DELTA®

SCAFFOLDING ▪ FORMWORKS

SCAFFOLDING DELTA 73

TECHNICAL AND OPERATIONAL DOCUMENTATION

Release Date: May 2020.

Delta-Bud Company

Operates in the construction sector. We deal in particular with the sale of modular façade scaffolding as well as ceiling and wall formwork. The offer also includes formwork plywood and scaffolding accessories.

The headquarters of the Delta-Bud Company is located at 10 Kłobucka St., Warsaw. We also have branches located throughout the country. We are at the forefront of Polish scaffolding manufacturers. As a direct manufacturer, we have been operating in the industry for several years, thanks to which we have extensive experience in servicing construction companies and various types of investment projects directly on the construction site.

To meet your expectations, we have enriched our offer with scaffolding and formwork rental for construction companies throughout Poland. We rent aluminum scaffolding and ceiling formwork. If necessary, we also offer transport, assembly and disassembly of structures on the construction site. In order to comprehensively meet your expectations, we have also expanded the range of second-hand façade scaffolding.
Our extensive offer also includes the lease of stairs, atypical structures or structures for large-format advertising.

The façade scaffolding manufactured by our company has been adapted to the standards and regulations in force in the European Union.
Made in Polish plants and from Polish steel – it is what makes them strong and reliable. Quality control at every production stage eliminates errors and increases the quality of the final product. The most important element in the production of scaffolding by our company is to meet all the requirements important to every customer - from easy assembly, through simple storage and transport of scaffolding.
We produce 4 façade scaffolding systems **DELTA 73, 65, B70, 70.**

Delta 73 façade scaffolding

Produced on the basis of the standards available and used on the Polish market and those used in the European Union.
The DELTA 73 system works well in many areas of work due to quick and easy installation.

DELTA 73 scaffolding is one of the most popular façade scaffolding systems in Poland. The basic load-bearing component of the DELTA 73 scaffolding are closed vertical frames, 0.73 m / 1.09 m wide. The frame consists of two vertical stands connected with each other by crossbars - colloquially called transoms, placed at the top and bottom of the frames. The upper cross member is used to fasten the scaffolding platforms. Vertical frames are connected with each other by means of platforms, which at the same time stiffen the scaffolding in horizontal planes. The lower crossbars of the frames form a blockade preventing the removal of the platforms from the assembled structure. In the vertical plane, the scaffolding is stiffened with diagonal braces.

Basic technical data:

- storey height of 2m (other supplementary lengths 0.5 m, 0.66 m, 1 m and 1.5 m),
- basic platform lengths of 2.57 m and 3.07 m (other supplementary lengths 0.73 m, 1.09 m, 1.57 m, 2.07 m),
- steel, wooden, aluminum-plywood platforms,
- extension brackets from 0.30 m to 1.09 m,
- hot-dip galvanized steel components,
- impregnated wooden components,
- **possibility of setting the scaffolding up to a height of 66m in the case of a typical construction network (details in the next section of the Operation Manual).**

Main advantages of the DELTA 73 system:

- quick and easy installation,
- easy to store and transport components,
- possibility to choose the type of platforms,
- long service life thanks to solid workmanship,
- platform secured against detachment,
- optimal adaptation to a wide variety of structures,
- only two workers are required for assembly,
- flexibility of using the outermost bays (reconstruction, relocation),
- characterized by high stability and stability.

Dear Sir or Madam,
We would like to inform you that the DELTA 73 scaffolding is made very reliably, accurately, effectively and entirely by our company. The Delta Company has two manufacturing plants. The first one is adapted to the production of steel and aluminum components, has a very extensive machine park, including welding robots for steel and aluminum, an automatic line for profiling steel platforms, automatic lines for precise profile cutting, many eccentric presses, own tool shop and many, many others. On the other hand, the second plant is adapted to the production of wooden products, which also includes machines with a very advanced technological level, such as dryers, sawmills, presses, planers, etc. All our components undergo a series of internal inspections and then go to the Institute of Construction Mechanization and Rock Mining (IMBiGS), where they pass resistance tests.

As proof of the high quality and safety of the DELTA 73 scaffolding, IMBiGS issued the Safety Certificate „B" No. B00/000/00. DELTA 73 scaffolding (workmanship, general rules of use and assembly) was developed on the basis of the following standards:

- **PN-M-47900-1: 1996 - Metal standing working scaffolding. Definitions, division and main parameters**
- **PN-M-47900-2: 1996 - Metal standing working scaffolding. Pole scaffolding made of tubes**
- **PN-M-47900-3: 1996 – Metal standing working scaffolding. Frame scaffolding**
- **PN-EN 12810-2:2010 – Cladding scaffolding made of prefabricated components. Part 1: Technical product specifications**
- **PN-EN 12810-2:2010 – Cladding scaffolding made of prefabricated components. Part 2: Particular methods for the design of structures**
- **PN-EN 12811-1:2007 – Temporary structures used on the construction site. Part 1: Scaffolding. Conditions of execution and general principles of design**
- **PN-EN 12811-2:2007 – Temporary structures used on the construction site. Part 2: Material information**
- **PN-EN 12811-4:2014-02 – Temporary structures used on the construction site. Part 4: Scaffolding canopies. Requirements for the performance and construction of the product**
- **PN-EN 74-1:2006 – Connectors, centering pins and stands used in formwork and scaffolding. Part 1: Tube connectors. Requirements and test methods**
- **Journal of Laws No. 47/2003 item 401 - Ordinance of the Minister of Infrastructure on occupational health and safety during construction works**
- **Journal of Laws No. 178/2003, item 1745 - Ordinance of the Minister of Economy, Labor and Social Policy amending the ordinance on the minimum requirements for occupational health and safety as regards the use of machines by employees at work**
- **K/0812-72/1/12 – Criteria for assessing products in terms of safety. Stationary standing working system scaffoldings. Institute of Mechanization of Construction and Rock Mining.**

INSTYTUT MECHANIZACJI BUDOWNICTWA I GÓRNICTWA SKALNEGO

OŚRODEK CERTYFIKACJI
Jednostka Certyfikująca Wyroby
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CERTYFIKAT BEZPIECZEŃSTWA NR B/02/015/18

Nazwa i adres posiadacza certyfikatu/ *Name and address of the certificate holder:*	**DELTA Marcin Sadlak** **ul. Kłobucka 10,** **02-699 Warszawa.**
Nazwa i adres producenta/*Name and address of the manufacturer:*	**DELTA Marcin Sadlak** **ul. Kłobucka 10,** **02-699 Warszawa.**
Rodzaj wyrobu/*Product description:*	**Rusztowanie ramowe**
Model/typ wyrobu/*Mode/type of the product:*	**DELTA 73**
Program certyfikacji/ *Certification Program*	**P-CW/01B**
Wymagania bezpieczeństwa/*Safety requirements:*	**Kryteria K/0812-72/1/12**
Okres ważności certyfikatu/*Certificate validity:*	**Od 29 października 2018 r. do 28 października 2023 r.**
Prawa i obowiązki posiadacza certyfikatu są zawarte w/*Rights and duties of the certificate holder are stated in:*	**Umowa nr 013/014/015/18 o stosowaniu certyfikatu bezpieczeństwa z dnia 22 listopada 2018 r.**

Niniejszy certyfikat bezpieczeństwa upoważnia posiadacza do oznaczenia znakiem bezpieczeństwa „B" wyrobu wymienionego w certyfikacie. Znakiem bezpieczeństwa „B" mogą być oznaczone wyłącznie wyroby identyczne z egzemplarzem, który był badany/*This certificate allows the holder to affix safety mark „B" on the product(s) mentioned in this certificate. The safety mark „B" can be affixed only on those products that are identical with tested item(s).*

UWAGI:

1. Niniejszy certyfikat dotyczy rusztowań ramowych DELTA 73, których dane oraz informacje o montażu i zakresie stosowania zawarte są w:
   - *Dokumentacji Techniczno-Ruchowej. Instrukcja użytkowania i montażu rusztowania modułowego DELTA 73 – październik 2018 r.*
2. Niniejszy certyfikat potwierdza spełnienie wymagań Rozporządzenia Ministra Infrastruktury z dnia 06.02.2003 r. w sprawie bezpieczeństwa i higieny pracy podczas wykonywania robót budowlanych, a w szczególności § 108, ust. 2 tego Rozporządzenia.
3. Wyrób określony niniejszym certyfikatem może być wprowadzony do obrotu i użytkowania na terenie Polski jako wyrób bezpieczny w rozumieniu art. 4 pkt. 1 i art. 6 pkt. 1 Ustawy z 12 grudnia 2003 r. o ogólnym bezpieczeństwie produktów.

KIEROWNIK OŚRODKA CERTYFIKACJI

mgr inż. Michał Koźlik

DYREKTOR INSTYTUTU

prof. dr hab. inż. Zbigniew Starczewski

Warszawa, dnia 22 listopada 2018 r.

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TECHNICAL DOCUMENTATION

DELTA 73 Scaffolding Component List

DELTA 73/110 SYSTEM FRAME	Description	Height [mm]	Width [mm]	Weight [kg]	Catalog number
	**Steel vertical frame** A steel vertical frame made of pipes Ø 48.3mm with Re>355 MPa, protected by hot-dip galvanization. Equipped in the upper part with a U-profile enabling quick and safe installation of two platforms or a communication platform. Additionally, the frame has railing joints with a wedge for quick installation of the railing. Frame stands have holes at their ends for optional joining of frames with a securing pin. The DELTA 73 system frame has gusset plates in the upper corners to ensure increased frame rigidity. The wide range of frame heights allows to compensate for large terrain faults. **Packaging:** 25 items in a pack.	2000	732	18.50	LN 073 200
		1500	732	15.80	LN 073 150
		1000	732	12.10	LN 073 100
		666	732	10.00	LN 073 066
		500	732	8.60	LN 073 050
	Additionally, we offer a frame with a profile of Ø 48.3 mm x 3.2 mm	2000*	732	20.40	LN 073 232
	**Steel vertical frame 'plus'** A frame made as above. Contrary to the standard frame, it has additional grips enabling the installation of internal handrails. **Packaging:** 25 items in a pack.	2000	732	19.30	LN 073 202
		2000	1088	21.70	LN 110 202
	**Double-sided vertical steel frame** A frame made as above. Contrary to the standard frame, it has additional grips enabling the installation of internal handrails and curbs. **Packaging:** 25 items in a pack.	2000	732	19.40	LN 073 203
	**Steel vertical starting frame** A frame made as above. Contrary to the standard frame, it has additional grips enabling the installation of internal handrails and in the lower part it has a beam for mounting platforms. **Packaging:** 25 items in a pack.	2000	732	19.60	LN 073 204

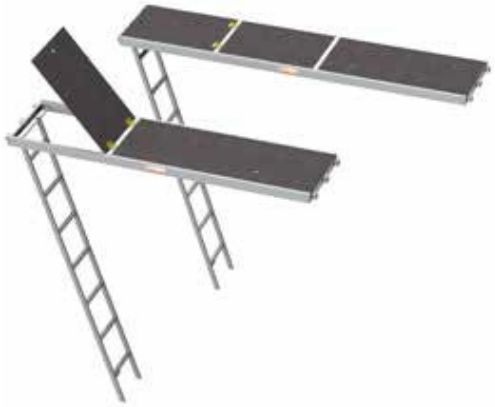
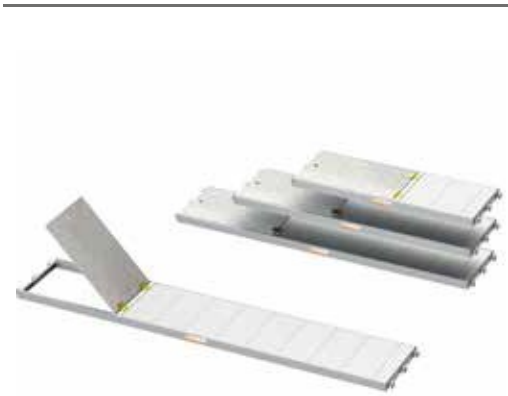
DELTA 73/110 SYSTEM FRAME	Description	Height [mm]	Width [mm]	Weight [kg]	Catalog number
	**Vertical aluminum frame** A vertical frame made of Ø 48.3 mm x 4.00 aluminum tube. Equipped in the upper part with a U-profile for quick and safe installation of platforms. Additionally, the frame has railing couplings with a wedge for quick railing installation. The frame stands have holes at their ends for optional connection of frames with a securing pin. The DELTA 73 system frame has gusset plates in the upper corners to ensure increased frame rigidity. The wide range of frame heights allows to compensate for large terrain faults. **Packaging:** 25 items in a pack.	2000 1500 1000 666 500	732 732 732 732 732	9.60 8.20 6.40 5.10 4.80	LN 073 201 LN 073 151 LN 073 101 LN 073 067 LN 073 051
	**Cornice vertical frame** The cornice vertical frame is made of a Ø 48.3 mm profile. It is used to bypass horizontal obstacles on the façade of the building, such as cornices, eaves or roof protrusions. Thanks to its construction, it allows to maintain a constant width of the platforms. The notch in the frame is recessed by 320 mm. **Packaging:** 25 items in a pack.	2000	732	22.90	LN 074 200
	**Vertical recess frame** The recess frame is made of a steel Ø 48.3 mm profile, protected by hot-dip galvanization, it is used wherever we have narrow gaps that prevent the installation of a standard frame, e.g. ventilation shafts. **Packaging:** 25 items in a pack.	2000	366	16.50	LN 030 200
	**Widening frame 200x40/70** The extension frame is made of a steel profile Ø 48.3 mm, protected by hot-dip galvanization. It is used to change the frame width from 0,4 m to 0,7 m. **Packaging:** 25 items in a pack.	2000	366/732	19.10	LN 040 073

DELTA 73/110 SYSTEM FRAME	Description	Height [mm]	Width [mm]	Weight [kg]	Catalog number
	**Widening frame 200x73/110** The extension frame is made of a steel profile Ø 48.3 mm, protected by hot-dip galvanization. It is used to change the frame width from 0.7 m to 1.1 m. **Packaging:** 25 items in a pack.	2000	732/1088	21.90	LN 073 110
	**Steel vertical frame Delta 100** A steel vertical frame made of pipes Ø 48.3 mm with Re>355 MPa, protected by hot-dip galvanization. Equipped in the upper part with a U-profile enabling quick and safe installation of three decks or a communication platform and one deck. Additionally, the frame has railing joints with a wedge for quick installation of the railing. The frame stands have openings at their ends for optional connection of frames with a securing pin. The DELTA 73 system frame has gusset plates in the upper corners to ensure increased frame rigidity. The wide range of frame heights allows to compensate for large terrain faults. **Packaging:** 25 items in a pack.	2000 1500 1000 666 500	1088 1088 1088 1088 1088	21.50 17.50 13.80 11.50 10.30	LN 109 200 LN 109 150 LN 109 100 LN 109 066 LN 109 050
	Additionally, we offer a frame with a reinforced profile Ø 48.3 mm x 3.2 mm.	2000*	1088	23.60	LN 109 232
	**Steel transition frame 150** The frame is made of a Ø 48.3 mm, profile, protected by hot-dip galvanization. It is used for the construction of a safe pedestrian crossing tunnel wherever works are carried out on the façade over the pedestrian communication route. The width of the frame makes it possible to install four platforms above it and 732 mm wide frames. **Packaging:** 10 items in a pack. **Packaging:** 20 items in a pack.	2400	1500	31.50	LN 200 150
	**Steel transition frame 180** The frame is made of a Ø 48.3 mm, profile, protected by hot-dip galvanization. It is used for the construction of a safe pedestrian crossing tunnel, wherever works are carried out on the façade over the pedestrian communication route. The width of the frame allows five platforms to be installed above it and a frame with a width of 732 mm or 1088 mm. **Packaging:** 10 items in a pack. **Packaging:** 20 items in a pack.	2400	1750	33.00	LN 200 180

DELTA 73/110 SYSTEM FRAME	Description	Height [mm]	Width [mm]	Weight [kg]	Catalog number
	**Transition beam 110/70** The steel transition beam is made of a Ø 48.3 mm profile, protected by hot-dip galvanization. It is used to change the frame width from 1.088 m to 0.732 m. **Packaging:** 20 items in a pack.	390	1088/732	8.00	LN 110 073

PLATFORMS, PASSAGES, COMMUNICATION COMPONENTS	Description	Height [mm]	Width [mm]	Weight [kg]	Catalog number
	**Wooden platform** A wooden deck made of coniferous wood, protected by impregnation. The deck has fittings at both ends, which makes it very durable. The fitting is equipped with special holders that enable installation on the U-profile of the frame. The width of the board is 320 mm, the thickness is 48 mm. **Packaging:** 60 items in a pack. **Packaging:** 80 items in a pack.	3072	320	23.40	LN 032 307
		2572	320	20.90	LN 032 257
		2072	320	18.30	LN 032 207
		1572	320	13.80	LN 032 157
		1088	320	9.60	LN 032 109
		732	320	7.00	LN 032 073
	**Wide wooden deck** A wooden deck made of coniferous wood, protected by impregnation. The deck has fittings at both ends, which makes it very durable. The fitting is equipped with special holders that enable installation on the U-profile of the frame. The width of the board is 640 mm, the thickness is 35 mm. **Packaging:** 25 items in a pack.	2572	640	28.40	LN 035 257
		2072	640	25.40	LN 035 207
		1572	640	22.30	LN 035 157
		1088	640	19.30	LN 035 110
		732	640	15.30	LN 035 073
	**Steel deck** A steel deck made of galvanized steel, forged on both sides. The deck has perforations to increase the rigidity of the deck and ensures work safety thanks to the anti-slip surface. **Packaging:** 60 items in a pack. **Packaging:** 80 items in a pack.	3072	316	21.00	LN 033 307
		2572	316	17.60	LN 033 257
		2072	316	15.00	LN 033 207
		1572	316	11.40	LN 033 157
		1088	316	8.00	LN 033 109
		732	316	6.00	LN 033 073

PLATFORMS, PASSAGES, COMMUNICATION COMPONENTS	Description	Height [mm]	Width [mm]	Weight [kg]	Catalog number
	**Aluminum deck** An aluminum deck, forged on both sides. The deck has perforations to increase the rigidity of the platform and ensures work safety thanks to the anti-slip surface. Made of aluminum alloys, it is very light. **Packaging:** 60 items in a pack. **Packaging:** 80 items in a pack.	3072	316	13.35	LN 033 301
		2572	316	11.25	LN 033 251
		2072	316	8.30	LN 033 201
		1572	316	6.95	LN 033 151
		1088	316	5.15	LN 033 107
		732	316	3.75	LN 033 071
	**Supplementary deck** The steel deck is made of galvanized sheet metal, forged on both sides. The deck has perforations to increase the rigidity of the platform and ensures work safety thanks to the anti-slip surface. It is used to fill undersized bays in platforms.	3072	190	17.40	LN 335 307
		2572	190	14.50	LN 335 257
		2072	190	11.90	LN 335 207
		1572	190	9.30	LN 335 157
		1088	190	6.60	LN 335 107
		732	190	4.00	LN 335 073
	**Aluminum-plywood deck** The aluminum-plywood deck has a frame (rack) made of aluminum, while the filling is made of waterproof, anti-slip plywood. Load 2,00 kN/m^2. **Packaging:** 10 items in a pack.	3072	630	24.00	LN 064 307
		2572	630	19.50	LN 064 257
		2072	630	16.60	LN 064 207
		1572	630	12.00	LN 064 157
		1088	630	8.90	LN 064 109
		732	630	7.00	LN 064 073
	**Aluminum-plywood access deck without a ladder** The aluminum-plywood deck has a frame (rack) made of aluminum, while the filling is made of waterproof, anti-slip plywood. The decks have hatches enabling vertical communication on the scaffolding. Load 2,00 kN/m^2. **Packaging:** 10 items in a pack.	3072	630	26.00	LN 164 307
		2572	630	21.50	LN 164 257
		2072	630	18.30	LN 164 207
		1572	630	15.00	LN 164 157

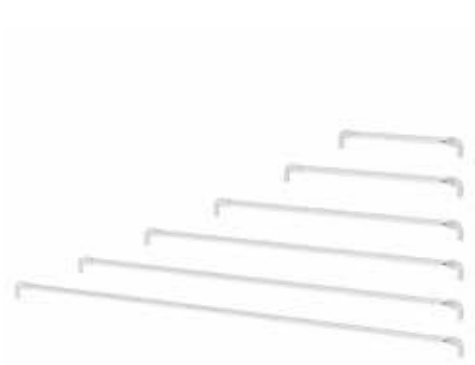
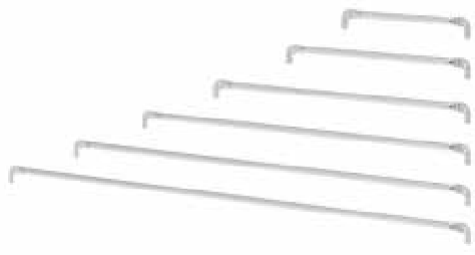
PLATFORMS, PASSAGES, COMMUNICATION COMPONENTS	Description	Height [mm]	Width [mm]	Weight [kg]	Catalog number
	**Aluminum-plywood access deck with a ladder** The aluminum-plywood deck has a frame (rack) made of aluminum, while the filling is made of waterproof, anti-slip plywood. The deck have manholes and ladders integrated with the deck, enabling vertical communication on the scaffolding. Load 2.00 kN/m^2. **Packaging:** 10 items in a pack.	3072	630	30.50	LN 264 307
		2572	630	25.40	LN 264 257
	**Wide aluminum deck** A wide aluminum deck made entirely of aluminum. The sheathing is a special anti-slip profile. **Packaging:** 10 items in a pack.	3072	630	24.00	LN 064 301
		2572	630	19.50	LN 064 251
		2072	630	16.60	LN 064 201
		1572	630	12.00	LN 064 151
		1088	630	8.90	LN 064 101
		732	630	7.00	LN 064 071
	**Aluminum transition deck without a ladder** A transition deck made entirely of aluminum. The sheathing is a special non-slip profile. The platforms have hatches enabling vertical communication on the scaffolding. **Packaging:** 10 items in a pack.	3000	630	26.00	LN 164 301
		2500	630	21.50	LN 164 251
		2000	630	18.30	LN 164 201
		1500	630	15.00	LN 164 151
	**Aluminum transition deck with a ladder** A transition deck made entirely of aluminum. The sheathing is a special anti-slip profile. The platforms have manholes and ladders integrated with the platform enabling vertical communication on the scaffolding. **Packaging:** 10 items in a pack.	3000	630	30.50	LN 264 301
		2500	630	25.40	LN 264 251

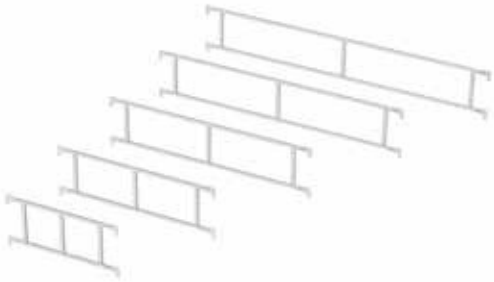
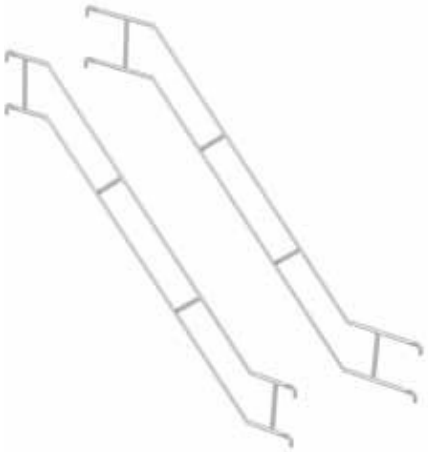
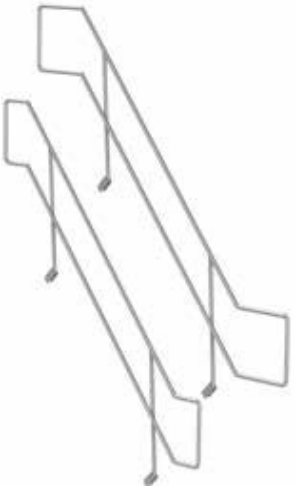
PLATFORMS, PASSAGES, COMMUNICATION COMPONENTS	Description	Height [mm]	Width [mm]	Weight [kg]	Catalog number
	**Steel ladder** A steel ladder secured by hot-dip galvanization is used for communication inside the scaffolding, used together with aluminum-plywood access deck. **Packaging:** 20 items in a pack.	2200	400	9.50	DL 164 205
	**Aluminum staircase h=2 m** The aluminum staircase is used for convenient vertical communication on the scaffolding and transport of materials thanks to the use of anti-slip profiles with the function of steps. **Packaging:** 10 items in a pack.	3072 2572	640 640	26.20 21.55	LN 364 307 LN 364 257
	**Aluminum staircase h=1 m** The aluminum staircase is used for convenient vertical communication on the scaffolding and for transporting materials. The height of the staircase is 1m and the communication can be conveniently adjusted to any building height. **Packaging:** 10 items in a pack.	1250	640	11.10	LN 364 100

