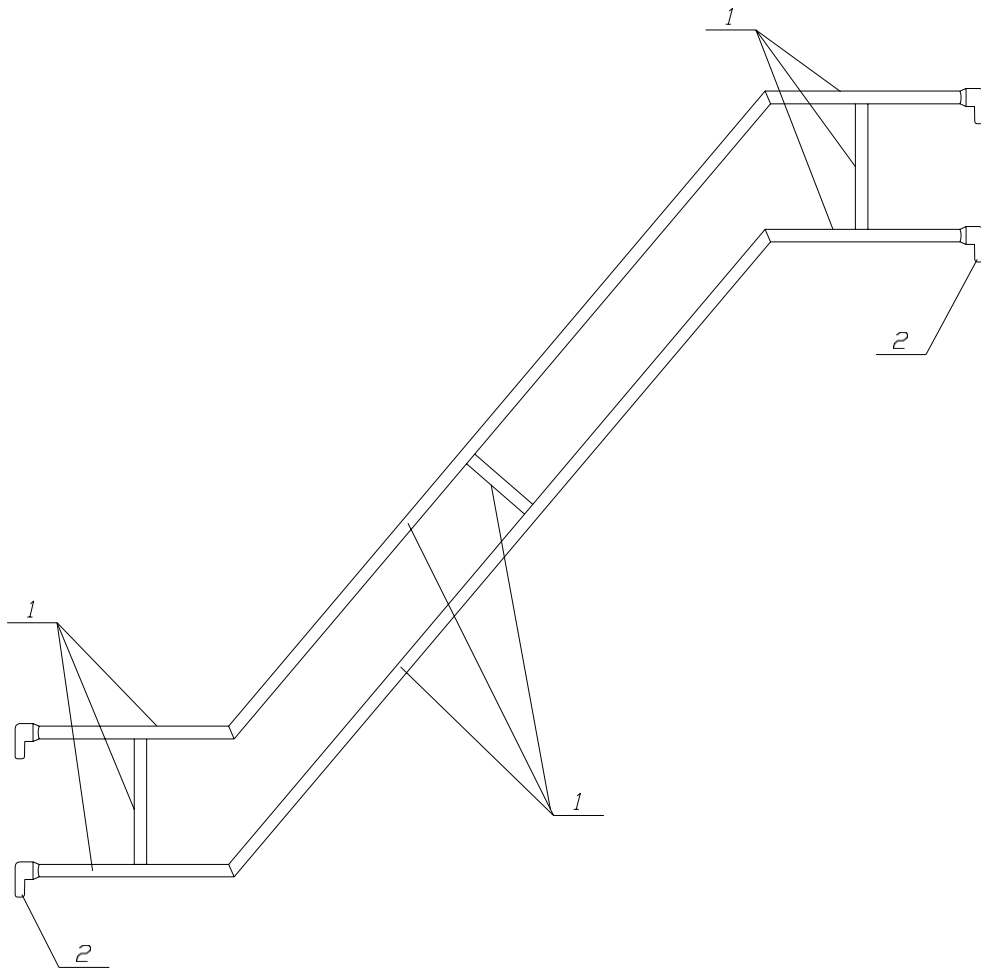
There is a front section at the end of each landing - **Drawing 1, Item 3**; with welded hooks - **Drawing 1, Item 4**.

Between ledger beams, there are steps - **Drawing 1, Item 1**, which are used to climb up and down the scaffolding.

Whereas between the landing beams, the same sections as for the steps are used, but in this case they constitute a uniform plane.

There are two modular stair lengths available: 2,530 mm and 3,030 mm - which correspond to typical working platform lengths, with their widths being identical at 608 mm.

Staircase modules must be mounted together with the double safety guardrail sets. Using typical **RAM1** system components, such as frames, consoles or posts, it is possible to build various staircase versions.



Drawing 2 - Double guardrail

Guardrail - **Drawing 2**, consists of pipes joined together - **Drawing 2, Item 1**, ended with hooks - **Drawing 2, Item 2**, which makes it possible to mount them in wedge sockets.