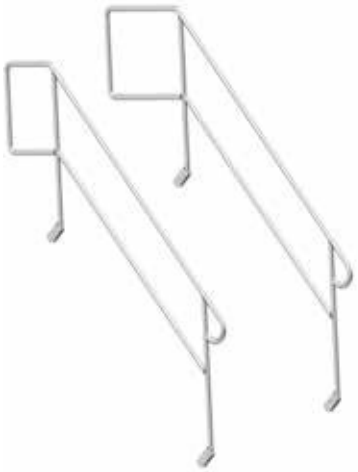
VERTICAL STRAINERS	Description	Field width [mm]	Total length [mm]	Weight [kg]	Catalog number
	**Vertical brace** Made of steel tube, protected by hot-dip galvanization. Mounted on the inside of the scaffolding. The purpose of the bracing is to provide stiffness in the parallel and vertical directions to the façade. Very quick assembly, which takes place by inserting one end into the gusset plate opening at the upper end of the vertical frame, while the other end, equipped with a half-joint, is screwed into the lower part of the vertical frame stand. **Packaging:** 50 items in a pack.	3072	3600	8.60	LN 001 307
		2572	3200	7.30	LN 001 257
		2072	2800	6.30	LN 001 207
		1572	2400	5.90	LN 001 157
		1088	2200	5.30	LN 001 109
		732	2100	4.70	LN 001 073

VERTICAL STRAINERS	Description	Field width [mm]	Total length [mm]	Weight [kg]	Catalog number
	**Horizontal brace** Made of steel tube, protected by hot-dip galvanization. It is used to stiffen the scaffolding structure. They are used in braced risers at the bottom of the first frame.	3072	3072	10.40	LN 101 307
		2572	2572	8.60	LN 101 257
		2072	2072	6.90	LN 101 207
		1572	1572	5.50	LN 101 157
		1088	1088	5.00	LN 101 109
		732	732	4.40	LN 101 073
	**Starting beam** It allows to attach two or three platforms just above the screw jacks.	1088	1088	4.30	LN 000 109
		732	732	3.00	LN 000 073

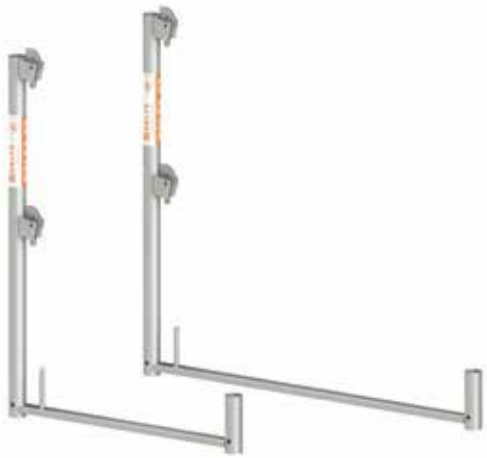
SCREW JACKS	Description	Height [mm]		Weight [kg]	Catalog number
	**Screw jack** It is used for assembling and leveling frames. The screw jacks are of different heights, thanks to which they are used to compensate for ground faults. The base dimensions are 150x150 mm. They have a threaded spindle with a nut with a socket for a pipe for easy and quick adjustment. The stand also has a lock against unscrewing the nut (at least 15 cm of thread should be inserted into the frame).	1100		4.70	DL 038 100
		800		3.75	DL 038 080
		600		3.30	DL 038 060
		500		2.80	DL 038 050
		400		2.60	DL 038 040
		300		2.40	DL 038 030
	**Tilting screw jack** A stand with a threaded tubular pin pivoted to the base with dimensions 150x150 mm. This stand is used to assemble the scaffolding on an inclined surface. In addition, the base has holes through which the base can be attached to the ground.	800		3.90	DL 039 080
		500		2.95	DL 039 050

SIDE COVERS	Description	Field width [mm]	Height [mm]	Weight [kg]	Catalog number
	**Longitudinal steel railing** A steel tube, protected by hot-dip galvanization, terminated with hooks that are inserted into the railing joint with a wedge in the frame. **Packaging:** 100 items in a pack.	3072		5.30	LN 002 307
		2572		4.70	LN 002 257
		2072		3.80	LN 002 207
		1572		2.85	LN 002 157
		1088		2.00	LN 002 109
		732		1.50	LN 002 073
	**Longitudinal aluminum railing** An aluminum tube, terminated with hooks, that slides into a handrail joint with a wedge in the frame. **Packaging:** 100 items in a pack.	3072		2.40	LN 002 301
		2572		2.10	LN 002 251
		2072		1.55	LN 002 201
		1572		1.50	LN 002 151
		1088		1.20	LN 002 101
		732		0.90	LN 002 071

SIDE COVERS	Description	Field width [mm]	Height [mm]	Weight [kg]	Catalog number
	**Double aluminum handrail** An aluminum tube, terminated with hooks, which is inserted into the railing joint with a wedge in the frame. The double railing speeds up the assembly and stiffens the scaffolding structure. **Packaging:** 25 items in a pack. **Packaging:** 50 items in a pack.	3072		5.90	LN 002 302
		2572		5.10	LN 002 252
		2072		4.30	LN 002 202
		1572		3.50	LN 002 152
		1088		3.00	LN 002 102
		732		2.50	LN 002 072
	**External railing for stairs** The outer handrail for the stairs is made of aluminum or steel. It has hooks at the ends that are inserted into the joints with a wedge in the frame. It is used to secure the staircase from the outside. **Packaging:** 25 items in a pack.		Steel handrail		
		3072		17.50	LN 365 307
		2572		15.80	LN 365 257
			Aluminum handrail		
		3072		7.20	LN 365 301
		2572		5.40	LN 365 251
	**External steel railing for the staircase attached to the stair flight** The outer handrail for the staircase is made of steel, protected by hot-dip galvanization. It is used to secure the staircase from the outside. Installation takes place by sliding the handrail over the flight of stairs and secures it against slipping with a screw. The total length of the railing is 3.07 m - 3850 mm, while the railing is 2.57 m - 3510 mm. **Packaging:** 10 items in a pack.	3072		17.90	DL 365 302
		2572		16.80	DL 365 252
	**Internal railing for stairs** An internal handrail for stairs made of steel or aluminum. It is used to protect the staircase from the inside. Installation takes place by sliding the railing over the flight of stairs and secures it against slipping with a screw. The total length of the handrail is 2865 mm. **Packaging:** 10 items in a pack.		Steel handrail		
		3072/2572		12.70	DL 366 300
			Aluminum handrail		
		3072/2572		4.45	DL 366 301

SIDE COVERS	Description	Field width [mm]	Height [mm]	Weight [kg]	Catalog number
	**End railing of the stairway** A steel handrail made of a pipe with a diameter of Ø 48.3 mm, protected by hot-dip galvanization. It is used to secure the last level of the staircase. The handrail has two half-couplers at the end, which should be attached to the stand in the frame. Handrail designed for a bay of 3.07 m and a bay of 2.57 m. **Packaging:** 25 items in a pack.	1935	500	17.85	DL 365 100
	**Starting handrail** A steel handrail, protected by hot-dip galvanization. It is used to secure the first flight of stairs h=1 m The total length of the handrail is 2185 mm. **Packaging:** 25 items in a pack.			9.00	DL 365 200
	**Stair protection handrail** A steel handrail used to protect the space under the stair flight. **Packaging:** 25 items in a pack.			4.30	DL 365 050
	**Internal end railing for stairs** A steel handrail protected by hot-dip galvanization. The handrail is used on the top storey. Secures the last run from the inside. **Packaging:** 25 items in a pack.	3072 2572		17.20 16.20	DL 365 303 DL 365 253

SIDE PROTECTIONS	Description	Field width [mm]	Height [mm]	Weight [kg]	Catalog number
	**Single side railing** A steel railing protected by hot-dip galvanization is used to secure the scaffolding vertical segment from the front side of the scaffolding. **Packaging:** 50 items in a pack.	1088 732		2.50 1.55	LN 041 109 LN 041 073
	**Double side railing** A steel railing protected by hot-dip galvanization is used to secure the scaffolding vertical segment from the front side of the scaffolding. The double handrail meets the requirements for edge protection with two handrails. **Packaging:** 25 items in a pack.	1088 732	470 470	4.40 3.00	LN 005 109 LN 005 073
	**Longitudinal curb** The curb is made of coniferous wood, protected by impregnation, at both ends it has fittings enabling quick assembly by sliding them over the pins in the lower part of the frame. It prevents the employee's foot from slipping or objects on the working platform from falling. **Packaging:** 100 items in a pack.	3072 2572 2072 1572 1088 732	150 150 150 150 150 150	7.80 5.90 4.80 3.65 2.50 2.20	LN 003 307 LN 003 257 LN 003 207 LN 003 157 LN 003 109 LN 003 073
	**Side curb** The curb is made of coniferous wood protected by impregnation, at both ends it has fittings that allow for quick assembly by sliding them over the pins and a stand in the lower part of the frame. Prevents the employee's foot from slipping or objects placed on the working platform from falling from the front of the scaffolding from falling. **Packaging:** 50 items in a pack.	1088 732	150 150	2.40 1.70	LN 004 109 LN 004 073

SCAFFOLDING END	Description	Height [mm]	Width [mm]	Weight [kg]	Catalog number
	**Handrail post** It is made of a steel tube with a diameter of Ø 48.3 mm, protected by hot-dip galvanization, or of an aluminum tube. It is used to fix the railing on the highest scaffolding level and to fix the curb. **Packaging:** 50 items in a pack.				
			Steel		
		1000		5.00	LN 007 073
			Aluminum		
		1000		2.30	LN 007 071
	**Steel railing post with platform protection** It is made of a steel tube with a diameter of Ø 48.3 mm, protected by hot-dip galvanization. It is used to attach handrails and curbs on the highest level of the scaffolding. The post is protected against sliding the platforms off from the last level. **Packaging:** 25 items in a pack.	1000	732	6.00	LN 008 073
		1000	1088	7.20	LN 008 109
	**Aluminum railing post with platform protection** It is made of an aluminum tube with a diameter of Ø 48.3 mm x 4.0 mm. It is used to attach handrails and curbs on the highest level of the scaffolding. The post is protected against sliding the platforms off from the last level. It is a lighter alternative to the railing post with a platform protection. **Packaging:** 25 items in a pack.	1000	739	2.70	LN 008 071
	**Railing post with a roofing platform protection** It is made of a steel tube with a diameter of Ø 48.3 mm, protected by hot-dip galvanization. It is used to attach handrails and curbs on the highest scaffolding level and to protect workers working at the edges of roofs, where the standard 1 m high protection does not meet the requirements. The post is protected against sliding the platforms off from the last level. **Packaging:** 25 items in a pack.	2080	732	11.00	LN 200 073
		2080	1088	11.55	LN 200 109

SCAFFOLDING END	Description	Height [mm]	Width [mm]	Weight [kg]	Catalog number
	**A railing post without securing the roofing platform** It is made of a steel tube with a diameter of Ø 48.3 mm, protected by hot-dip galvanization. It is used to attach handrails and curbs on the highest scaffolding level and to protect workers working at the edges of roofs, where the standard 1 m high protection does not meet the requirements. **Packaging:** 50 items in a pack.	2080		8.50	LN 007 200
	**Upper edge frame made of steel** It is made of a steel tube with a diameter of Ø 48.3 mm, protected by hot-dip galvanization. It is used to attach handrails and curbs on the highest level of the scaffolding on the front side of the scaffolding. The frame additionally has protection against sliding the platforms off from the last level. **Packaging:** 25 items in a pack.	1000 1000	732 1088	9.00 11.00	LN 006 073 LN 006 109
	**Upper aluminum frame** It is made of an aluminum pipe with a diameter of Ø 48.3 mm. It is used to attach handrails and curbs on the highest level of the scaffolding on the front side of the scaffolding. The frame additionally has protection against sliding the platforms off from the last level. Provides a lighter alternative to a steel end frame. **Packaging:** 25 items in a pack.	1000	732	6.90	LN 006 071
	**Roofing edge frame** It is made of a steel tube with a diameter of Ø 48.3 mm, protected by hot-dip galvanization. It is used to fix handrails and curbs on the highest level of the scaffolding from the front side and to protect employees working at the edges of roofs, where the standard protection, 1 m high, does not meet the requirements. The frame has protection against sliding the platforms off from the last level. **Packaging:** 25 items in a pack.	2000 2000	732 1088	15.00 17.10	LN 006 200 LN 006 201

SCAFFOLDING EXTENSION	Description	Length [mm]	Height [mm]	Weight [kg]	Catalog number
	**Bracket 0.30 without a nipple** Made of steel profiles protected by hot-dip galvanization with a welded half-joint. It is used to expand the scaffolding from the inside of the scaffolding by one platform, 0.32 m wide. It is used wherever internal handrails are not required. **Packaging:** 25 items in a pack.	300		3.00	LN 009 030
	**Bracket 0.32 with a nipple** Made of steel profiles protected by hot-dip galvanization with a welded half-joint and a nipple enabling the assembly of a railing pole. It is used to widen the scaffolding from the inside or outside of the scaffolding by one platform, 0.32 m wide. It is used wherever internal handrails are required. **Packaging:** 25 items in a pack.	320		3.70	LN 009 036
	**Bracket 0.50 m** Made of steel profiles protected by hot-dip galvanization with a welded half-joint and a nipple enabling the assembly of a railing pole. It is used to expand the scaffolding by two platforms with a total width of 0.50 m.	500		5.10	LN 009 050
	**Bracket 0.73 m** Made of steel profiles protected by hot-dip galvanization with a welded half-joint and a nipple enabling the assembly of a railing pole. It is used to widen the scaffolding by two platforms with a total width of 0.64 m. This bracket enables the shifting of the scaffolding vertical segment by 732 mm by mounting one frame stand on the bracket's nipple and the other on the frame stand to which the bracket is mounted. Permissible load of the bracket without support up to 1 kN/m^2, and with support up to 3 kN/m^2.	732		6.40	LN 009 073
	**Reinforced bracket 0.73 m** Made of steel profiles protected by hot-dip galvanization with a welded half-joint and a nipple enabling the assembly of a railing pole. It is used to widen the scaffolding by two platforms with a total width of 0.64 m. This bracket enables the shifting of the scaffolding vertical segment by 732 mm by mounting one frame stand on the bracket's nipple and the other on the frame stand to which the bracket is mounted. The reinforced bracket does not require additional support.	732		16.00	LN 009 200

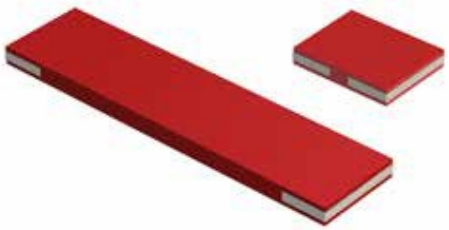
SCAFFOLDING EXTENSION	Description	Length [mm]	Height [mm]	Weight [kg]	Catalog number
	**Bracket 1.10 m** Made of steel profiles protected by hot-dip galvanization with a welded half-joint and a nipple enabling the assembly of a railing pole. It is used to widen the scaffolding by three platforms with a total width of 0.96 m. This bracket enables the shifting of the scaffolding vertical segment by 1088 mm by mounting one frame stand on the bracket's nipple and the other on the frame stand to which the bracket is mounted.	1065		10.50	LN 009 109
	**Brace supporting the bracket 0.73 m and 1.09 m** Bracing made of steel protected by hot-dip galvanization. The brace at the ends has two pivoting half-couplings.	732 1088		6.00 6.40	LN 009 210 LN 009 211
	**Eaves console** The eaves console is made of steel protected by hot-dip galvanization. The console meets the requirements of a work surface for painters, roofers and stucco workers. It is slipped onto the outer stand in the frame and then secured under the frame beam by tightening the joint located in the lowest part of the eaves console.	1000	732	14.80	LN 010 073
	**Platform protection** Protection made of steel profiles protected by hot-dip galvanization. It is used to protect the platforms against falling out of the frame U-section on the highest scaffolding level with installed standard handrail posts and platforms placed on steel brackets.	1088 732 360		2.50 1.70 1.00	LN 012 109 LN 012 073 LN 012 036

SCAFFOLDING EXTENSION	Description	Length [mm]	Height [mm]	Weight [kg]	Catalog number
	**Traverse** It is used to attach platforms, e.g. in the construction of stage platforms. It has half-couplings welded at the bottom, enabling quick assembly to load-bearing components such as lattice girders. We offer three lengths of the traverse.	2000 1000 640		6.50 3.60 2.80	LN 029 200 LN 029 100 LN 029 064
	**Visor component** Made of steel profiles protected by hot-dip galvanization. It is used for securing and protecting people on the scaffolding site. It is mounted on a 0.73 m bracket.			5.90	LN 012 100
TRAVEL COMPONENTS	Description	Length [mm]		Weight [kg]	Catalog number
	**Travel beam** Made of steel profiles protected by hot-dip galvanization, it is the basis of the mobile scaffolding. It is equipped with 4 pins enabling the assembly of two frames at the same time next to each other, so we can build a one-sided or double-sided scaffolding. Additionally, the beam has pins that enable the installation of platforms at the lowest level.			22.50	LN 011 002

TRAVEL COMPONENTS	Description	Length [mm]		Weight [kg]	Catalog number
	**Roller foot (castor) with a brake** The foot with the roller (castor) has a threaded spindle with a nut that allows to set the height of the mobile scaffolding and a roller equipped with a safety brake, thanks to which we can easily move the scaffolding.	600		5.70	DL 011 001
	**Horizontal diagonal brace** It is made of a steel tube with a diameter of Ø 48.3 mm, protected by hot-dip galvanization. It is used to stiffen the mobile scaffolding. Mounted on opposite sides of the beams.	3072 2572		10.00 9.30	LN 011 005 LN 011 003
	**Horizontal brace** It is made of a steel tube with a diameter of Ø 48.3 mm, protected by hot-dip galvanization. It is used to stiffen the mobile scaffolding. Installed on the same sides of the travel beams.	3072 2572		7.80 7.30	LN 011 006 LN 011 004
COMPLEMENTARY COMPONENTS	Description	Length [mm]	Width [mm]	Weight [kg]	Catalog number
	**Transition component** Component made of steel profiles, protected by hot-dip galvanization. It has a half-connector on one side, and a nipple on the other for attaching a railing post. The transition component makes it possible to make a transition from two adjacent risers arranged perpendicular to each other. **Packaging:** 25 items in a pack.	500		3.30	LN 012 050

COMPLEMENTARY COMPONENTS	Description	Length [mm]	Width [mm]	Weight [kg]	Catalog number
	**Reinforced girder connector** The steel component is used to connect pipes or lattice girders. We offer two types of connectors: with pins and cotters, and without pins and cotters. **Packaging:** 25 items in a pack.	410		3.00	DL 044 003
	**Pin with a cotter** The steel component is used to secure the connector of the reinforced girder in the lattice girder against displacement. **Packaging:** 25 items in a pack.			0.15	DL 044 004
	**Vertical sliding transom** It is used for mounting platforms at different frame heights. It is used where it is not possible to attach the platforms to the frame, because an obstacle appears, e.g. a balcony railing, this transom allows to install platforms over the obstacle. **Packaging:** 25 items in a pack.	739 1065		3.80 5.40	LN 027 073 LN 027 109
	**Frame transom** Made of hot dip galvanized steel, may be applied as transom above. This component was designed to build a continuous platform level between the scaffolding. **Packaging:** 25 items in a pack.	739 1065		3.90 5.60	LN 028 073 LN 028 109

COMPLEMENTARY COMPONENTS	Description	Length [mm]	Width [mm]	Weight [kg]	Catalog number
	**Security component** It is used to secure the scaffolding connections, e.g. when the scaffolding is moved with a crane or in special wind conditions.			0.10	DL 010 023
	**Eye pin** The hot-dip galvanized pin is used to anchor the scaffolding. diameter Ø 14 mm.	120		0.20	DL 010 120
		230		0.26	DL 010 230
		300		0.35	DL 010 300
		400		0.45	DL 010 400
	**Expansion plug** The plastic expansion plug is an integral part of the pin with the eye.			0.001	DL 010 071
	**Scaffold holder** A hot dip galvanized steel tube Ø 48.3 mm with bent hook at the end. Short anchors are attached with one fixed joint to the frame, while longer anchors are attached with two fixed joints to two stands in the frame to transfer forces perpendicular and parallel to the wall.	300		1.40	DL 010 030
		600		1.90	DL 010 060
		1100		3.70	DL 010 110
		1300		4.40	DL 010 130
		1500		5.50	DL 010 150
		2000		7.25	DL 010 200

COMPLEMENTARY COMPONENTS	Description	Length [mm]	Width [mm]	Weight [kg]	Catalog number
	**Steel tube** A hot-dip galvanized steel tube with a diameter of Ø 48.3 mm. We offer a wide range of dimensions.	500		1.75	DL R00 050
		1000		3.50	DL R00 100
		1500		5.25	DL R00 150
		2000		7.00	DL R00 200
		2500		8.75	DL R00 250
		3000		10.50	DL R00 300
		3500		12.25	DL R00 350
		4000		14.00	DL R00 400
		4500		15.75	DL R00 450
		5000		17.50	DL R00 500
		6000		21.00	DL R00 600
		7000		24.50	DL R00 700
	**Construction console** A construction console. 1.2 m high and 1.25 m wide. It serves as a support for the scaffolding when it cannot be placed on the ground or on the ceiling. The bracket has three large holes with a diameter of Ø 20 mm. thanks to which the bracket can be mounted to the wall using standard construction ties or expansion anchors.	1250	1200	38.00	DL 012 000
	**Wooden sleepers** Made of impregnated wood. Protected against delamination with a steel fitting. For use in difficult terrain as a base for screw jacks.	1000		5.75	DL P00 100
		300		2.00	DL P00 030
	**Girder wall connector** A steel girder wall connector, hot-dip galvanized, used to mount a lattice girder on a building's wall, e.g. in a situation when it is necessary to suspend above a lower building.	700	100	5.00	DL 004 040

JOINTS	Description			Weight [kg]	Catalog number
	**Handrail joint** Ribbed, class BB 9 according to DIN 4420 and EN 74. Hot-dip galvanized forged steel with flange nuts for a spanner width of Ø 19 mm or Ø 22 mm. It is used to attach additional longitudinal handrails, e.g. internal, or to attach additional braces. **Packaging:** 25 items in a pack.			1.10	LN 010 002
	**Curb joint** A connector for the assembly of the internal curb. Made of steel with a welded half-joint with flange nuts for a spanner width of Ø 19 mm or Ø 22 mm. **Packaging:** 25 items in a pack.			0.95	DL 010 004
	**Rotary joint** A connector with flange nuts for a spanner size of Ø 19 mm or Ø 22 mm, used for a total of two pipes with a diameter of Ø 48.3 mm pod at any angle. The permissible rotating union load is 5.9 kN. **Packaging:** 25 items in a pack.			1.40	DL 010 001
	**Fixed joint** A joint with flange nuts for a spanner size of Ø 19 mm or Ø 22 mm, used for a total of two pipes of Ø 48.3 mm at an angle of 90°. The permissible load on the joint is 9.1 kN. **Packaging:** 25 items in a pack.			1.20	DL 010 000
	**Foot support connector** The joint is made of steel protected by hot-dip galvanization. It is used to prevent the foot from slipping out of the frame during the scaffolding transfer (e.g. transferring the mobile scaffolding with a crane).	325		1.55	LN 010 012

JOINTS	Description			Weight [kg]	Catalog number
	**Spacer joint 150mm** A galvanized steel tube Ø 48.3 mm with two half-couplers. For example, it can be used as a connection (without interruption) between the façade scaffolding and the external staircase. **Packaging:** 25 items in a pack.			1.55	DL 010 006
	**Longitudinal joint** Made of hot-dip galvanized steel, used to connect longitudinally, for example, two tubes with a diameter of Ø 48.3 mm. **Packaging:** 25 items in a pack.			1.55	DL 010 005
	**Bridge joint** Hot-dip galvanized steel. Thanks to its design, it is used, for example, to anchor the scaffolding to steel structures such as poles, bridges, etc. **Packaging:** 25 items in a pack.			1.45	DL 010 003

LATTICE GIRDERS	Description	Length [mm]	Width [mm]	Weight [kg]	Catalog number
	**Aluminum lattice girder, 0.4m** A lattice girder made of aluminum with a profile of Ø 48.3x4.0 mm. The girder belt spacing is 0.4 m. The girder is used wherever it is necessary, for example, to suspend the scaffolding on heavy consoles, suspend the scaffolding in gate passages, install platforms and stages..	8240	400	32.00	DL 004 824
		6240	400	25.10	DL 004 624
		5240	400	19.60	DL 004 524
		4240	400	17.10	DL 004 424
		3240	400	14.00	DL 004 324

LATTICE GIRDERS	Description	Length [mm]	Width [mm]	Weight [kg]	Catalog number
	**Aluminum lattice girder, 0.5 m** A lattice girder made of aluminum with a profile of Ø 48.3 x 4.0 mm. The girder belt spacing is 0.5 m. The girder is used wherever it is necessary, for example, to suspend the scaffolding on heavy consoles, suspend the scaffolding in gate passages, install platforms, stages.	8240	500	34.00	DL 004 825
		6240	500	27.00	DL 004 625
		5240	500	21.60	DL 004 525
		4240	500	19.10	DL 004 425
		3240	500	16.00	DL 004 325
	**Steel lattice girder, 0.4 m** The lattice girder is made of Ø 48.3 mm steel profiles. The girder belt spacing is 0.4 m. The girder is used wherever it is necessary, for example, to suspend the scaffolding on heavy consoles, suspend the scaffolding in gate passages, install platforms, stages.	6240	400	51.00	DL 044 604
		5240	400	45.00	DL 044 504
		4240	400	39.50	DL 044 404
		3240	400	32.00	DL 044 304
	**Steel lattice girder, 0.5 m** The lattice girder is made of Ø 48.3 mm steel profiles. The girder belt spacing is 0.5 m. The girder is used wherever it is necessary, for example, to suspend the scaffolding on heavy consoles, suspend the scaffolding in gate passages, install platforms, stages.	6240	500	55.50	DL 044 605
		5240	500	49.50	DL 044 505
		4240	500	44.00	DL 044 405
		3240	500	36.50	DL 044 305

SCAFFOLDING SECURITY	Description	Length [m]	Width [m]	Weight [kg]	Catalog number
	**Protective net** The scaffolding net is used to protect workers on the scaffolding. Available in many sizes. Weight 80 g/m^2.	20	3	4.40	DL Z20 300
		10	3	2.00	DL Z10 300
		20	2.5	3.60	DL Z20 250
		10	2.5	1.55	DL Z10 250

SCAFFOLDING SECURITY	Description	Length [m]	Width [m]	Weight [kg]	Catalog number
	**Protective tarpaulins** The scaffolding net is used to protect employees on the scaffolding and protects the façade on which work is carried out. Available in many sizes. Weight 160 g/m^2.	20	3.1	8.75	DL 200 310
		10	3.1	4.80	DL 100 310
		20	2.6	7.55	DL 200 260
		10	2.6	4.30	DL 100 260

TRANSPORT BASKETS	Description	Length [mm]	Width [mm]	Weight [kg]	Catalog number
	**Tubular basket** A seel basket made of steel profiles, protected by hot-dip galvanization. Very durable, it is used to transport, for example, curbs.	1300	1000	35.00	DK 000 002
	**Steel basket** A steel basket made of steel profiles, protected by hot-dip galvanization. Very durable, it is used to transport e.g. bracings.	1200	900	52.00	DK 000 001
	**Mesh basket** A mesh basket designed for transporting small items. Made of steel protected by hot-dip galvanization.	1200	900	85.00	DK 000 003

TRANSPORT BASKETS	Description	Length [mm]	Width [mm]	Weight [kg]	Catalog number
	**Steel frame pallet** It is used for storage and easy transport of DELTA system frames.	1100 1100	739 1065	30.00 39.00	DK 000 004 DK 000 005

WINCHES, TRANSPORT ARMS, PULLEYS	Description			Weight [kg]	Catalog number
	**Pulley** A pulley for transporting material. Maximum working load 200 kg, rope diameter Ø 22 mm. wheel diameter Ø 165 mm. Rope type: braided ropes.			3.00	DL 011 200
	**Transport arm** A frame for transporting materials vertically during works carried out on façades and for transporting scaffolding components during assembly and disassembly of the scaffolding. After mounting, the arm can be swung out.			7.50	DL 011 100
	**Geda Mini 60s rope winch** Geda's winch ensures quick and easy assembly on the scaffolding, it is the fastest winch model on the market. It achieves a very high speed of 23/69 m/min. The maximum possible working height of the Geda winch is 40 m, and if the drive unit is suspended higher – up to 76 m. The winch has two lifting speeds and protection against overload and twisting of the rope. Maximum load 60 kg.				GD 01S 060

WINCHES, TRANSPORT ARMS, PULLEYS	Description			Weight [kg]	Catalog number
	**Geda Maxi 120s rope winch** Geda's winch ensures quick and easy assembly on the scaffolding. It achieves a very high speed of 20/60 m/min., with a lifting capacity of up to 120 kg. The maximum possible working height of the Geda's winch is 40 m, and if the drive unit is suspended higher - even 76 m. The winch has two lifting speeds and has protection against overload and twisting of the rope.				GD 01S 120
	**Geda Maxi 150s rope winch** Geda's winch ensures quick and easy assembly on the scaffolding. It has a material load capacity of up to 150 kg. The maximum possible working height of the Geda's winch is 40 m, and if the drive unit is suspended higher – up to 76 m. The winch has two lifting speeds and has protection against overload and twisting of the rope.				GD 01S 150
	**Geda's winch arm** A swivel arm used with GEDA MINI 60 S and GEDA MAXI 120 S/150 S.				GD 01S 000

NEW ITEMS	Description	Height [mm]	Width [mm]	Weight [kg]	Catalog number
	**Roof pole** It is made of a steel tube with a diameter of Ø 48.3 mm, protected by hot-dip galvanization. It is used to protect employees working on the last level of the scaffolding against weather conditions through the possibility of stretching the scaffolding tarpaulin or protective net. The tarpaulin is attached to the handrail, which slides into the handrail pockets and then blocks the wedge that prevents it from sliding out.	3000	1400	14.00	LN 300 140

1.2 Service Components

DELTA 70 SERVICE COMPONENTS	Description				Catalog number
	**Railing wedge** The handrail wedge is used wherever the handrail is installed, its task is to block the handrail against its unauthorized sliding out of the handrail pocket.				LN SN003
	**Narrow wooden platform fitting** Galvanized steel hardware used in DELTA 73 wooden platforms, 320 mm wide.				LN 000 273
	**Wide wooden platform fitting** Galvanized steel hardware used in DELTA 73 wooden platforms, 640 mm wide.				LN 000 271
	**Aluminum- plywood platform end** Galvanized steel hardware applicable to all aluminum-plywood platforms of the DELTA 73 group.				LN 000 071

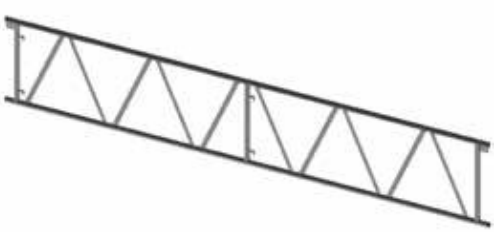
DELTA 70 SERVICE COMPONENTS	Description				Catalog number
	**Transition platform aluminum ladder** Aluminum ladder, used in aluminum-plywood transition platforms.				DL 000200
	**Tube fixing the ladder in the passageway** The tube is used in aluminum-plywood transition platforms to attach an aluminum ladder.				LN 000070
	**Manhole cover latch and ladder fasteners** A latch used in aluminum-plywood transition platforms to prevent the access hatch from opening or to prevent the aluminum ladder from lowering.				DL 000001
	**Latch lock** The lock is an integral part of the manhole hatch latch and the ladder fastener.				DL 000003

DELTA 70 SERVICE COMPONENTS	Description				Catalog number
	**Hinge** The steel hinge is used to fix the damper in aluminum-plywood transition products.				DL 000002
	**Manhole bracket** The steel component is used to strengthen the aluminum-plywood platforms, and as a supporting beam for fixing the manhole cover in the passage platforms.				LN 000 173
	**Anti-slip plywood** Anti-slip plywood used in aluminum and plywood platforms. Available in any size.				DSKD 0003
	**Side profile of the aluminum-plywood platform** Side platform profile used as a frame in aluminum-plywood platforms.	for a segment of 3.07 m for a segment of 2.57 m for a segment of 2.07 m for a segment of 1.57 m for a segment of 1.09 m for a segment of 0.73 m			DL 002 915 DL 002 415 DL 001 915 DL 001 415 DL 000 980 DL 000 654

DELTA 70 SERVICE COMPONENTS	Description				Catalog number
	**Rivets** Steel rivets used in the assembly of hardware for wooden platforms, curbs, for the assembly of handrail latches and braces, and for the assembly of anti-slip plywood in aluminum and plywood platforms.	Rivet for mounting handrail latches and braces			NIT 010 000
		Rivet Ø 23 mm (platform fittings 320 mm)			NIT 023 054
		Rivet Ø8mm (platform fittings 320 mm)			NIT 008 054
		Rivet Ø23mm (platform fittings 640 mm)			NIT 023 039
		Rivet Ø8mm (platform fittings 640 mm)			NIT 008 039
		Rivet Ø 8 mm (curb fittings)			NIT 008 039
		Nit Ø 4.8 mm (fastening of plywood in the platforms alu-plywood)			NIT 005 160
	**Side curb fitting** Steel hardware protected by hot-dip galvanization, mounted in the side curbs.				DLK 070 BOK
	**Longitudinal curb fittings** Steel hardware protected by hot-dip galvanization, mounted in side and longitudinal curbs.				DLK 070 WZD
	**Half-connector** Half-connector Ø 48.3 mm, protected by hot-dip galvanization.				DL 001 008

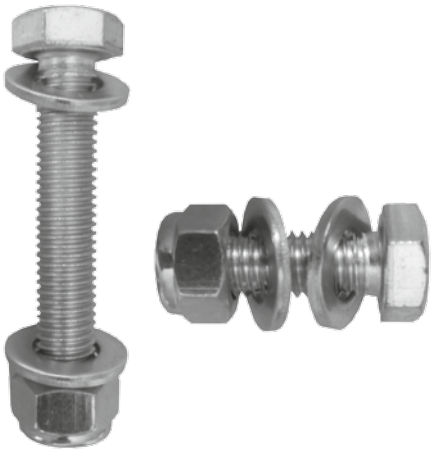
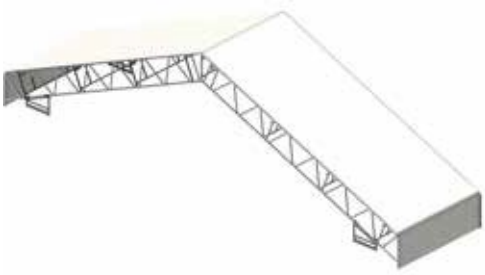
DELTA 70 SERVICE COMPONENTS	Description				Catalog number
	**T-bolt with nut for connectors** T-bolt used in all kinds of joints.	T-bolt with nut T-bolt Nut Ø 22 mm			DL SN 000 DL SN 001 DL SN 002
	**Mounting wrench 19/22 mm** The mounting wrench is equipped with a combined pass-through ratchet in sizes 19 and 22 mm. Made of high quality tool steel.				DL 019 022

1.3 DELTA ROOF Components

DELTA ROOF COMPONENTS	Description	Length [mm]	Height [mm]	Weight [kg]	Catalog number
	**Roof lattice girder** Aluminum lattice girder. The lower belt of the girder is made of Ø 48.3x4.0 mm profile, while the upper belt is Ø 48.3 mm which has special holes along the belt, enabling the installation of tarpaulins in them. The girder chord spacing is 0.7 m.	8240	700	41.60	DL 045 824
		7240	700	35.20	DL 045 724
		6240	700	31.70	DL 045 624
		5240	700	26.20	DL 045 524
		4240	700	21.55	DL 045 424
	Additionally, we offer a frame with a profile of Ø 48.3 mm x 3.2 mm.	2240	700	10.60	DL 045 224
	**Roof lattice connector** Connector made of aluminum. The lower strip of the girder is made of the Ø 48.3 x 4.0 mm profile, while the upper strip is Ø 48.3 mm, which has special holes along the strip for the installation of tarpaulins. The spacing of the girder belts is 0.7 m. The connector enables the installation of roof slopes with an inclination of 23° relative to the ground.	920	700	5.20	DL 045 001
	**Roof frame connector** Roof frame connector made of steel protected by hot-dip galvanization. The design of the connector allows it to be mounted directly on the frame as well as on the trolley. The connector is used to connect roof slopes with the load-bearing scaffolding.	739	600	10.00	DL 044 003
	**Roof drip** The roof drip is made of aluminum. The lower strip of the girder is made of the Ø 48.3 x 4.0 mm profile, while the upper strip is Ø 48.3 mm, which has special holes along the strip for the installation of tarpaulins. The drip is a component that ends the roof slope.	900	700	4.90	DL 045 004

DELTA ROOF COMPONENTS	Description	Length [mm]	Height [mm]	Weight [kg]	Catalog number
	**Roof railing** Roof rails made of steel profiles, protected by hot-dip galvanization. The special structure of the handrail allows the tarpaulin to be tensioned, thus reducing the collection of water and snow to a minimum. The handrails at the end have holes for quick assembly on the frame by sliding them over the bolts with self-locking pins.	3072	475	12.10	LN 046 307
		2572	475	10.85	LN 046 257
		2072	475	9.35	LN 046 207
		1572	475	7.95	LN 046 157
	**Roof brace** The brace is made of steel protected by hot-dip galvanization. The brace at the ends has two pivoting half-couplings.	for a segment of 3.07 m		11.00	LN 045 307
		for a segment of 2.57 m		10.00	LN 045 257
		for a segment of 2.07 m		9.00	LN 045 207
		for a segment of 1.57 m		7.90	LN 045 157
	**Clamp connector** The clamp connector is made of steel profiles, protected by hot-dip galvanization. It is used to connect two slopes with a lattice girder H=0.4 m, thanks to which the stiffness of the roof is increased.	700	400	5.70	DL 045 005
	**Aluminum roof lattice girder** Aluminum lattice girder with a profile of Ø 48.3 x 4.0 mm. The girder belt spacing is 0.4 m. The girder is used wherever it is necessary, for example, to suspend the scaffolding on heavy consoles, suspend the scaffolding in gate passages, install platforms, stages.	8240	400	32.00	DL 004 824
		6240	400	25.10	DL 004 624
		5240	400	19.60	DL 004 524
		4240	400	17.10	DL 004 424
		3240	400	14.00	DL 004 324

DELTA ROOF COMPONENTS	Description	Length [mm]	Height [mm]	Weight [kg]	Catalog number
	**Aluminum girder connector** Aluminum girder connector is used to connect the upper chords of roof girders, lattice connectors and drips with screws.	180	40	0.04	DL 045 003
	**Reinforced girder connector** A steel girder connector, protected by hot-dip galvanization, is used to connect the lower chords of the girder of two adjacent roof girders.	410		3.00	DL 044 003
	**Trolley** The trolley is made of steel protected by hot-dip galvanization. It has two guide wheels made of stainless steel and two support wheels made of polyamide. The trolley is used to transfer the loads from the roof directly to the scaffolding, and also enables the roof to be moved in relation to the supporting scaffolding. The construction of the trolley ensures safety against the roof being lifted by the wind.			11.00	DL 045 006
	**Roof guide rail** The roof guide rail is made of aluminum. It is used for movable roofs as a guide rail for a trolley.	6200 3200 2200	250 250 250	35.00 17.50 11.00	DL 045 620 DL 045 320 DL 045 220

DELTA ROOF COMPONENTS	Description	Length [mm]	Height [mm]	Weight [kg]	Catalog number
	**Rail connector with a frame** The connector is made of steel protected by hot-dip galvanization. It is used to connect the guide rail with the scaffolding frame by means of fixed couplings.	732		2.60	LN 045 007
	**Connecting bolts** Connecting bolts are used to connect separable components and secure them against slipping out or disconnecting. the bolts are equipped with self-locking nuts and have two washers. There are two types of bolts in roof connections.				DL M12 070 DL M12 35
	**Roof tarpaulin** Roof tarpaulins are made to order for a specific size. Due to its structure, the tarpaulin allows for quick assembly, it consists in inserting the tarpaulin into the longitudinal holes in the upper beam of the girder, and then stretching it with the use of a rail that is inserted into the pockets on the shorter sides of the tarpaulin.			11.00	DL 045 006

TECHNICAL AND OPERATIONAL DOCUMENTATION OF DELTA 73 FRAME SCAFFOLDINGS

Installation and Operating Manual

1. This manual is intended for designers, assembly personnel and users of DELTA 73 scaffolding

2. This manual specifies the basic principles of erecting scaffolding in the DELTA 73 system, provides detailed technical conditions for typical scaffolding and design requirements for non-standard structures

3. The scaffolding erection company is responsible for the safe assembly and disassembly of DELTA 73 scaffolding

4. The assembly and disassembly of the DELTA 73 system may only be performed by personnel with the legally required qualifications and knowledge of assembly. Knowledge of these scaffolding assembly and operating instructions is mandatory

5. The construction company using it is responsible for ensuring safe operation of DELTA 73 scaffolding in accordance with its intended use

6. On each construction site where the DELTA 73 scaffolding is used, the following should be available:

   - this manual

   - standards and regulations:

- PN-M-47900-2:1996 Metal standing working scaffoldings. Pole scaffolding made of tubes. General requirements and tests and operation,

- PN-M-47900-3:1996 Metal standing working scaffoldings. Frame scaffolding. General requirements and tests and operation,

- Ordinance of the Minister of Labor and Social Policy of September 26, 1997 on general provisions on health and safety at work (Journal of Laws No. 129 of October 23, 1997, item 844),

- Ordinance of the Minister of Infrastructure of February 6, 2003 on occupational health and safety during construction works (Journal of Laws No. 47, item 401),

- Ordinance of the Minister of Economy, Labor and Social Policy of October 30, 2002 on the minimum requirements for occupational health and safety in the use of machines by employees at work (Journal of Laws No. 191, item 1596),

- Ordinance of the Minister of Economy, Labor and Social Policy of September 30, 2003 amending the ordinance on the minimum requirements for occupational health and safety as regards the use of machines by employees at work (Journal of Laws No. 178, item 1745).

2.1 TECHNICAL DESCRIPTION OF THE SCAFFOLDING

2.2 PURPOSE OF FRAME SCAFFOLDINGS DELTA 73

DELTA 73 type scaffoldings are frame scaffoldings, assembled from prefabricated components. The products are compatible with DELTA 110 scaffoldings. The main load-bearing component of DELTA 73 scaffolding are closed vertical frames, 0.73 m wide. The frame consists of two vertical stands connected with each other by crossbars (transoms) located at the top and bottom of the frames. The upper cross member is used to fasten the scaffolding platforms. Vertical frames are connected with each other by means of decks (platforms), which also stiffen the scaffolding in horizontal planes. Such a solution means that in the scaffolding being assembled, the decks must be placed on every level and in every bay. The lower cross-members of the frames are a blockade preventing the removal of the decks from the assembled structure. In the vertical plane, the scaffolding is stiffened with diagonal braces. In DELTA 73 scaffoldings, the following scaffold bay lengths are 0.732; 1.088; 1.5072; 2.072; 2.5072; 3.072 m. Working platforms used in this system have a load capacity of 2.0 kN/m² and can be made of solid or glued softwood with a platform width of 320 mm, perforated steel with a platform width of 316 mm or aluminum with plywood sheathing with a width of 640 mm platform. The DELTA 73 type frame scaffolding system includes a number of complementary components, thanks to which it is possible to erect the structure taking into account the local foundation conditions and the shape of the façade.
Apart from the brackets extending the platforms (consoles), lattice girders, transition frames and cornice frames are used. The DELTA 73 working scaffolding is intended mainly for construction works such as inspection, painting, plastering, bricklaying, etc.

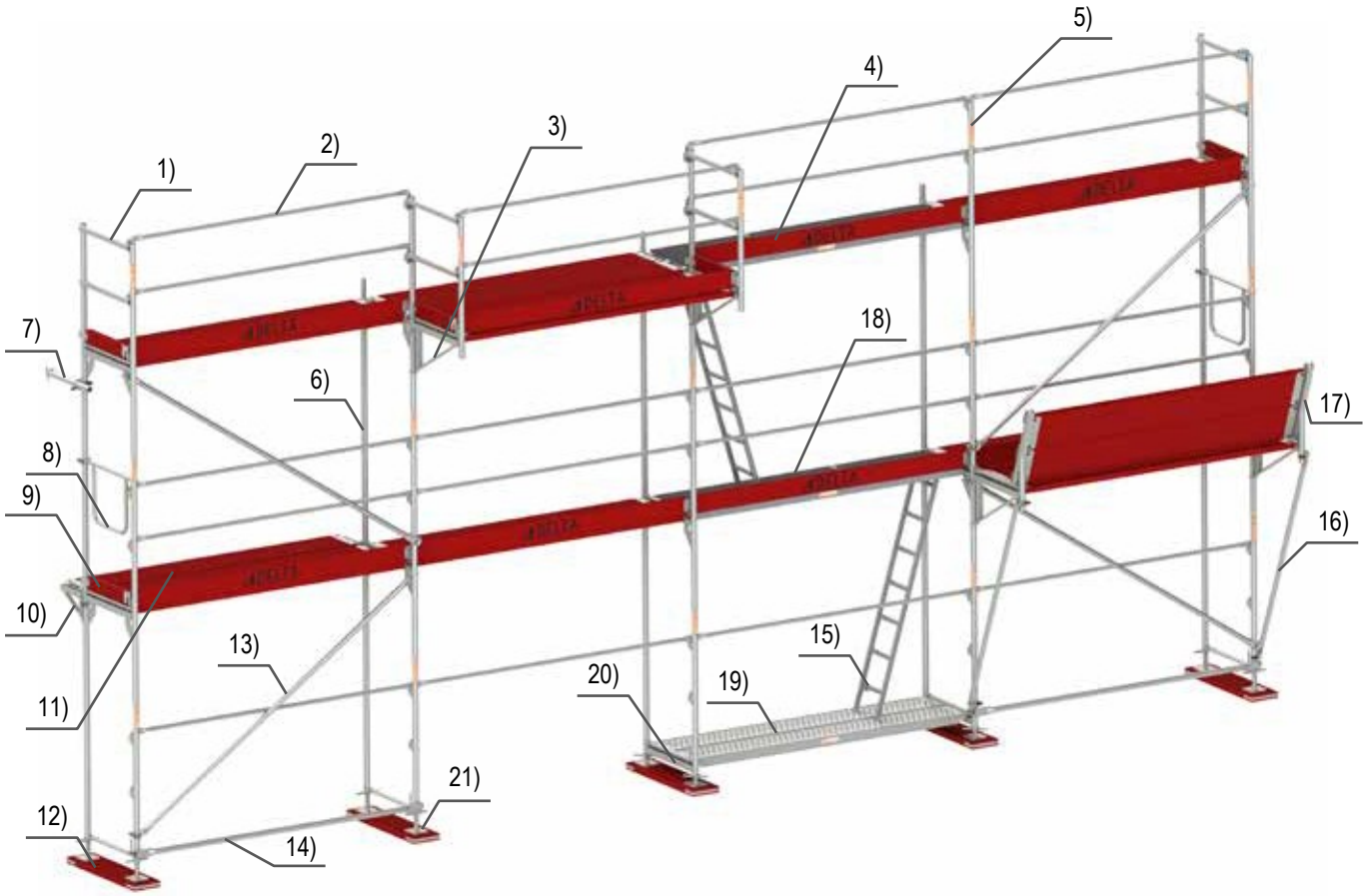


Fig. 1. Basic components of the DELTA 73 scaffolding

1) LN 006 073 - Upper edge frame
2) LN 002 257 - Longitudinal railing, 2.57 m
3) LN 009 073 - Bracket, 0.73 m
4) LN 003 257 - Longitudinal curb, 2.57 m
5) LN 008 073 - Handrail post with lock bridge
6) LN 073 200 - Cornice vertical frame
7) DL 010 060 - Scaffold holder, 0.60 m
8) LN 005 073 - Double side railing
9) LN 004 073 - Side curb, 0.73 m
10) LN 009 036 - Bracket, 0.36 m
11) LN 032 257 - Wooden platform, 2.57 m
12) DL P00 100 - Wooden sleeper 100
13) LN 001 257 - Vertical brace, 2.57 m
14) LN 101 257 - Horizontal brace, 2.57 m
15) DL 164 205 - Steel ladder
16) LN 009 210 - Brace supporting the cantilever
17) LN 012 100 - Visor component
18) LN 164 257 - Transition platform, aluminum-plywood, 2.57 m
19) LN 033 257 - Steel platform, 2.57 m
20) LN 000 073 - Starting beam
21) DL 038 060 - Screw base

		Wall length [m]	101.37	52.22	30.72	15.36	12.28
		Working height [m]	10	10	10	10	10
		Scaffolding area [m²]	1013.7	522.2	307.2	153.6	122.8
		Number of risers 3 m	30	15	9	4	3
		Number of circulation paths 3 m	3	2	1	1	1
No.	**Cat. No.**	**Name of the component**	**Number of components for a given surface:**				
1.	LN 073 200	Steel vertical frame 200/73	136	72	44	24	20
2.	LN 001 307	Vertical brace 307x200	28	16	12	8	4
3.	LN 005 073	Double side railing 73	6	6	6	6	6
4.	LN 008 073	Handrail post with lock platform 73	32	16	9	4	3
5.	LN 006 073	Upper extreme frame 73	2	2	2	2	2
6.	LN 004 073	Side curb 70	8	8	8	8	8
7.	LN 264 307	Aluminum-plywood access platform with a ladder 307x64	12	8	4	4	4
8.	DL 010 060	Scaffold holder 60	68	36	22	12	10
9.	DL 010 000	Fixed joint	68	36	22	12	10
10.	DL 038 050	Screw jack with a threaded pin	68	36	22	12	10
11.	LN 032 307	Wooden platform 307x32	240	120	72	32	24
12.	LN 002 307	Longitudinal railing 307	330	170	100	50	40
13.	LN 003 307	Longitudinal curb 307	132	68	40	20	16
14.	LN 101 307	Horizontal brace 307	7	4	3	2	1
15.	DL P00100	Wooden sleeper 100	34	18	11	6	5
16.	DL 010 230	Eye pin 230	68	36	22	12	10
17.	DL 010 071	Expansion plug	68	36	22	12	10
Set weight [kg]			12472	6476	3903	2006	1590

Table 1. Sample component list of DELTA 70 scaffolding.

		Wall length [m]	102.88	51.44	30.86	15.43	12.86
		Working height [m]	10	10	10	10	10
		Scaffolding area [m²]	1028.8	514.4	308.6	154.3	128.6
		Number of risers 3 m	37	18	11	5	4
		Number of circulation paths 3 m	3	2	1	1	1
No.	**Cat. No.**	**Name of the component**	**Number of components for a given surface:**				
1.	LN 073 200	Steel vertical frame 200/73	164	84	52	28	24
2.	LN 001 257	Vertical brace 257 x 200 m	32	16	12	8	4
3.	LN 005 073	Double side railing 73	6	6	6	6	6
4.	LN 008 073	Handrail post with lock platform 73	39	19	11	5	4
5.	LN 006 073	Upper extreme frame 73	2	2	2	2	2
6.	LN 004 073	Side curb 70	8	8	8	8	8
7.	LN 264 257	Aluminum-plywood access platform with a ladder 257x64	12	8	4	4	4
8.	DL 010 035	Scaffold holder 60	82	42	26	14	12
9.	DL 010 000	Fixed joint	82	42	26	14	12
10.	DL 038 050	Screw jack with a threaded pin	82	42	26	14	12
11.	LN 032 257	Wooden platform 257x32	296	144	88	40	32
12.	LN 002 257	Longitudinal railing 257	400	200	120	60	50
13.	LN 003 257	Longitudinal curb 257	160	80	48	24	20
14.	LN 101 257	Horizontal brace 257	8	4	3	2	1
15.	DL P00100	Wooden sleeper 100	41	21	13	7	6
16.	DL 010 230	Eye pin 230	82	42	26	14	12
17.	DL 010 071	Expansion plug	82	42	26	14	12
Set weight [kg]			13709	6886	4219	2160	1786

Table 2. Exemplary component list of DELTA 70 scaffolding.

3. GENERAL RULES OF SCAFFOLDING ASSEMBLY IN THE DELTA 73 SYSTEM

The scaffold assembler is fully responsible for the scaffolding assembly. The scaffolding should be installed in accordance with the rules set out in this manual and the requirements of standards and regulations in force in Poland.

3.1 PRE-ASSEMBLY WORK

The scaffolding assembly should be performed in accordance with the prepared scaffolding assembly plan.
The assembly plan should enable the scaffolding to be assembled in accordance with the requirements of this Operation and Maintenance Manual or the scaffolding structure design in the case of non-standard scaffolding, as well as with the health and safety regulations applicable to scaffolding assembly. The assembly plan should be developed with consideration of:

1) location of the scaffolding erection site (wind load zone, wall openness, height of the erected scaffold, location of the scaffolding in relation to traffic routes and pedestrian crossings)
2) type of base on which the scaffolding is erected
3) scope of work performed on the scaffolding
4) dimensions of the scaffolding construction net (scaffold width, bay length)
5) shape and dimensions of the façade
6) possibilities of anchoring the scaffolding
7) distribution of the scaffolding circulation paths
8) vertical transport of scaffolding components during its assembly and transport of materials used in the work performed on the scaffolding
9) installation of safety devices (lightning protection devices, protective canopies in the case of scaffolding on streets or passageways)
10) protective marking of the scaffolding

The assembly plan should include the scaffolding detailed drawings and (if justified) assembly requirements resulting from the specificity of the structure to be assembled. For the scaffolding configurations described in the technical conditions (point 5), static calculations were made, as a result of which the basic scaffolding parameters (dimensions of construction grids, number and location of anchors, method of scaffolding components assembly, etc.) were determined. These scaffoldings should be treated as typical. Typical structures which are the most common application cases do not require a computational proof of static strength. Documentation of static strength is also not required for scaffolding structures showing deviations from the typical variants, provided that the deviations do not affect the strength and stability of the structure. The above-mentioned structures can be assessed and performed by experienced, professional and properly trained staff of companies specializing in the assembly of scaffolding of the DELTA 73 system.

3.2 ASSEMBLY WORK

3.2.1 SCAFFOLDING COMPONENTS

Only original parts of the DELTA 73 system scaffolding should be used for assembly. All the scaffolding components are stamped with the manufacturer's marks, which allows for clear identification of the parts. The list of parts used for scaffolding assembly can be found in the list of components in this manual.
Before starting the assembly, the technical condition of the scaffolding components should be checked according to the criteria listed below:

- frames, braces, handrails, platform beams, foot beams, ladders - must not have any mechanical damage, such as buckling, deflection, cracks in joints, cracks in profiles, tearing,
- screw jacks - the threaded parts of the jacks must be clean, without any signs of corrosion, the thread is undamaged, the pin must not be bent, the base nut should rotate slightly,
- wooden platforms, curbs - should not have cracks and delamination; Transverse cracks are not allowed.

3.2.2 THE ORDER OF ASSEMBLY OF A TYPICAL SCAFFOLDING

The foundation of the scaffolding on the ground and structural base is specified in the PN-M-47900-2:1996 standard - Metal standing working scaffoldings. Pole scaffolding made of tubes and the PN-EN 12811-1:2007 standard - Temporary structures used on the construction site. Part 1: Scaffolding. Conditions of execution and general principles of design. The most important aspects of them are listed below.

A) FOUNDATION

The scaffolding is placed on the ground. The base on which the scaffolding is erected must be sufficiently even and load-bearing. The load-bearing capacity of the sub-base must not be less than 0.1 MPa, i.e. 1 kg/cm². The bearing capacity should be determined according to the PN-B- 03020:1981 standard. When setting the scaffolding on the ground, wooden sleepers should be used under the screw jacks. In the case of a frozen ground substrate, the surface for the underlay should be cleaned of a layer of snow and ice, and then leveled with a layer of unfrozen sand approximately 5 cm thick. Additionally, the subsoil must have a slope that allows groundwater to drain. It is not allowed to use cracked boards, sawn timber or hollow bricks etc. interchangeably as the sleepers.

Fig. 2a. Foundation of scaffolding on wooden sleepers.

FOUNDATION OF SCAFFOLDING ON A CONSTRUCTIONAL SUBSTRATE

A scaffolding can be placed on a structural base only when the unit load from the scaffolding structure does not exceed the permissible loads for a given base. In the case of scaffolding installation on the surface of streets, footpaths, it is required to obtain the appropriate consent from the authorities supervising the mentioned communication routes. In a situation where the construction base is inclined at a large angle, it is necessary to use tilting screw jacks with an adjustable span.

Fig. 2b. The scaffolding is based on the tilting screw jacks.

PREPARATION OF THE SUBSTRATE TO START THE ASSEMBLY

If the scaffolding is placed on the ground, the sleepers should be placed perpendicularly to the building wall in such a way that there are two feet on one sleeper (Fig. 2a) and the underlay itself adheres to the ground with its entire surface. The minimum distance between the sleeper front and the plinth of the building must be 5 cm. On the other hand, at the structural base, it is allowed to place the scaffolding on the sleepers arranged parallel to the building wall in a situation where we want to transfer the concentrated load from the stand to the adjacent structural components of the base. When erecting the scaffolding on an inclined surface, it is necessary to use compensatory sleepers. If the slope angle of the ground exceeds 6° (about 10%, i.e. 10 cm in height over a length of 100 cm), terraces should be made, the width of which should be at least 80 cm. The strip of subsoil should extend beyond the outer stand at least 80 cm. Additionally, the frame stands should be stiffened with tubes, braces (stringers), mounted at a height of at least 20 cm above the ground level, parallel to the ground slope. The leveling of the scaffolding is possible thanks to the use of adjustable screw supports (with a minimum adjustment range of 20 cm) or leveling frames (50 cm; 100 cm; 150 cm).

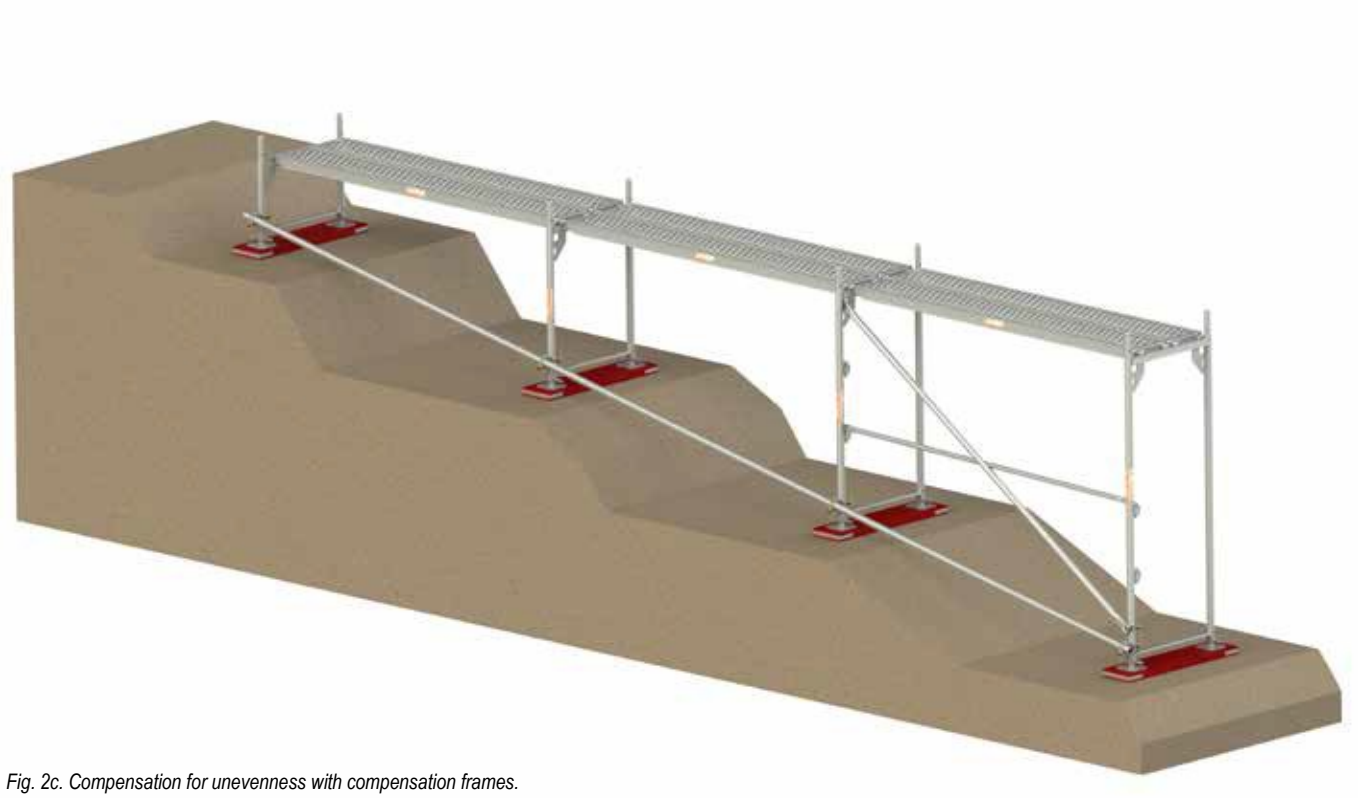


Fig. 2c. Compensation for unevenness with compensation frames.

A) INSTALLATION OF THE FIRST BASE BAY

The scaffolding assembly should be started from the highest point of the ground on which the scaffolding will be erected, while observing the principle that the first assembled bay (of the first storey) should be braced with vertical bracing (base bay) immediately after assembly.
The screw jacks should be spaced according to the dimensions of the construction grid of the scaffolding being assembled. In typical scaffoldings, the base jack nuts must have an adjustment range of at least 200 mm.

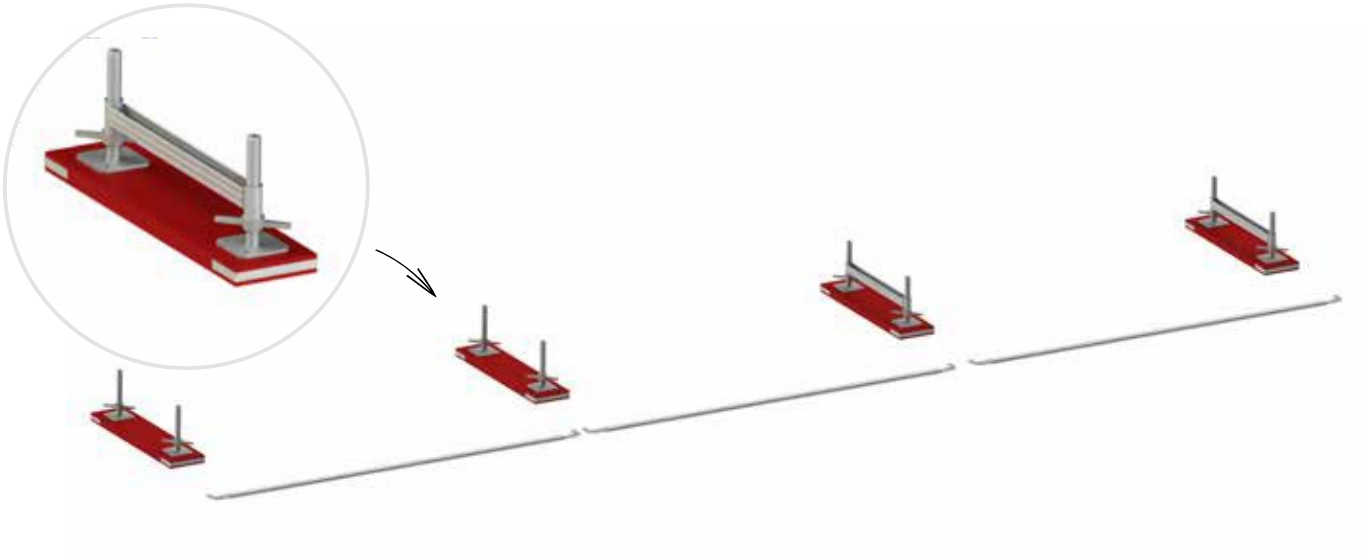


Fig. 3. Installation of screw jacks, starting beams and lower braces.

Vertical frames should be placed on the so prepared supports with starting beams, then the longitudinal railing should be placed on the railing handles at a height of 1 m and immediately stiffened with a vertical diagonal brace, as shown in Fig. 4. One end of the brace should be fixed in the opening in the frame gusset plate, and the other end by tightening the half coupler at the bottom of the opposite frame. Additionally, in each braced bay only in the first level of the scaffolding, a horizontal brace should be installed in the lower parts of the frames by tightening the half-couplers at both ends of the brace.

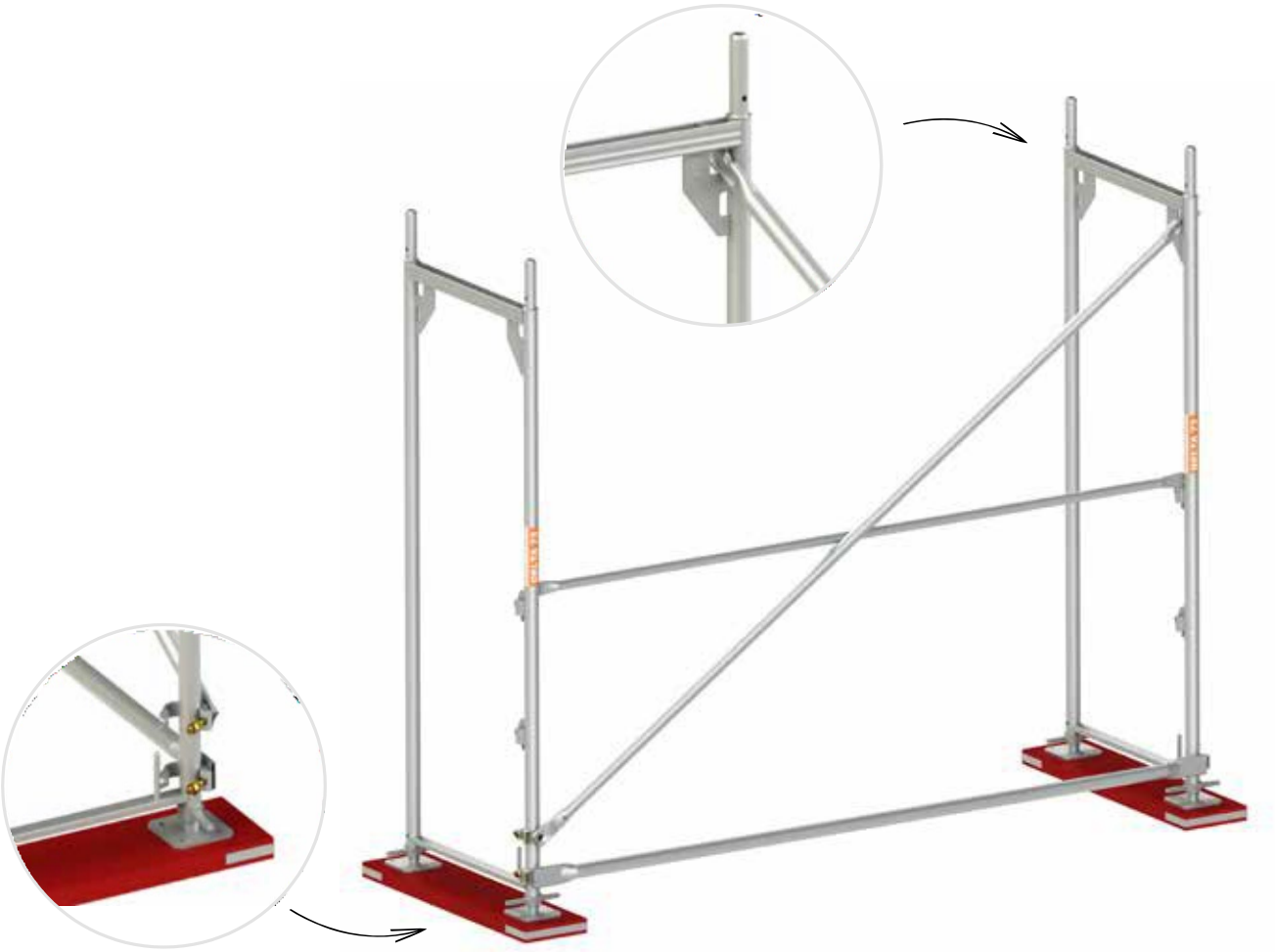


Fig. 4. Installation of the first vertical frames, handrails and diagonal brace in the base bay.

Then, install the platforms (Fig. 5). Only system wooden, steel or aluminum-plywood decks should be used for assembly. Two decks 0.32 m wide or one deck 0.64 m wide must be installed in one bay. The decks should be mounted on the U-section of the vertical frame, which is the upper cross member of the frame. When installing, make sure that the distance between the edge of the decked platform and the wall is not more than 20 cm. Keeping this distance makes it possible to bypass the protection of platforms (handrails and curbs) of the higher storeys from the scaffolding wall side. The bay assembled in this way is the base bay from which you can start assembling the consecutive bays of the first storey.

Fig. 5. First-storey base bay assembled.

B) ASSEMBLY OF THE NEXT BAYS OF THE FIRST STOREY

Beginning with the assembled base bay (Fig. 5), install consecutive bays by placing frames on the pins of the screw footings and connecting them with platforms and handrails at a height of 1 m. and free-standing. Vertical braces should be installed along the entire height of the scaffolding, while horizontal braces should be installed every 10 m (for bays 0.7 to 2.5 m long, max every 5 bays, and for 3 m bays max every 4th bay). The number of braces on one storey may not be less than 2, regardless of the number of bays installed.

Fig. 6. Assembled consecutive bays of the first storey

In the bay above which, according to the scaffolding design, the circulation path will be erected, before the frames are installed, platforms should be placed on the landing beams to support the ladder. After assembling the frames, install the ladder passages with a ladder (the boards can be used interchangeably with wooden platforms, which should be placed on the beams at the bottom of the frame). The access platforms must have locks at the passage flaps to protect them against opening. The hatches can only be opened during communication between the levels. After completing the assembly of the first storey, it should be leveled using the nuts of the screw jacks, starting from the highest point of the ground on which the scaffolding is erected.

Fig. 7. Scaffolding leveling.

C) ASSEMBLY OF HIGHER STOREYS

The vertical frames of the next storeys are overlapped by an employee equipped with personal protective equipment to prevent falls from height where the circulation path is located. The first vertical frame of the next storey should be inserted from the ladder. Starting from this vertical frame, the scaffolding level should be extended in both directions. The installed vertical frames must be connected immediately with safety railings (main and intermediate). The handrails are mounted in pockets on the inside of the frame and then secured against slipping by driving a wedge, which is an integral part of the pocket in the frame.

Fig. 8a. Installation of the first frames and the handrails of the second storey.

After assembling all the frames and longitudinal handrails, secure the scaffolding fronts with the double side handrails.
In braced risers, braces should be installed so as to maintain vertical continuity.

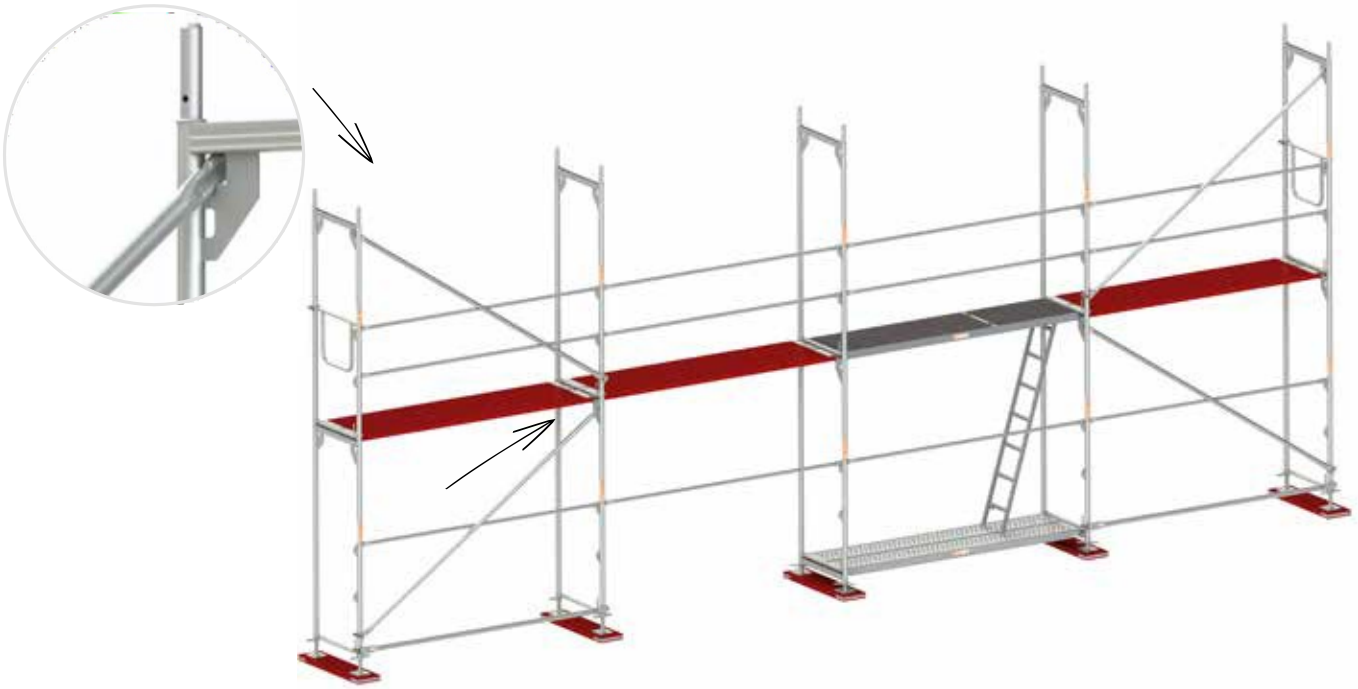


Fig. 8b. Installation of the consecutive frames and handrails for the second storey.

The next stage is the installation of longitudinal and side curbs, and then mounting the platforms on the frames of the second storey. All higher levels of the scaffolding are assembled in the same order (repeat the above-mentioned steps).

Fig. 8c. Installation of curbs and decks.

The scaffolding should be anchored successively during its assembly, in accordance with the anchoring grid provided in the manual or the design.

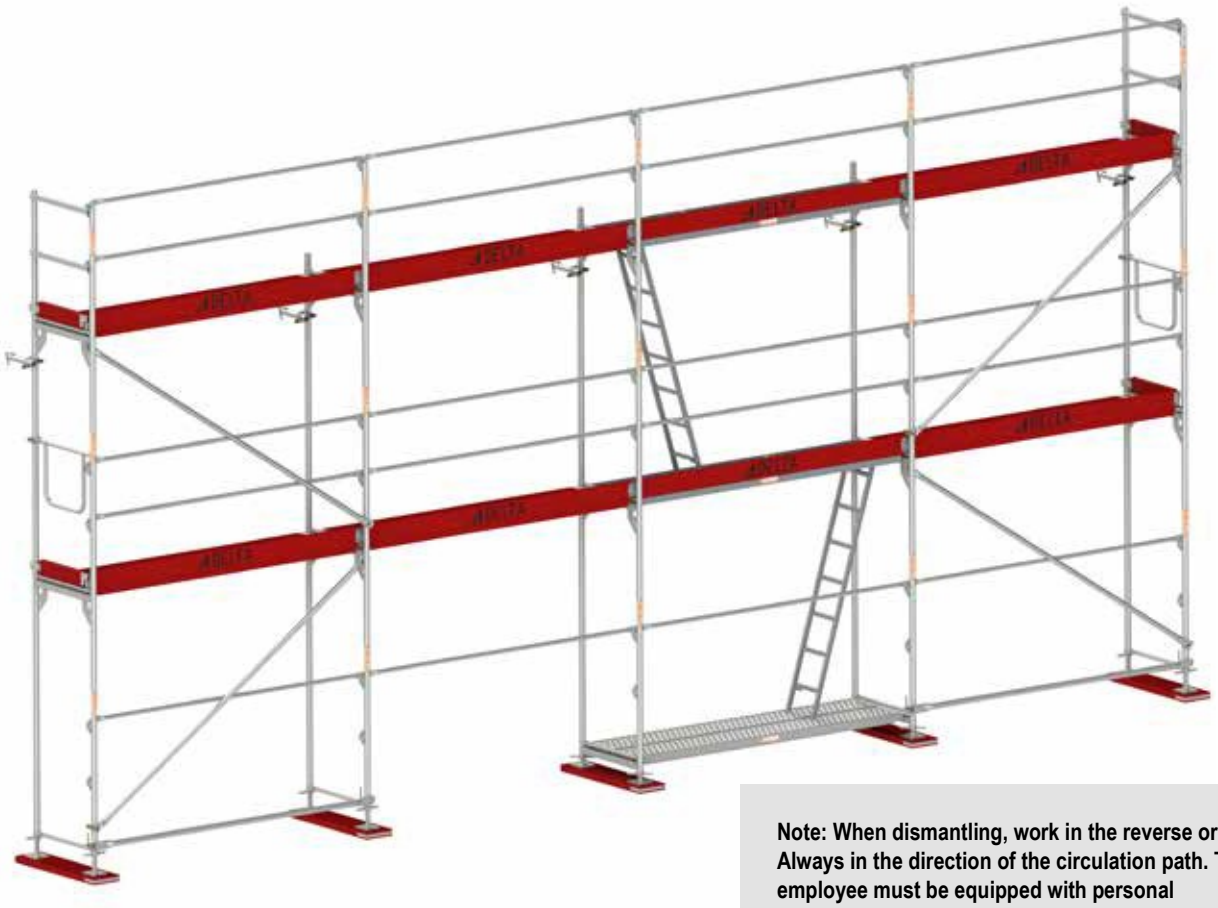
Fig. 9. Anchorage assembly.

D) ASSEMBLY OF THE TOP STOREY

In order to secure the last scaffolding level, install the railing posts with the platforms protection and the end frames by putting them on the nipples (tubes in the upper part of the frame). The whole structure should be covered with longitudinal handrails and curbs using the same assembly scheme as in the points above.

Fig. 10. Installation of railing posts with protection of platforms.

Fig. 11. Assembly of the end frame.



Note: When dismantling, work in the reverse order. Always in the direction of the circulation path. The employee must be equipped with personal protective equipment against falls from a height.

Fig. 12. Complete scaffolding.

3.2.3 ASSEMBLY OF CIRCULATION PATHS

The circulation paths should be erected parallel to the entire scaffolding. The platforms of the circulation paths should be assembled from aluminum and plywood platforms with a hatch. Vertical communication should be via ladders pivotally attached to the platforms. When installing the circulation path, make sure that the ladder and the damper are placed alternately during the assembly (the two closest hatches must not be directly above each other). The circulation paths should be arranged so that the distance of the farthest scaffolding workstation from the circulation path is not greater than 20 m (the distance of two adjacent circulation paths cannot exceed 40 m). In the DELTA 73 system scaffolding, the circulation paths should be internal. During the scaffolding operation, the access platforms can be used as working platforms. Scaffolding hatches may be left open only when entering the scaffolding. After the employee has reached the appropriate level, the hatch should be closed. The circulation path should be additionally anchored. Anchorages should be made on both sides of the riser at a vertical distance every 4 m. The assembled circulation path is shown in Fig. 13.

An example of using the starting frame.

Fig. 13. Circulation path.

3.2.4 ASSEMBLY OF BRACES

The braces are installed in accordance with the PN-M-47900-2:1996 standard - Metal standing working scaffoldings.
Pole scaffoldings made of tubes, in the outer scaffolding plane, parallel to the face of the wall, in a large-scale or tower arrangement.
The vertical braces should be positioned as follows:

- at least in every 5th bay of the scaffolding grid for bays 0.73 to 2.57 m long,
- at least in every 4th bay of the scaffolding grid for bays 3.07 m long,
- symmetrically, the number of braces may not be less than 2 on each level,
- the braced riser should have bracings installed along the entire height of the riser.

In the case of non-standard structures, the rules for the arrangement of braces should be specified in the scaffolding design.
Braces with one end are installed in the gusset plate opening in the upper part of the frame, and the other end is fastened by tightening the half-joint in the lower part of the opposite frame. The typical scaffolding bracings are presented in the technical conditions of this manual (point 7).

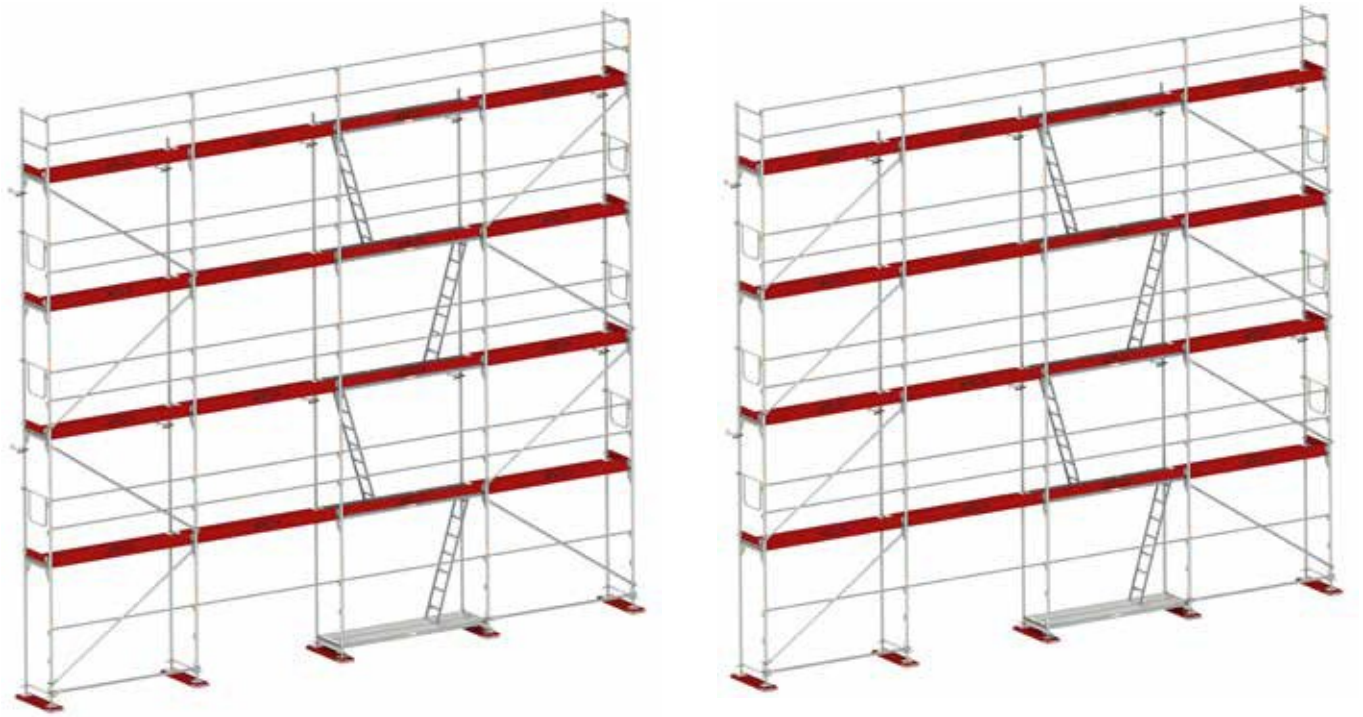


Fig. 14. Examples of bracing variants.

3.2.5 INSTALLATION OF ANCHORAGES

The scaffolding must be anchored to the wall of the structure or building in a manner ensuring the stability and rigidity of the scaffolding structure and allowing the transfer of external forces acting on the scaffolding (forces from side wind pressure, eccentric static loads, loads resulting from human work and forces from uneven settlement of the structure).
For the typical configurations described in this manual, the rules for the execution of anchorages are clearly defined. The technical conditions of the installation include the number and distribution of anchorages, their type and method of installation, as well as the required anchoring forces. For all scaffolding structures deviating from the typical variants and for typical scaffoldings operated in the wind load zones IIa, IIb, III according to PN-B-02011:1977, static calculations should be made to determine the anchoring conditions (anchor distribution, number of anchors, anchoring forces).
The anchorages must not transmit vertical force components. The scaffolding should be anchored on an ongoing basis, while the scaffolding is erected, in accordance with the anchorage grid specified in the instructions or in the design. Anchor connectors are used for anchoring the scaffolding. The hooks of the connectors should be connected with the eye bolts screwed into the wall plugs embedded in the wall or other equally durable building components.

There are three types of anchoring:

a) **Short anchorage** (fig. 15a) – one anchor fastened to one stand (internal) with a cross joint.
The anchors only transfer loads perpendicular to the façade
b) **Long anchorage** (fig. 15b) – one anchor connector fastened to two stands with two cross connectors.
The anchors transfer loads perpendicular and parallel to the building façade
c) **Triangular anchorage** (fig. 15c) – are an alternative to long anchorage - anchoring the so-called by the "V" method.
It consists in mounting two short anchors in one node, positioned at an angle of approximately 90° to each other .
Tighten the nuts of the cross joints with a torque of 50 Nm. Anchorages should be installed directly under the platforms.

Fig. 15a. Short anchorage.

Fig. 15b. Long anchorage.

Fig. 15c. Triangular "V" anchorage.

Basic principles of anchorage implementation:

a) **Anchoring starts from the second scaffold level**
b) **Anchors are placed symmetrically over the entire surface of the scaffolding**
c) **Anchorage is placed horizontally every second bay and every second storey, assuming that the adjacent rows of anchorages are shifted one bay in relation to each other.**
d) **Top storey should be anchored in every second bay**
e) **Outermost strings of vertical frames should be anchored every 4 m**
f) **Horizontal component of one fixed anchor must not be less than 2.5 kN**

The above rules apply to basic, simple scaffolding without additional components such as tarpaulins, transport booms, protective canopies, etc.

3.2.6 INSTALLATION OF PROTECTIONS

A) GUARD RAILS AND CURBS

The Ordinance of the Minister of Infrastructure of February 6, 2003 on occupational health and safety during construction works (Journal of Laws No. 47, item 401) stipulates that communication routes located above the ground level above 1 m are secured with railings. The railing consists of a curb plank, 0.15 m high, and a protective handrail at a height of 1.1 m. The free space between the curb plank and the handrail is filled with an intermediate railing to protect workers against falling from height. In system scaffolding, it is allowed to use a safety railing at a height of 1 m. Additionally, the standard PN-EN 12811-1:2007 - Temporary structures used at the construction site. Part 1: Scaffolding. The construction conditions and general design rules emphasize that the scaffolding must be secured from the side with the main railing, intermediate railing and a side curb. Therefore, in the DELTA 73 system, during the scaffolding assembly, two handrails and one curb must be installed in each bay from the longitudinal side. The handrails are placed in pockets on the inner part of the racks in the frame and locked by inserting a wedge, which is an inseparable component of the frame pocket. From the top sides, the platforms should be secured with a transverse curb and a double side railing.

It is allowed to omit the handrails and curbs on the side of the wall, if the distance between the platform edge and the wall face does not exceed 20 cm.

Fig. 16a. Installation of longitudinal rails and double side railings.

Fig. 16b. Installation of longitudinal and side curbs.

B) PROTECTIVE CANOPIES

In the case of scaffolding located directly next to traffic routes not excluded from traffic, as well as places of crossings and passages, protective canopies should be made in accordance with the provisions of the Ordinance of the Minister of Infrastructure of February 6, 2003 on occupational health and safety during construction works (Journal of Laws No. 47, item 401). Protective canopies should be at a height of not less than 2.4 m above the ground at the lowest point and inclined at an angle of 45° towards the source of the hazard. The roofing should be tight and resistant to penetration by falling objects. In places of passages and passages, the width of the protective canopy is at least 0.5 m more on each side than the width of the passage or roadway.

Note:
It is not allowed to store materials on protective canopies.

Fig. 17a. Installation of protective canopies in accordance with the PN-EN 12811-4:2014-02 standard.

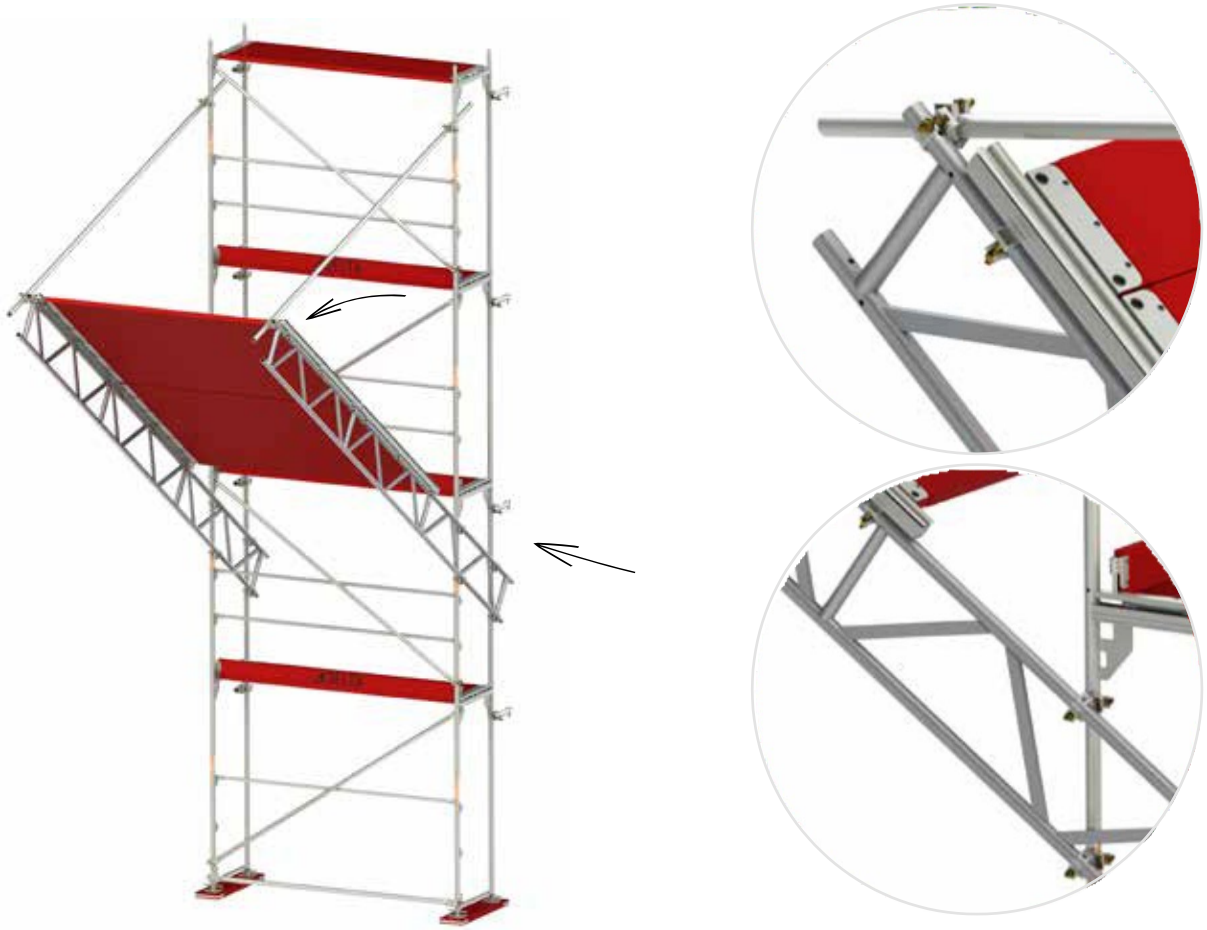


Fig. 17b. Installation of protective canopies in accordance with the PN-M-47900-2:1996 standard.

C) FENCES, BUMP STOPS, SIGNS AND WARNING LIGHTS

The installation of the above-mentioned protections should be carried out in accordance with the provisions of the PN-M- 47900-2:1996 standard, items. 4.10.4; 4.10.5; 4.10.6; 4.10.7. When assembling the scaffolding, the danger zone should be marked out and secured by marking and fencing with 1.5 m high railings. The danger zone cannot be less than 1/10 of the scaffolding height and not less than 6 m. provided that other safeguards are applied. The area where the scaffolding assembly and disassembly works are carried out should be marked by placing warning boards in visible places at a height of 2.5 m from the ground level. The inscriptions on the boards should be visible from a distance of at least 10 m.

D) SECURING ROOFING WORKS

In order to protect employees working on the roof, a roofing post should be used, which is mounted directly on the vertical frame. The height of the highest handrail, measured from the working platform, is 2 m. In order to protect against unwanted sliding of the post from the frame, pierce the holes in the lower part of the post with a securing pin.

Fig. 18. Installation of roofing posts.

E) SECURING THE WORKS ON THE HIGHEST SCAFFOLDING LEVEL AGAINST WEATHER CONDITIONS

In order to protect employees on the highest scaffolding level against rainfall, the DELTA 73 system has roof poles that are mounted to the rack in the frame by means of rotary joints. Next, the longitudinal rails should be placed in the pockets with wedges, to which the scaffolding tarpaulin is mounted. Due to their construction, the posts can be adjusted to the height of each roof.

Fig. 19. Installation of roof poles.

3.2.7 INSTALLATION OF PLATFORM EXTENSIONS

To extend the working platforms in the scaffolding, to the outside or inside, consoles (brackets) with a width of 0.36 m, 0,50 m, 0.73 m or 1.10 m can be used. The consoles should be screwed to the frame stands the console channels were at the level of the upper frame channel. After installing the platforms on the console, they should be secured against removal by installing security measures. The gaps between the main deck and the extension deck should be filled with slotted platforms.

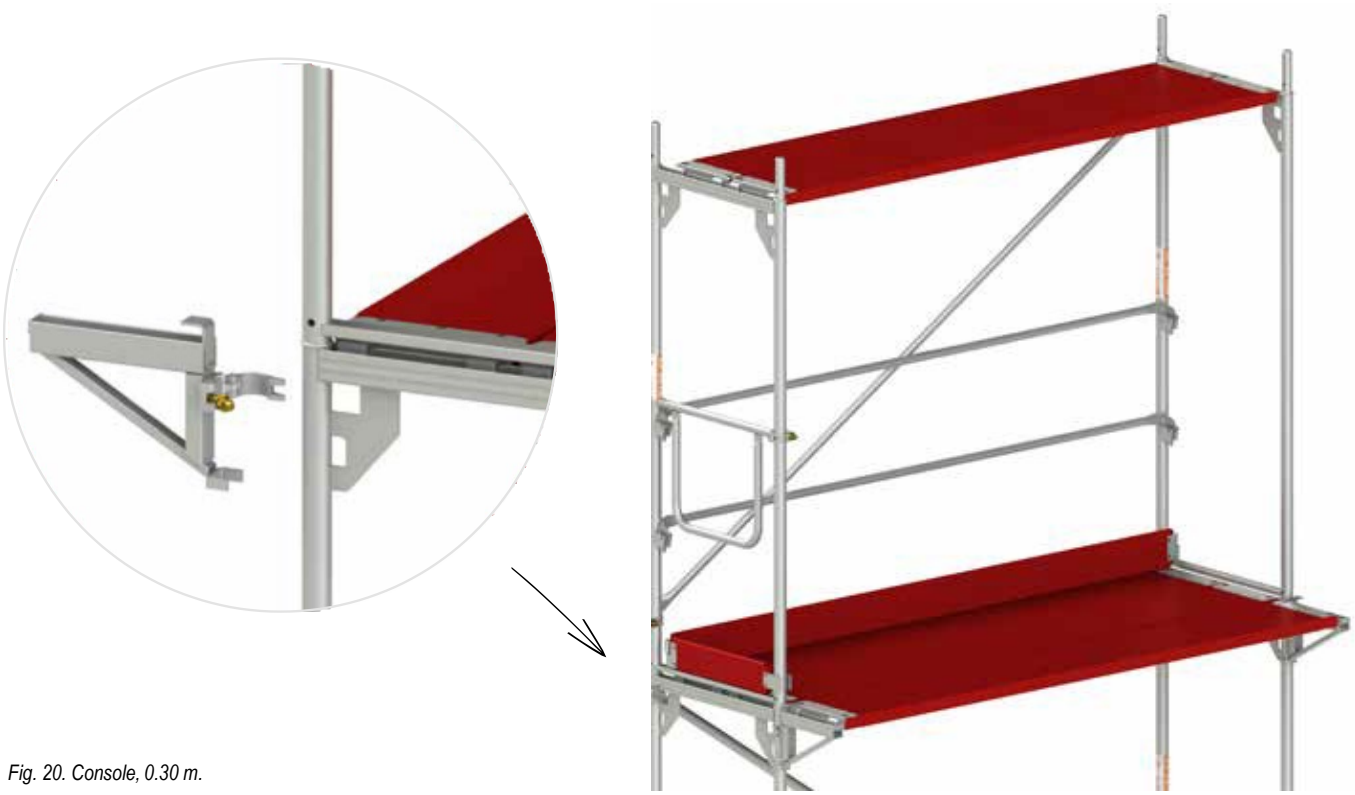


Fig. 20. Console, 0.30 m.

Fig. 21. Bracket 0.32 m with a nipple.

Fig. 22. Bracket, 0.73 m.

Fig. 23. Reinforced bracket, 0.73 m.

Fig. 24. Bracket, 1.1 m.

Fig. 25. Widening of the platforms of the last storey.

3.2.8 TRANSITIONAL FRAMEWORK

In order to ensure a safe passage under the scaffolding, transition frames are installed. The frames should be connected to each other by handrails, decks and diagonal braces. The bracings at the transition are installed on both sides of the frame (outside and inside), while on the next storeys only from the outside. One should also remember to anchor all the nodes of the first and second storey.

We offer two types of frames:

- 1.5 m (4 platforms, width 320 mm),
- 1.8 m (5 platforms, width 320 mm).

Fig. 26a. Transition frame, 1.50 m.

Fig. 26b. Transition frame, 1.80 m.

3.2.9 CORNICE FRAMES

The cornice frames are used to avoid horizontal obstacles on the façade of the building, such as cornices, eaves or roof protrusions. Due to their structure, the cornice frames enable the maintenance of a constant width of the platforms throughout the scaffolding vertical segment. The notch in the frame is inserted 320 mm.
Before starting the installation, it is important to carefully assess the height of the obstacle, so that the cornice frame falls over the obstacle. Correcting frames should be used for proper scaffolding layout.

Fig. 27. Cornice frame.

3.2.10 EXTENSION FRAMES

Passage frames are used to change the width of working platforms without the use of extension consoles. There are two frames:

- extension frame 200 x 40/70 - used to change the scaffolding width from one 320 mm platform to two platforms with a total width of 640 mm,
- extension frame 200 x 70/110 - used to change the scaffolding width from two 320 mm platforms to three platforms with a total width of 960 mm.

Fig. 28a. Widening frame 200 x 40/70.

Fig. 28b. Widening frame 200 x 70/110.

3.2.11 INSTALLATION OF CORNERS

Installation of corners can be done in many ways, among others:

a) with the use of tubes and fixed joints (two segments of the scaffolding at an angle of 90˚, should be connected with each other every 4 m with the use of steel tubes Ø 48.3x3,2 and cross joints. Additional anchors should be made in the corner zone starting from the 2nd storey. Fill the gaps (over 8 cm wide) between the scaffolding segments with slotted platforms.

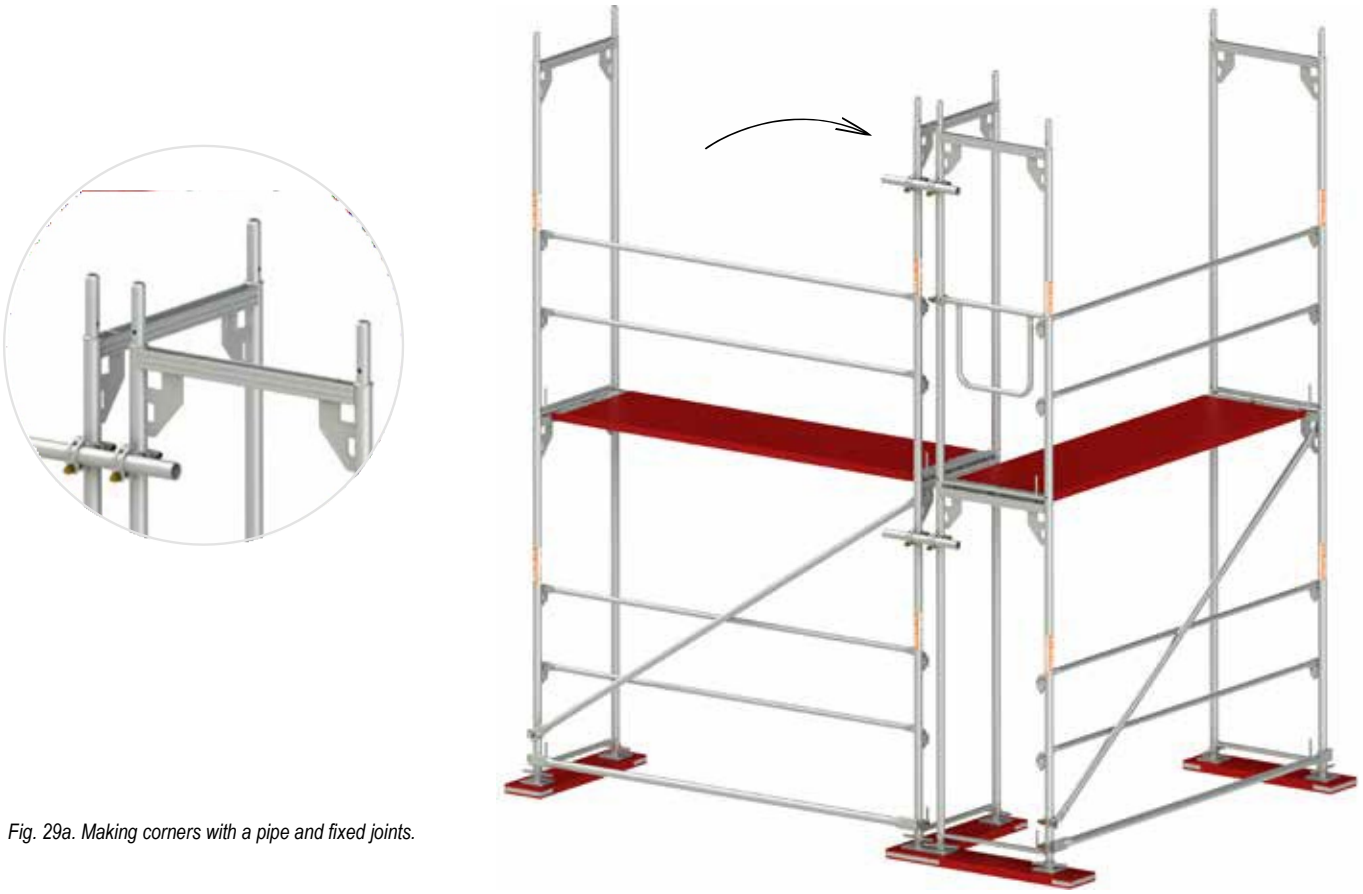


Fig. 29a. Making corners with a pipe and fixed joints.

b) By means of rotating joints (remember that the assembly takes place by twisting the adjacent frames of two corner bays so that each frame has one swivel joint, except for the first frames, which should be twisted into two joints. The screw jack is mounted in only one frame stand as shown in Fig. 29b).

Fig. 29b. Assembly of corners with rotary joints.

c) With the use of a frame transom (installation is carried out by screwing the transom at the same height as the platform beam of the adjacent frame. the end of the deck on the frame as shown in Figure 29c).

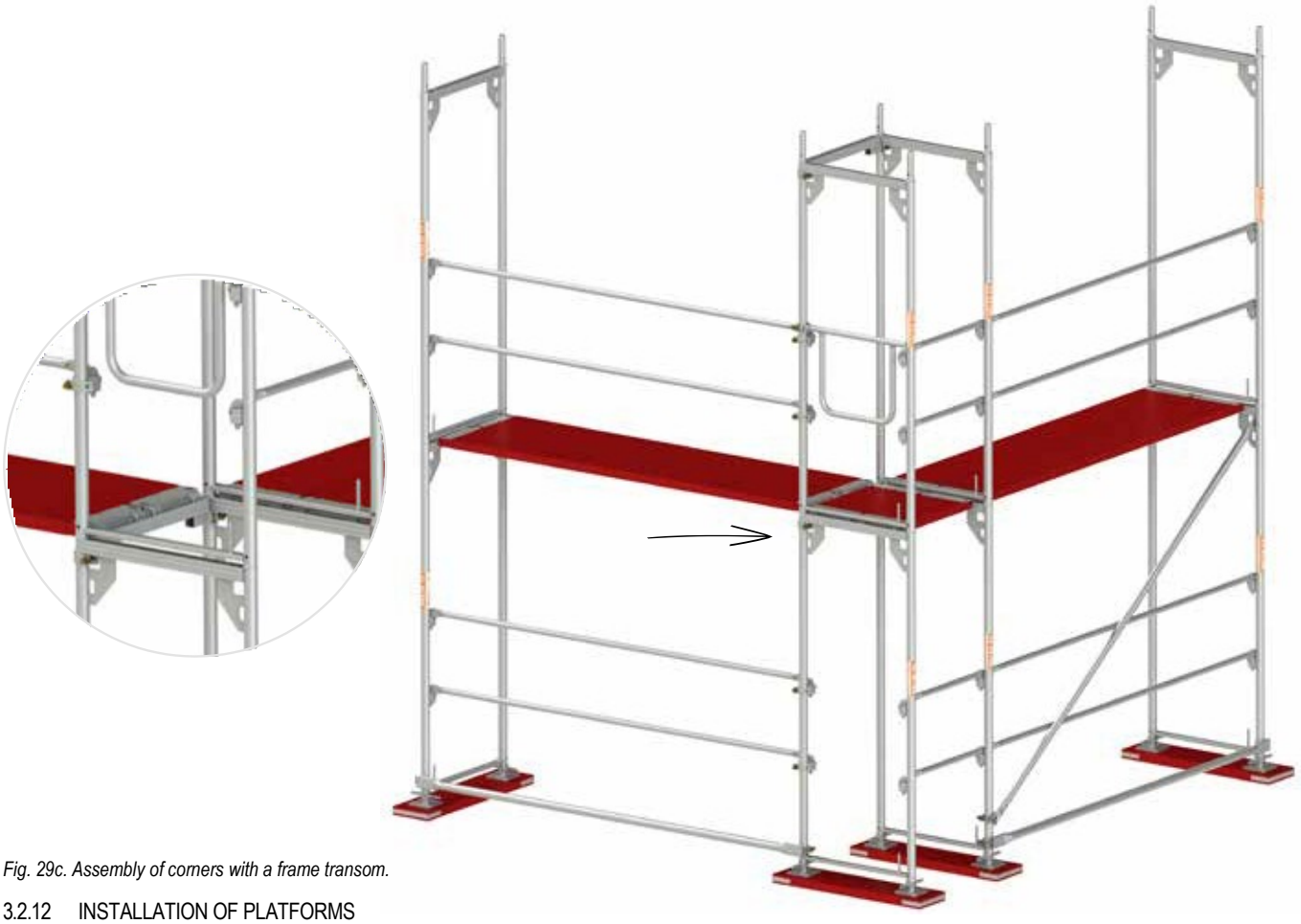


Fig. 29c. Assembly of corners with a frame transom.

3.2.12 INSTALLATION OF PLATFORMS

The DELTA 73 system also allows the construction of working platforms, which are used, for example, for work carried out at ceilings, at platforms for material storage, etc. The assembly of the platforms begins with the assembly of the supporting scaffolding, between which lattice, aluminum or steel girders are mounted, then traverses (two, three or six deck) are mounted on the girders, to which half-couplings are welded, enabling quick assembly on the girders. The traverse is equipped with pins identical to those in the upper beam of the system frame, on which 0.32 m wide decks are placed.

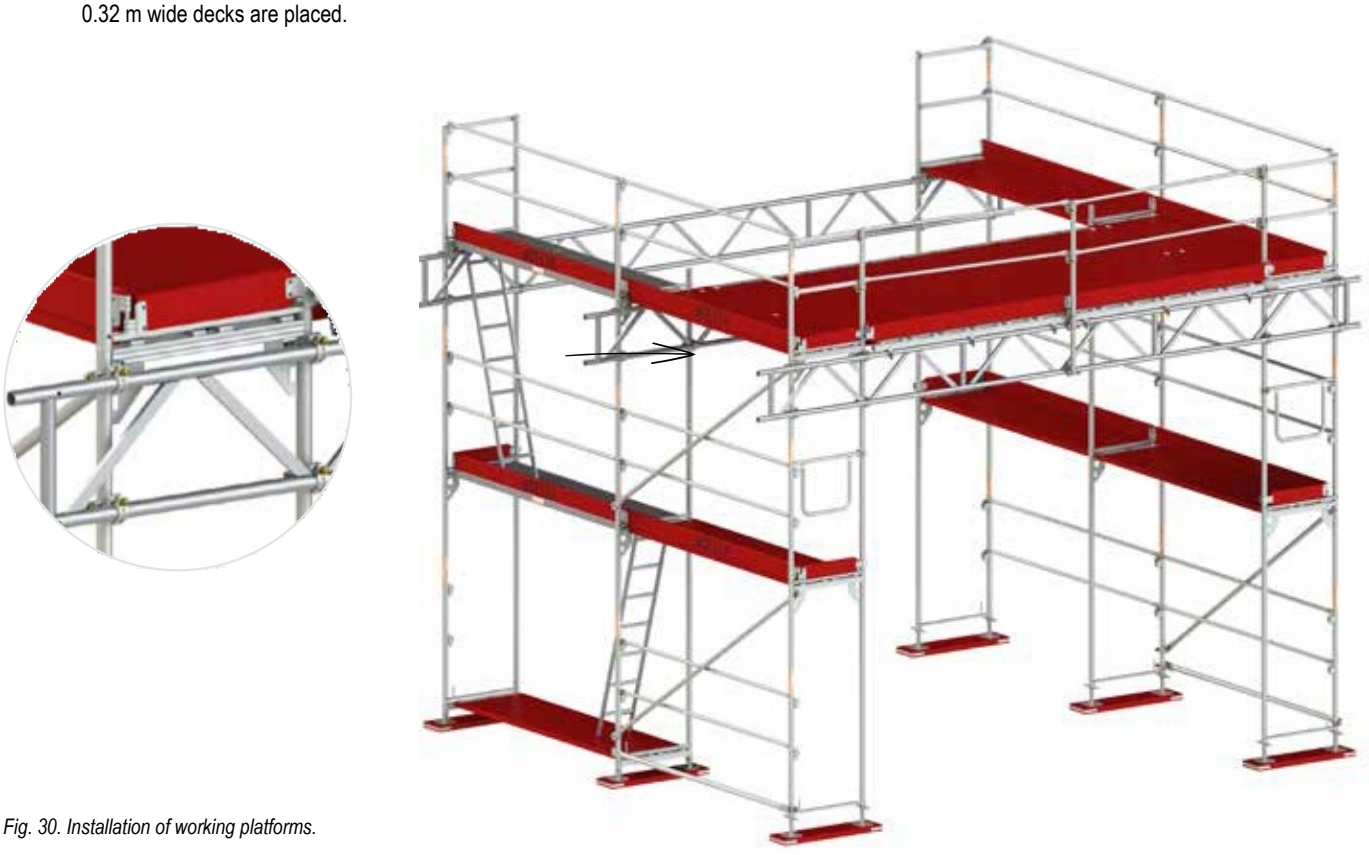


Fig. 30. Installation of working platforms.

3.2.13 SUSPENSION OF THE SCAFFOLDING ON THE LATTICE GIRDER ABOVE A ROADWAY

Steel or aluminum lattice girders are used to carry out passages under the scaffolding wherever, for example, there are garage entrances or passages to the patio, the task of which is to transfer the loads set from the scaffolding and the employees on it. In order to increase the stiffness of the girders, their upper or lower flange (or both, depending on the height of the scaffolding being assembled) should be braced with tubes, fixed joints and rotating joints. To lead the scaffolding on the girder, intermediate frames are used, such as, for example 100 x 73 or 50 x 73 etc., which should be screwed to the girder belts with permanent couplers. Determining the position in which to screw the frame is done by placing a railing of the appropriate length of the bay to be mounted in the pockets with wedges.

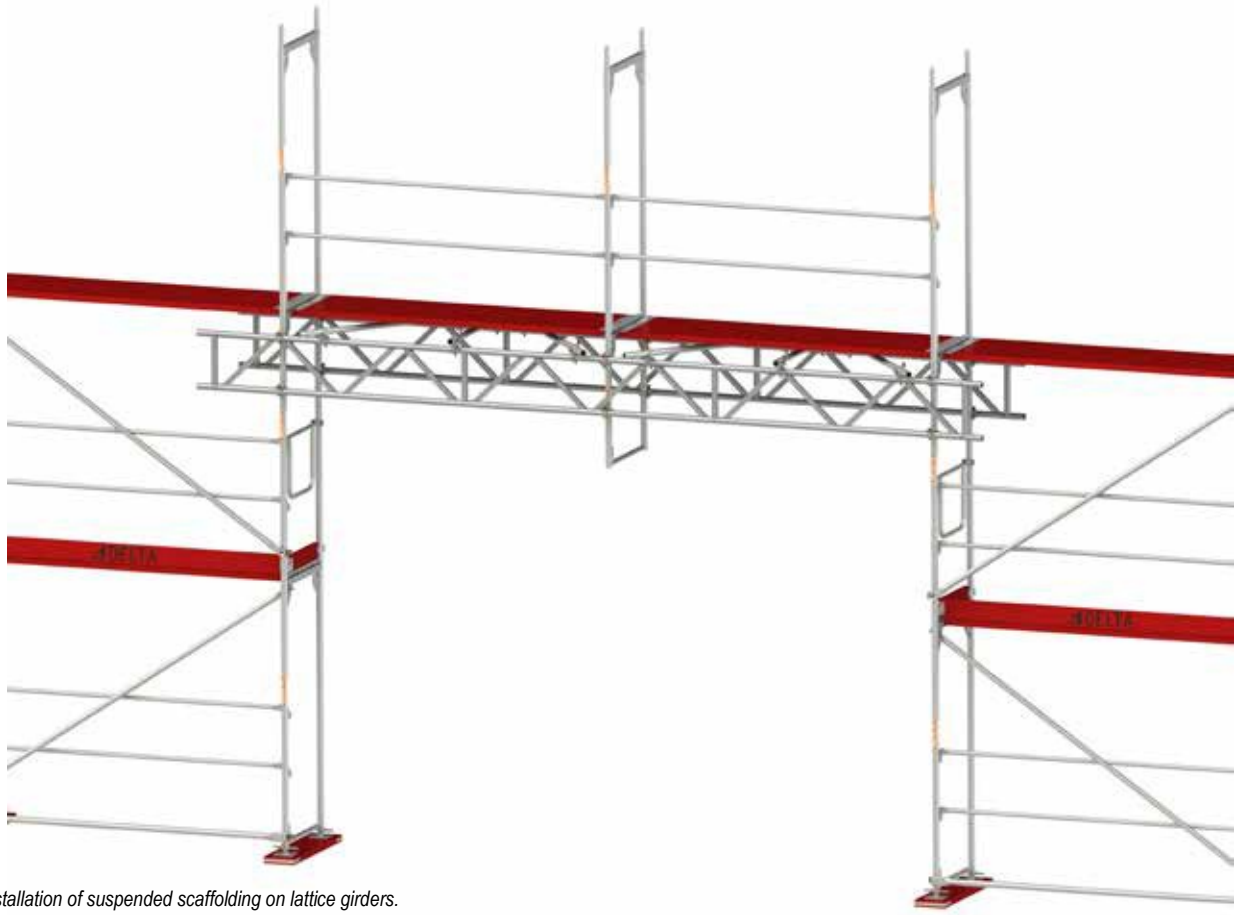


Fig. 31. Installation of suspended scaffolding on lattice girders.

3.2.14 INSTALLATION OF TRANSPORT EQUIPMENT

For vertical transport of scaffolding components during its erection and for transport of construction components and materials during operation, it is recommended to use rope winches with a rotating arm mounted to the stand. The weight of the transported materials must not exceed 1.50 kN (150 kg). The figure below shows the assembly diagram of winches with a swivel arm. Installation of winches and additional jib anchorages should be performed in accordance with their operation and maintenance documentation.

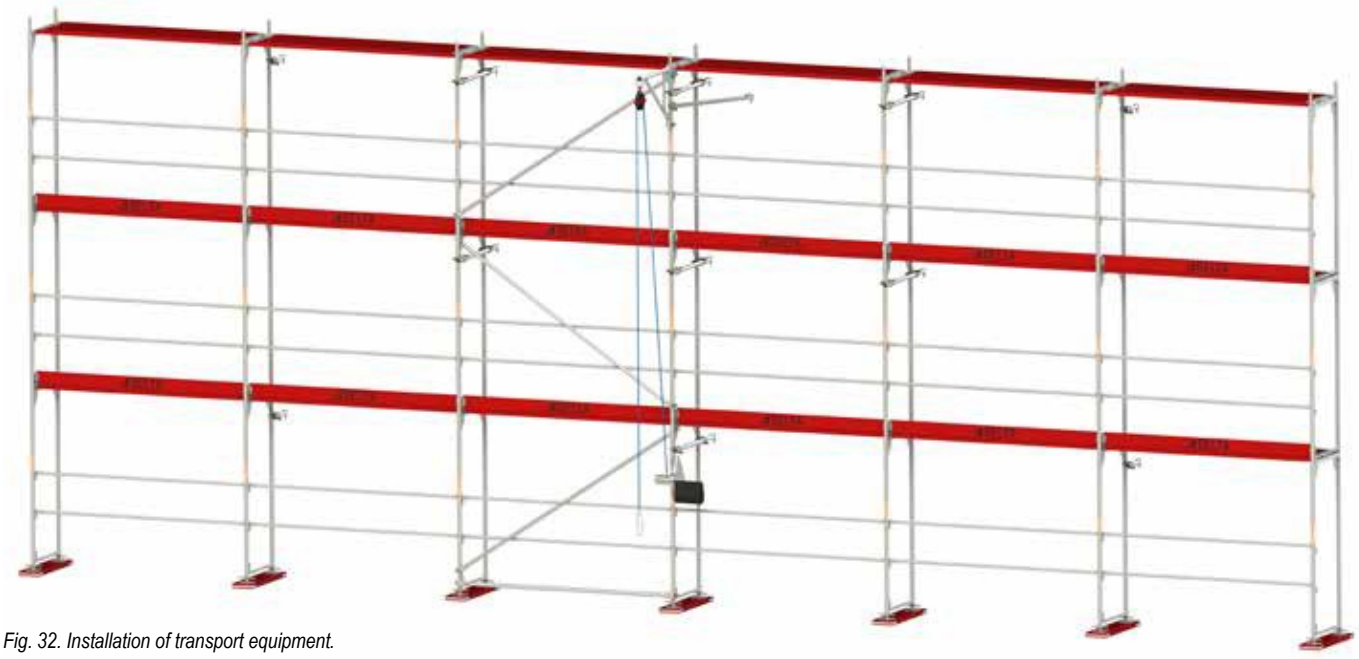


Fig. 32. Installation of transport equipment.

For the transport of materials not exceeding 1.50 kN (150 kg), alternatively, on the scaffolding, transport jibs can be installed in accordance with the requirements of the PN-M-47900-02:1996 standard point 4.7.2 When installing winches with a swivel arm or transport jibs, observe the rule that the distance between the jibs should not exceed 30 m, and the distance from the jib to the scaffolding end - 15 m. Additionally, the transport jib should be anchored in at least two places with taking into account the anchoring of two adjacent frames on the storey below and above the jib. The scaffolding structure should bear a vertical static load of 1.40 of the nominal load and a horizontal load caused by rope tension. The position of the winch operator or a person pulling material with a rope slung over the block must be at least 4.0 m from the pulley's vertical axis. For the transport of materials weighing more than 150 kg, separate shaft towers should be made in accordance with the provisions of PN-M-47900-2:1996 standard point 4.7.3 or use goods lifts with a capacity of 200 kg. The crane should be assembled in accordance with its technical and operational documentation.

3.2.15 INSTALLATION OF LIGHTNING PROTECTION DEVICES

Scaffolding should be equipped with lightning protection devices in accordance with the provisions of PN-M-47900-2:1996 standard point 4.8. The scaffolding structures located outside the building should be equipped with lightning protection devices. When the scaffolding is placed at the façade of a building with a lightning protection system, it can be connected to the vertical air terminal of the lightning protection device.
The vertical points of the lightning protection device on the scaffolding are at least 4 m sections of tubes, which are flattened at one end, while the other end is mounted on the scaffolding frame and twisted using a longitudinal joint. The distance between adjacent vertical lightning strikes should not exceed 12 m. The spikes should be connected with 6 mm galvanized steel wire, or with a steel, galvanized or copper tape with dimensions of 3 x 20 mm in diameter. Each structure made of steel tubes should be earthed in accordance with the requirements of the relevant regulations on earthing and neutralization in electrical equipment with a voltage of not more than 1 kV. Earthing resistance measured with alternating current with a frequency of 50 Hz should not exceed 10 Ohms. The distance between the earth electrodes should not exceed 12 m.

3.2.16 INSTALLATION OF SCAFFOLDING NEAR POWER LINES

When scaffolding is placed near overhead, unshielded power lines, the requirements of the Ordinance of the Minister of Infrastructure of February 6, 2003 on occupational health and safety during construction works (Journal of Laws No. 47, item 401) must be met. The assembly, operation and disassembly of scaffolding and mobile working platforms located in the vicinity of overhead power lines are allowed if the lines are outside the hazardous zone. In a situation where the scaffolding is or will be located directly next to the line, the voltage in the overhead lines must be switched off. It is not allowed to locate workplaces, product, material or construction machinery and equipment storage sites directly under overhead power lines or at a distance calculated from the extreme wires, less than:

1) 3 m - for lines with a rated voltage not exceeding 1 kV,
2) 5 m - for lines with rated voltage above 1 kV, but not exceeding 15 kV,
3) 10 m - for lines with rated voltage above 15 kV, but not exceeding 30 kV,
4) 15 m - for lines with rated voltage above 30 kV, but not exceeding 110 kV,
5) 30 m - for lines with rated voltage above 110 kV.

3.2.17 INSTALLATION OF SCAFFOLDING ON CONSTRUCTION CONSOLES

The scaffolding is assembled on construction consoles wherever it is not possible to assemble the scaffolding directly on the ground, ceiling, etc. In such cases, the scaffolding base is made of construction consoles equipped with three holes with a diameter of 20 mm to attach the scaffolding to the building wall. Assembly can be done with:

a) expansion anchors
b) construction ties (assembly through the wall)
c) chemically bonded anchors

Before starting the installation, check the load-bearing capacity of the wall and what material it is made of, then estimate the possible method of fixing the bracket to the wall. After attaching the brackets, the lattice girders should be placed on them, and then the vertical frame should be screwed between the upper and lower chords of the girders with fixed couplings, the platforms should be mounted on the scaffolding prepared in this way and then, similarly to point 3, the scaffolding should be erected.

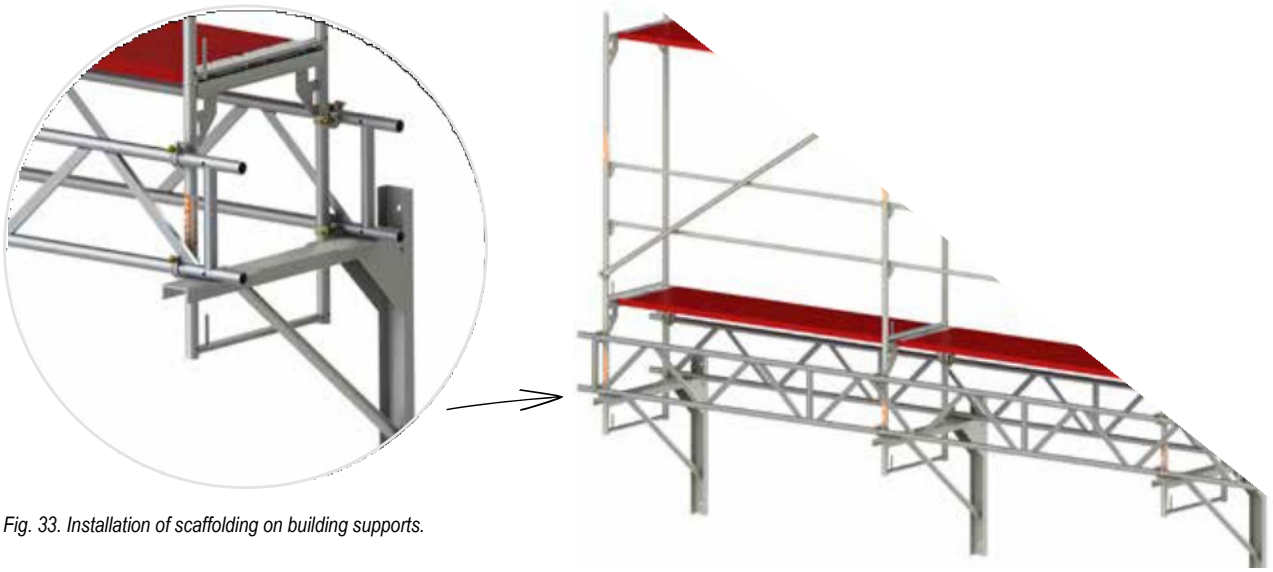


Fig. 33. Installation of scaffolding on building supports.

4 SCAFFOLDING USAGE

4.1 TECHNICAL TESTS

Technical tests of the assembled scaffolding are carried out after all assembly works are completed or after completion of individual assembly phases. **Preparation of scaffolding for tests** - according to PN-M-47900-2:1996 pkt 7.3.1. **Technical examination** includes:

1) Checking the condition of the substrate - tests are carried out before starting the assembly in accordance with PN-M-47900-2:1996 point 7.3.3.2
2) Checking the scaffolding foundation - checking for compliance with PN-M-47900-2:1996 pkt 4.4 is carried out after completing the assembly of the first storey and completing the assembly of the entire scaffolding
3) Checking the verticality of the frame stands - the check is carried out on an ongoing basis, after the completion of individual phases of assembly and after completing the assembly of the entire scaffolding
4) Checking bracings - checking by visual inspection on an ongoing basis during the scaffolding assembly phase and after completing the assembly of the entire scaffolding
5) Checking the load capacity of anchors - on an ongoing basis during the assembly phase
   The load-bearing capacity of the anchor connection with the ground must be checked by carrying out tests. The number of checked anchorages should be determined by an expert (site manager, scaffolding assembly supervisor), while observing the following rules:
   - proof load must be 1.2 times the required anchoring force specified for the individual scaffolding variants,
   - number of anchorage points to be tested must be at least:
     - 20% for concrete substrate,
     - 40% if the base is made of other materials,
   - all types of dowels used are checked,
   - minimum number of anchorages to be checked 5,
   - check anchorages with a lever or a special device for checking anchorages.

In cases where the bearing capacity of the dowel connection with the ground does not guarantee the transfer of the required anchoring forces, the following should be done:
- use multiple anchors, e.g. V-shaped, at the same anchoring point so that the individual components do not exceed the permissible value,
- increase the number of anchors.

6) Checking the platforms and their protection - tests are carried out after the assembly of the entire scaffolding is completed. Checks are carried out by visual inspection. The completeness of the deck filling with decks and the equipment of the platforms with handrails and curbs are checked

7) Checking the distribution of circulation paths - checks are made on an ongoing basis during the assembly phase

8) Inspection of transport devices - checking is performed immediately after their installation. The booms assembled in accordance with PN-M-47900-2:1996 standard point 4.7.2 should be checked at a test load of 200 daN. The lifting devices should be checked in accordance with their operation and maintenance documentation

9) Checking lightning protection devices - checks are performed in accordance with PN-M-47900- 2:1996 point 7.3.3.9

10) Checking the location of the scaffolding in relation to power lines - external inspection should be carried out and measurements should be made for compliance with the requirements of the Ordinance of the Minister of Infrastructure of February 6, 2003 on occupational safety and health during construction works (Journal of Laws No. 47, item 401)

11) Checking the protections - after the scaffolding is installed, protective canopies, fences, buffers, boards, warning lights, handrails, curbs are checked in accordance with PN-M- 47900-2:1996 point 7.3.3.11.

Assessment of test results
The tested scaffolding is considered correctly assembled if the result of the tests or checks carried out in the above-mentioned scope is positive. In the event of non-compliance, the defects should be removed and re-examined.

Test certificate (scaffolding acceptance)
A report should be prepared from the (acceptance) tests carried out.

4.2 HAND-OVER THE SCAFFOLDING

It is forbidden to use the scaffolding which has not been technically accepted. After the completion of the assembly work, the scaffolding should be jointly inspected, technically accepted by the construction manager or an authorized person and handed over for use on the basis of the acceptance protocol in accordance with the requirements of the Ordinance of the Minister of Infrastructure of February 6, 2003. on occupational health and safety during construction works (Journal of Laws No. 47, item 401). The scaffolding acceptance is confirmed by an entry in the construction log or in the technical acceptance protocol. An entry in the construction log or the scaffolding technical acceptance protocol specifies in particular:

- scaffolding user,
- purpose of the scaffolding,
- scaffolding assembly contractor, providing the full name or name and telephone number,
- allowable loads on the platforms and scaffolding structure,
- date of the scaffolding commissioning,
- earth electrode resistance.

Dates of subsequent scaffolding inspections.

4.3 SCAFFOLDING INSPECTIONS DURING USAGE PERIOD

During usage, the scaffolding is subject to the following inspections:

- **Daily inspections**

Daily inspections should be performed by people using the scaffolding. The review is about checking:

- technical condition of the scaffolding and correct anchoring of the scaffolding,
- condition of the working and communication platforms surface (cleanliness of the platforms, in winter conditions - anti-skid protection of the platforms),
- whether any phenomena have a negative impact on the safety of the scaffolding.

All identified defects should be removed before starting work.

- **Decade inspections**

Decade inspections should be carried out every 10 days by a scaffolding conservator or an engineering and technical worker appointed by the construction management. The purpose of the decade inspection is to check whether the scaffolding structure has undergone any changes that would jeopardize the safety of the scaffolding operation.

- scaffolding has not been washed out,
- there was no subsidence of the ground,
- anchorages were not damaged,
- protective canopies are tight and undamaged,
- lightning protection system and earth electrodes are not damaged,
- protection of working and communication platforms is appropriate.

- **Ad hoc inspections**

Occasional inspections are always carried out after a break in the use of the scaffolding for more than 2 weeks and after any strong wind (over 6° on the Beaufort scale). They should be made by a committee with the participation of the building supervision inspector.
Defects noticed during each inspection must be removed before further use of the scaffolding. The result of the decade and ad hoc inspections should be recorded in the construction logbook by the persons performing the inspections.

4.4 SCAFFOLDING DISASSEMBLY

Before dismantling, secure the scaffolding site with a fence and disable pedestrian and vehicle traffic. The scaffolding may be disassembled after the works performed on the scaffolding are completed and all tools and materials are removed from the structure and decks. Partial disassembly from the top is allowed, as work progresses on the highest platform, while observing the principle that during the disassembly of its upper storeys on the lower storeys no other works are performed.

During disassembly it is forbidden to throw components from height.

Dismantling is carried out in reverse order to the assembly steps. Upon completion of disassembly, all scaffolding components should be cleaned, inspected and segregated into suitable for further use or requiring repair or replacement.

4.5 STORAGE AND TRANSPORT OF SCAFFOLDING COMPONENTS

Small parts of the scaffolding, such as stands, joints, should be packed in boxes and containers. Scaffolding components should be stored and protected against direct precipitation and contact with the ground. For transport, the scaffolding components (frames, decks, bracings, handrails) should be tied in bundles or piles and placed in racks or pallets adapted for loading and unloading from means of transport. Scaffolding parts can be transported by any means of transport adapted to the length of the transported components, and it is recommended to use means of transport equipped with reloading devices (HDS). Storage at the construction site should meet the requirements in accordance with applicable regulations. It is recommended that the distance of the folded material from the vertical transport station for components should not exceed 10 m.

4.6 VERIFICATION OF SCAFFOLDING PARTS FOR DAMAGE AND WEAR

Upon completion of disassembly, all scaffolding components should be cleaned, inspected and sorted into ones suitable for further use or requiring repair or replacement. The parts verification rules are described below.

The framework should be checked:
- whether there were no cracks or missing joints connecting the transoms with the stands,
- whether the stands were not damaged,
- whether there was no deformation of pipe sections.

Diagonal braces, consoles, girders must be checked:
- whether the components have not been bent,
- whether there were any cracks in sections weakened by holes,
- whether there was no deformation of pipe sections,
- whether there are no cracks or missing joints.

Ladder penetrations (communication decks) should be checked:
- condition of the plywood plating in the decks, especially whether there were no delamination, cracks in the plating and whether there was any dirt or oily plywood surface reducing its anti-slip properties,
- condition of the deck beams, especially if they are not bent and if there are no cracks and scratches on welded joints,
- whether the hatch opens correctly.

The platforms cannot be used if one of the above-mentioned faults occurs.

Steel platforms should be checked:
- whether there were no deformations of the decks in the form of bending and torsion,
- whether there are no corrosion pits affecting the strength of the platforms.

Wooden platforms should be checked:
- whether there were no transverse cracks in the logs or boards,
- whether there was any dirt or oily surface of the platforms reducing its anti-slip properties,
- whether the knots in the wood are ingrown.

Adjustable screw feet should be checked:
- whether the thread has not been damaged, making it impossible to adjust the height of the stand's nut or reducing the strength of the "pin-nut" connection; the nut of the stand should turn slightly,
- perpendicularity of the pin to the foot of the stand.

4.7 MARKING OF COMPONENTS

The scaffolding components are permanently marked with the name of the company and the year of production, e.g. **DELTA 20**.
Additionally, the **DELTA 73** system components should be marked with stickers.

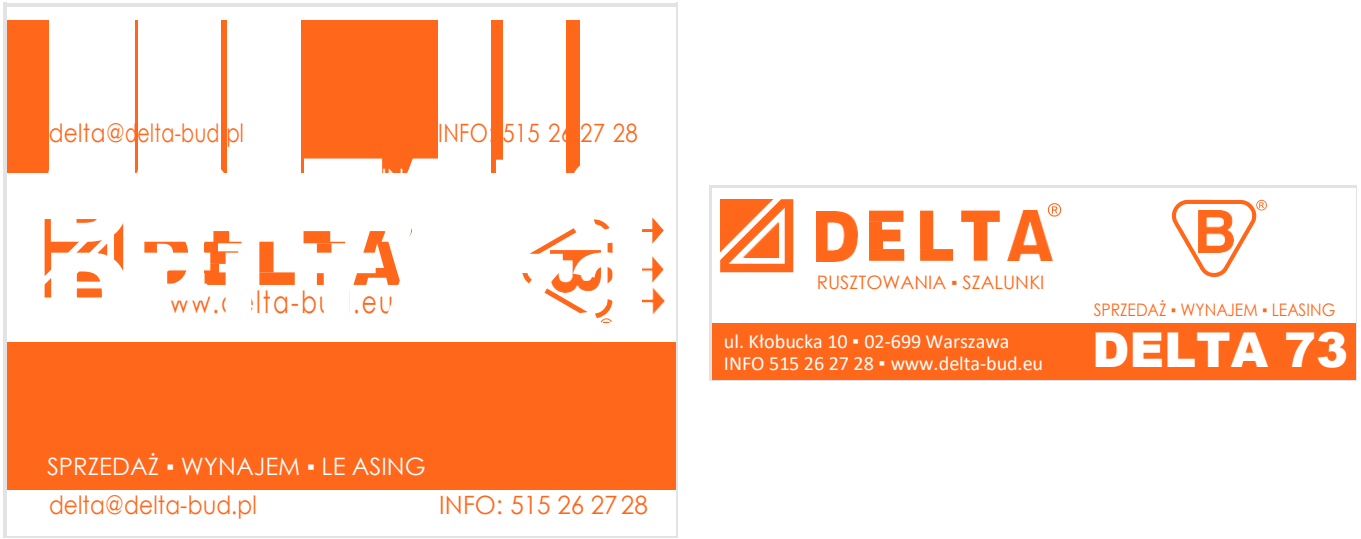


Photo 1. DELTA 70 system identification stickers.

5.0 HEALTH AND SAFETY REGULATIONS WHEN ERECTING AND USING SCAFFOLDING

When erecting and using the scaffolding, the health and safety regulations contained in:
- Ordinance of the Minister of Labor and Social Policy of September 26, 1997 on general provisions on health and safety at work (Journal of Laws No. 129 of October 23, 1997, item 844),
- Ordinance of the Minister of Infrastructure of February 6, 2003 on occupational health and safety during construction works (Journal of Laws No. 47, item 401),
- Ordinance of the Minister of Economy, Labor and Social Policy of October 30, 2002 on the minimum requirements for occupational health and safety in the use of machines by employees at work (Journal of Laws No. 191, item 1596),
- Ordinance of the Minister of Economy, Labor and Social Policy of September 30, 2003 amending the ordinance on the minimum requirements for occupational health and safety as regards the use of machines by employees at work (Journal of Laws No. 178, item 1745).

In particular, these rules should be followed:
- scaffolding may only be used by employees who know the conditions of its operation included in this manual, and the health and safety regulations generally applicable in construction,
- scaffolders and scaffolding workers must have a valid certificate stating that their health condition allows them to work at height,
- when assembling and disassembling the scaffolding, employees are required to use fall protection devices, helmets and gloves.

It is not allowed to use the scaffolding:

- not checked and not jointly accepted,
- during storms, black ice and fog,
- with damaged components or components not included in the DELTA 73 scaffolding system,
- contrary to the intended use.

The following must be strictly observed:

- it is forbidden to overload the scaffolding platforms above the permissible loads,
- evenly distributing the load over the entire surface of the platform,
- stacking materials and tools on the platform in such a way that they do not interfere with free work,
- it is forbidden to assemble (disassemble) and work on the scaffolding when the wind exceeds 10m/s and during storms, black ice and fog,
- dropping the scaffolding components, even from a low height, is strictly prohibited,
- a ban on admitting drunk persons to work,
- use of protective canopies as places to store materials or as work stations,
- proper secured passages and roadways,
- it is forbidden to carry out assembly works while any other works are being performed on the lower storeys.

6 TECHNICAL CONDITIONS FOR THE ASSEMBLY AND OPERATION OF TYPICAL DELTA 73 SCAFFOLDINGS

Typical structures described in this manual may be used under the following rules:

- it is allowed to operate and fully load only one platform in a given scaffolding section. Other scaffolding load conditions must be confirmed by static calculations of the scaffolding structure,
- scaffolding can be used in wind load zones I and II according to PN-B-02011:1977. Scaffoldings used in the wind load zones: IIa, IIb, III, should be subject to additional static calculations taking into account the greater wind action in these zones,
- it is not allowed to load the scaffolding platforms in excess of the intended load capacity of the scaffolding.

6.1 PLATFORMS

The platforms in typical scaffoldings consist of system decks adapted to be mounted on transoms with mounting bolts. The platforms in the scaffolding simultaneously fulfill the function of horizontal bracing in the plane of the scaffolding bays, therefore they must be absolutely installed in each bay of the scaffolding.
The following can be used for the assembly of working platforms:

- 2 wooden or steel deck, 0.32 m wide,
- 1 aluminum-plywood deck, 0.63 m wide,
- 1 aluminum-plywood deck, 0.63 m wide, with a manhole and a ladder, 0.63 m wide ladder passage (as a platform for the circulation path),
- 1 aluminum deck 0.63 m wide,
- 1 wooden deck, 0.63 m wide.

Simultaneous performance of works at different scaffolding levels is permissible, provided that the required distances between work stations are maintained. In cases other than those specified above, the safe distances are at least 5 m horizontally, and the vertical distances are due to the maintenance of at least one tight platform, not including the platform on which the works are performed. The surface of the platform should be level and free from hazards that could cause stumbling. Platform components should be blocked against unintentional lifting. It is recommended that the components constituting the deck be locked in position by adding additional components during the erection process. Additionally, the platforms should be protected against being lifted, e.g. by wind.

6.2 ANCHORING

The number and arrangement of the scaffold anchors and the value of the anchoring force should be specified in the scaffolding design or manufacturer's documentation. The horizontal component of a single scaffold fastening should not be less than 2.5 kN. The scaffolding structure should not protrude beyond the highest line of anchors by more than 3 m, and the working platform should not be placed higher than 1.5 m above this line.

Basic grid of anchors.
The scaffolding should be anchored starting from the second storey, every second bay vertically and every other bay horizontally, while the adjacent horizontal anchor lines should be shifted by one bay in relation to each other.

Additional anchorages:

- extreme frames should be anchored on the scaffolding edge in a given horizontal series of anchors,
- communication route bays should be additionally anchored on both sides in a given row of anchors,
- additional anchors according to the drawings of the respective variants,
- additional anchors at the installation site of the cable winch with a swivel arm.

The anchoring components should be attached to the frame stands by means of cross joints. Tighten the nuts of the cross joints with a torque of 50 Nm. Anchoring connectors should be mounted to two stands directly under the transom planes (platform planes) in accordance with the anchoring grids shown in the drawings. The permissible deviation from the theoretical anchoring points along the stands is: 40 cm for scaffolding up to 24 m high.

6.3 ANCHOR LOAD (ANCHORING FORCES)

The required values of the anchoring forces have been determined for the scaffoldings located at:

- partially open walls, i.e. those with equally spaced openings with an area not exceeding 60% or 30% of the total wall area,
- closed walls, i.e. those that do not have openings.

Linear interpolation of the anchoring forces is not allowed in the case of walls with wall "airiness" from 0% to 60%.

6.4 BRACES

The braces should be installed in every 5th bay in a tower arrangement or in a large-plane arrangement, and the number of braces cannot be less than two on a given scaffolding level. Additional bracings according to the grid are shown in the drawings of the respective variants.

6.5 SCAFFOLDING SERVICE LOADS (NOMINAL SIZE)

Typical variants of DELTA 73 scaffoldings are scaffoldings with a working load of 2 kN/m. Load class 3 according to PN-EN 12811-1.

6.6 CIRCULATION PATHS

Installation of circulation paths should be carried out in accordance with point 2.2.3 The platforms of the circulation paths should be installed alternately in the given riser, so that the manholes are placed on both sides of the bay. The frame stands adjacent to the circulation path must be anchored at vertical intervals not exceeding 4 m.

6.7 GUARD RAILS AND CURBS

All platforms should be secured in accordance with point 2.2.7.1. If the scaffolding is placed at a distance of more than 20 cm from the wall, protective handrails and curbs must be installed also on the side of the wall.

6.8 NARROW EXTENSION DECK,

Narrow extension decks (single-deck) may be installed only on the inside of the scaffolding and only at the level of the main platform.

6.9 WIDE EXTENSION DECK

Wide extension decks (double-deck) may be used only on the outside of the scaffolding and only at the level of the highest main platform.

7 ASSEMBLY DRAWINGS OF WALL-ANCHORED SCAFFOLDING

7.1 VARIANT I

Technical assumptions:

bay length - max 3.07 m,
storey height - 2 m,
scaffolding height - 24.2 m,
payload - 2 kN/m^2.

Scaffolding platforms - wooden-lined on each storey.
Safety rails are installed in each bay on each storey.
Bracing system: multi-faceted and/or tower.
The scaffolding is placed on a sufficiently durable surface (no settling).
The height of the position of the adjustment nut of the screw jack in relation to the foot - 0.20 m.
Maximum distance between the scaffolding and the wall (the distance between the platform edge and the wall) - 0.20 m.

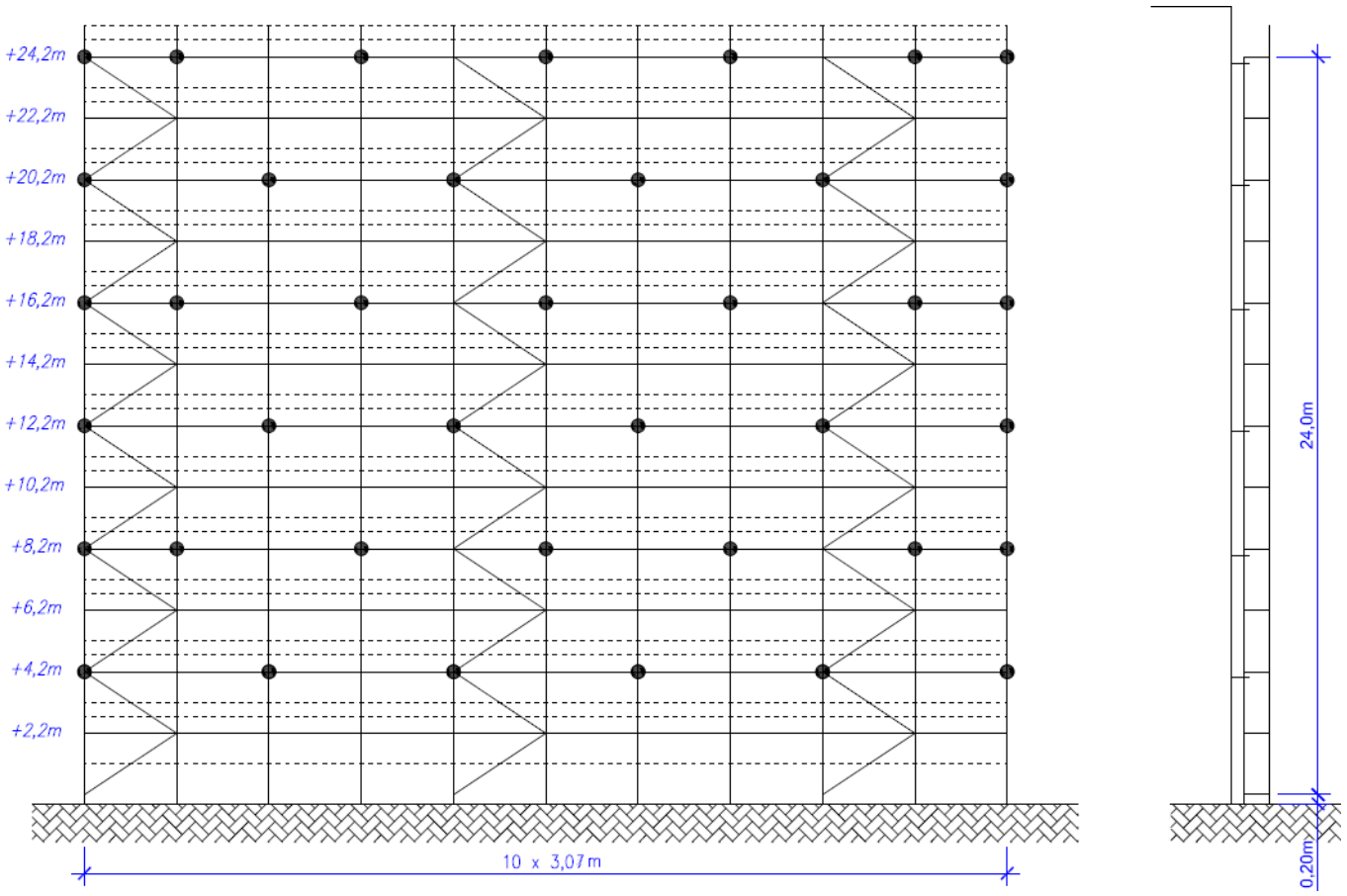
The scaffolding is set up at a partially open façade (max 60% of the openings evenly spaced) or a closed façade.

Consoles: none.
Coverage: none.

The highest storey, anchored in every second bay.
Anchoring by means of short anchoring connectors fastened to one frame stand.

Anchoring forces required:
- component perpendicular to the wall: 5.61 kN,
- component parallel to the wall: 1.34 kN.

Design forces per foot 10.88 kN.



7.2 VARIANT II

Technical assumptions:

bay length - max 3.07 m,
storey height - 2 m,
scaffolding height – 24.2 m,
payload - 2 kN/m^2.

Scaffolding platforms - wooden-lined on each storey.
Safety rails are installed in each bay on each storey.
Bracing system: multi-faceted and/or tower.
The scaffolding is placed on a sufficiently durable surface (no settling).
The height of the position of the adjustment nut of the screw jack in relation to the foot max - 0.20 m.
Maximum distance between the scaffolding and the wall (the distance between the platform edge and the wall) - 0.20 m.

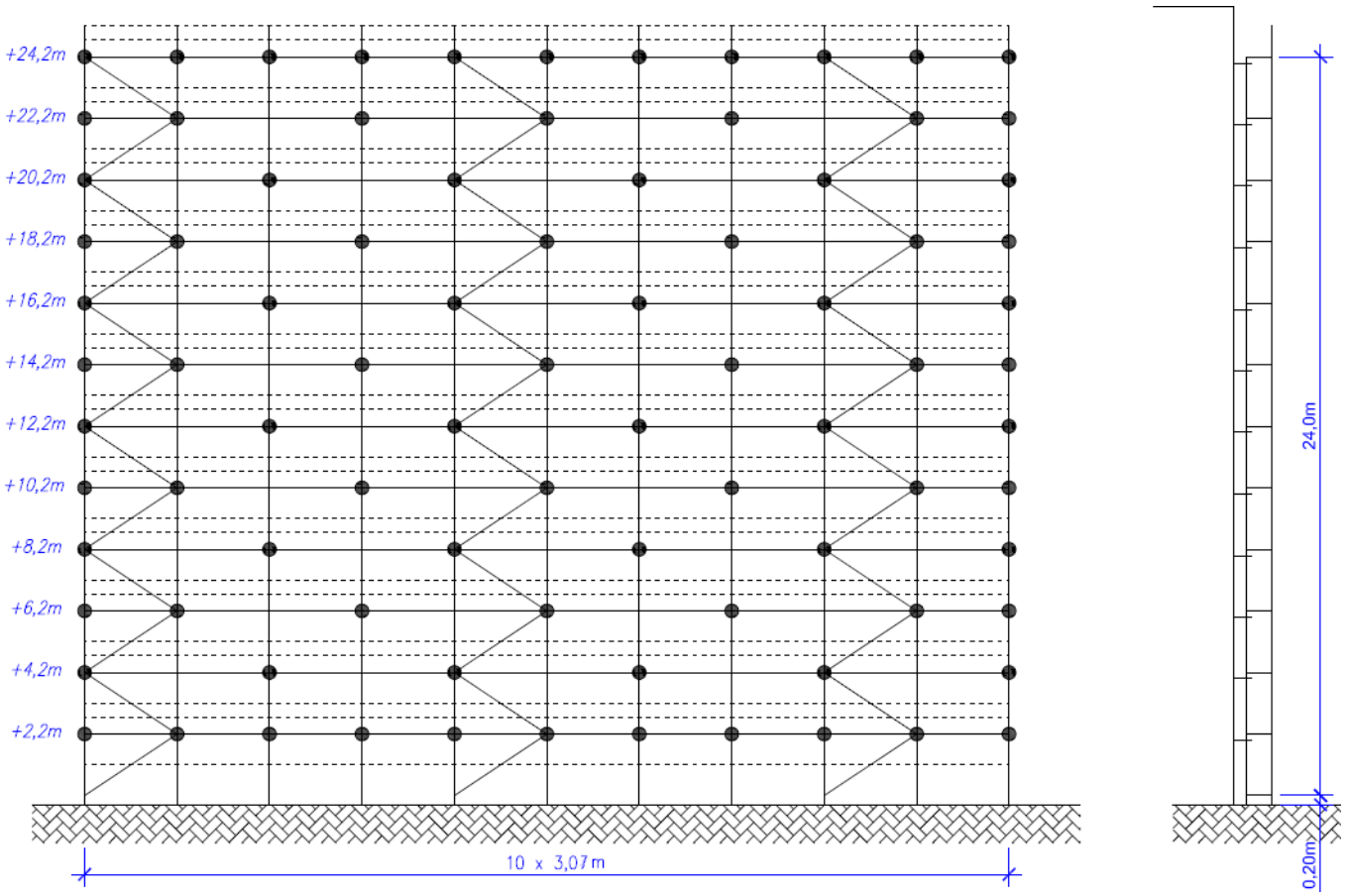
The scaffolding is set up at a partially open façade (max 60% of the openings evenly spaced) or a closed façade.

Consoles: none.
Coverage: net.

The highest storey, anchored in each bay.
Anchoring by means of short anchoring connectors fastened to one frame stand.

Anchoring forces required:
- component perpendicular to the wall: 5.98 kN,
- component parallel to the wall: 2.56 kN.

Design forces per foot 12.83 kN.



7.3 VARIANT III

Technical assumptions:

bay length - max 3.07 m,
storey height - 2 m,
scaffolding height – 24.2 m,
payload - 2 kN/m^2.

Scaffolding platforms - wooden-lined on each storey.
Safety rails are installed in each bay on each storey.
Bracing system: multi-faceted and/or tower.
The scaffolding is placed on a sufficiently durable surface (no settling).
The height of the position of the adjustment nut of the screw jack in relation to the foot max - 0.20 m.
Maximum distance between the scaffolding and the wall (the distance between the platform edge and the wall) - 0.20 m.

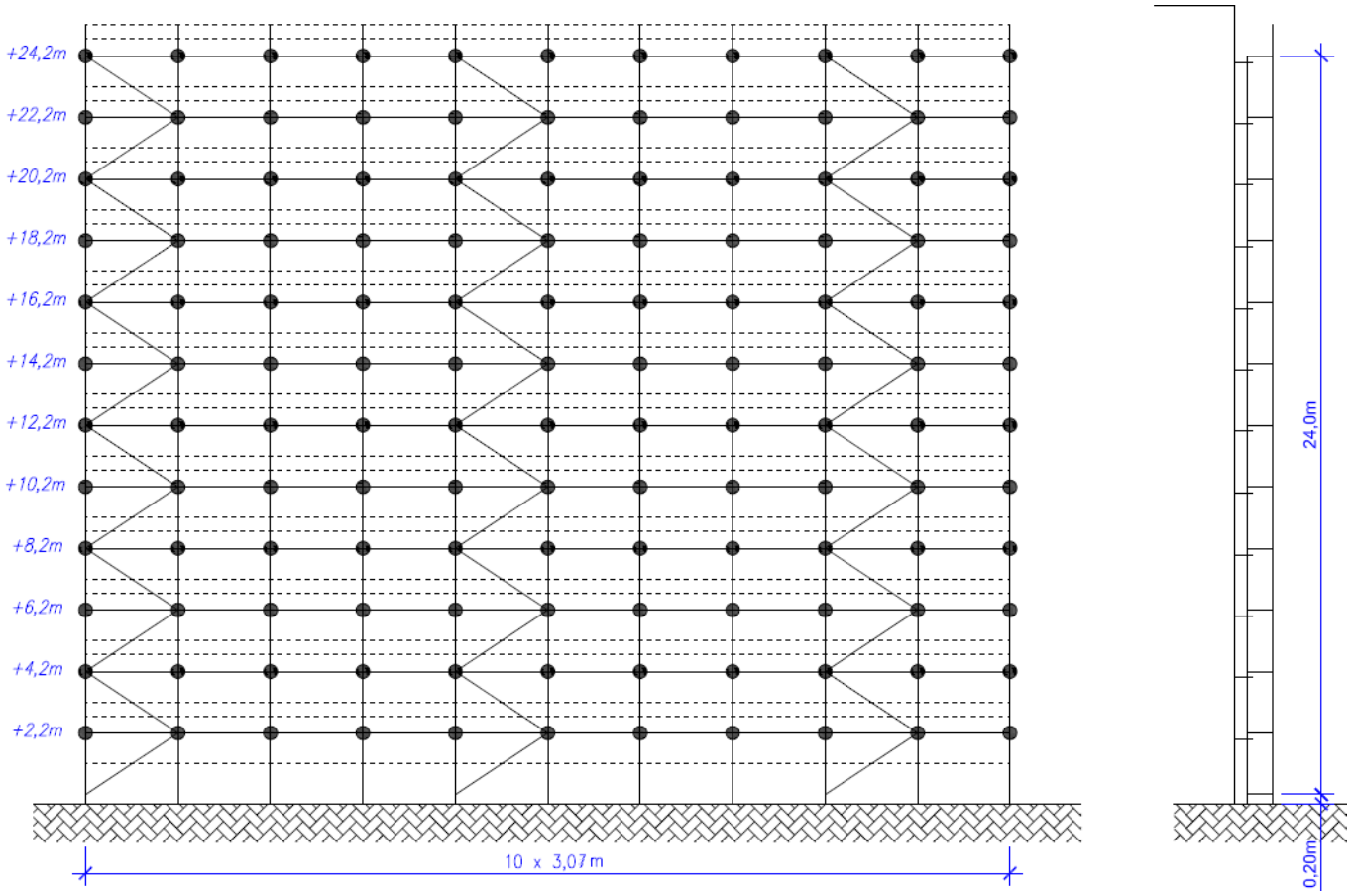
The scaffolding is set up at a partially open façade (max 60% of the openings evenly spaced) or a closed façade.

Consoles: none.
Coverage: tarpaulin.

All storeys anchored in each bay.
Anchoring by means of short anchoring connectors fastened to one frame stand.

Anchoring forces required:
- component perpendicular to the wall: 7.81 kN,
- component parallel to the wall: 0.94 kN.

Design forces per foot 10.59 kN.



7.4 VARIANT IV

Technical assumptions:

bay length - max 3.07 m,
storey height - 2 m,
scaffolding height – 24.2 m,
payload - 2 kN/m^2.

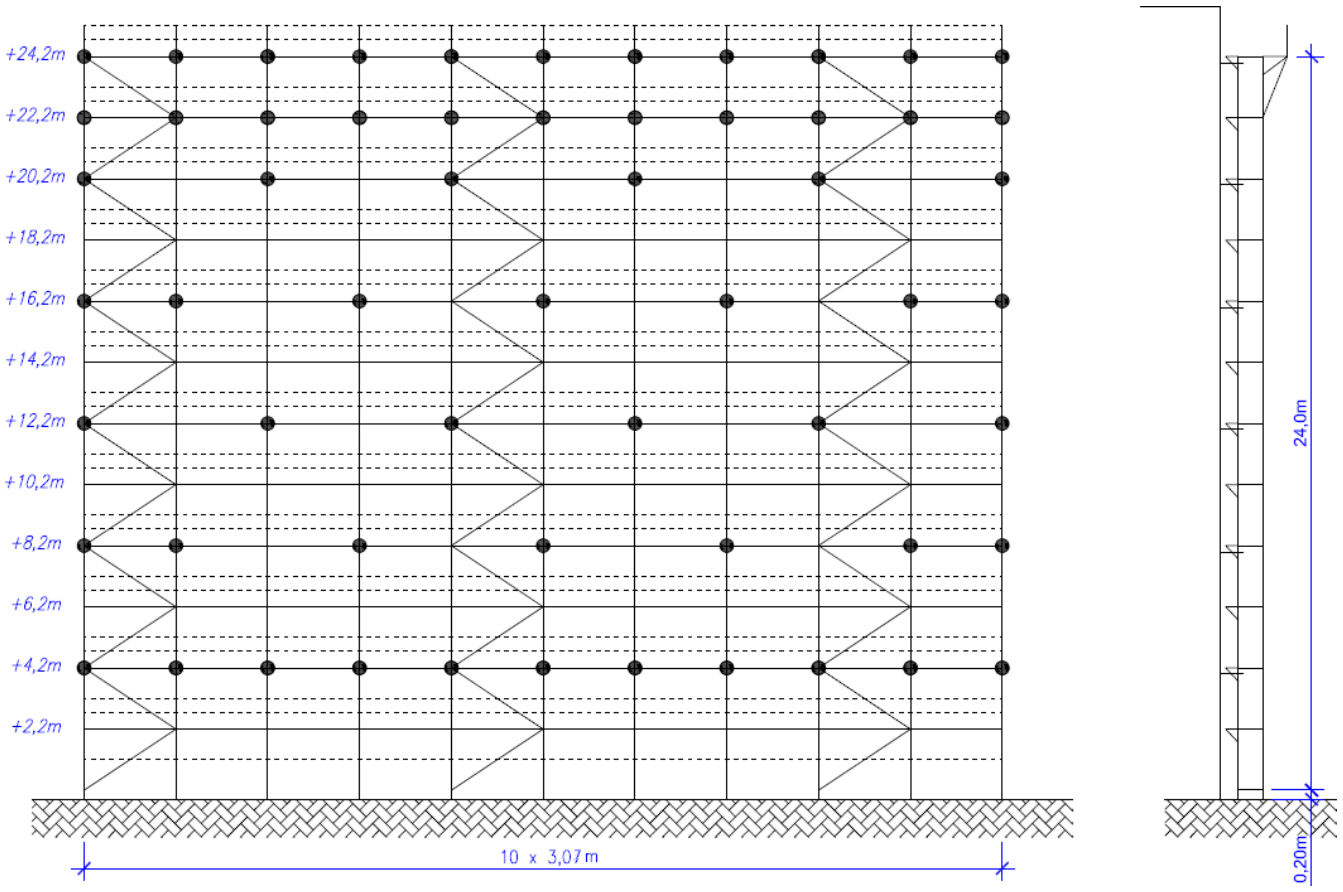
Scaffolding platforms - wooden-lined on each storey.
Safety rails are installed in each bay on each storey.
Bracing system: multi-faceted and/or tower.
The scaffolding is placed on a sufficiently durable surface (no settling).
The height of the position of the adjustment nut of the screw jack in relation to the foot max - 0.20 m.
Maximum distance between the scaffolding and the wall (the distance between the platform edge and the wall) - 0.20 m.
The scaffolding is placed next to the partially open façade (max 60% of the openings evenly distributed).

Consoles: narrow consoles on each storey from the wall side and a wide console on the last storey from the outside of the scaffolding.
Coverage: none.

The second, penultimate and last storey, anchored in each bay.
Anchoring by means of short anchoring connectors fastened to one frame stand.

Anchoring forces required:
- component perpendicular to the wall: 4.72 kN,
- component parallel to the wall: 1.20 kN.

Design forces per foot 14.38 kN.



7.5 VARIANT V

Technical assumptions:

bay length - max 3.07 m,
storey height - 2 m,
scaffolding height - 24.2 m,
payload - 2 kN/m^2.

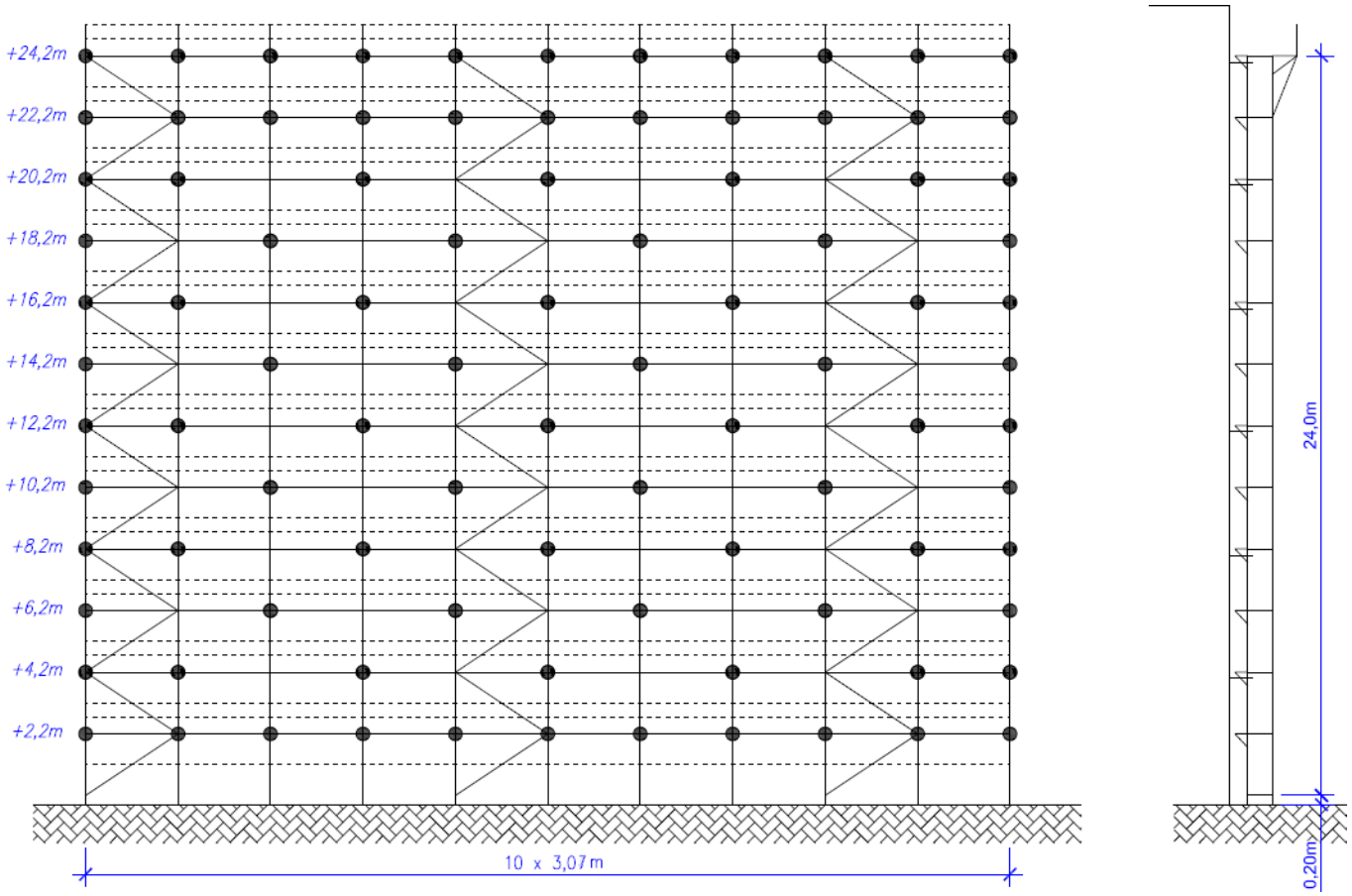
Scaffolding platforms - wooden-lined on each storey.
Safety rails are installed in each bay on each storey.
Bracing system: multi-faceted and/or tower.
The scaffolding is placed on a sufficiently durable surface (no settling).
The height of the position of the adjustment nut of the screw jack in relation to the foot max - 0.20 m.
Maximum distance between the scaffolding and the wall (the distance between the platform edge and the wall) - 0.20 m.
The scaffolding is set up at a partially open façade (max 60% of the openings evenly spaced) or a closed façade.

Consoles: narrow consoles on each storey from the wall side and a wide console on the last storey from the outside of the scaffolding.
Coverage: net.

The second, penultimate and last storey, anchored in each bay.
Anchoring by means of short anchoring connectors fastened to one frame stand.

Anchoring forces required:
- component perpendicular to the wall: 5.90 kN,
- component parallel to the wall: 1.20 kN.

Design forces per foot 14.66 kN.



7.6 VARIANT VI

Technical assumptions:

bay length - max 3.07 m,
storey height - 2 m,
scaffolding height - 24.2 m,
payload - 2 kN/m^2.

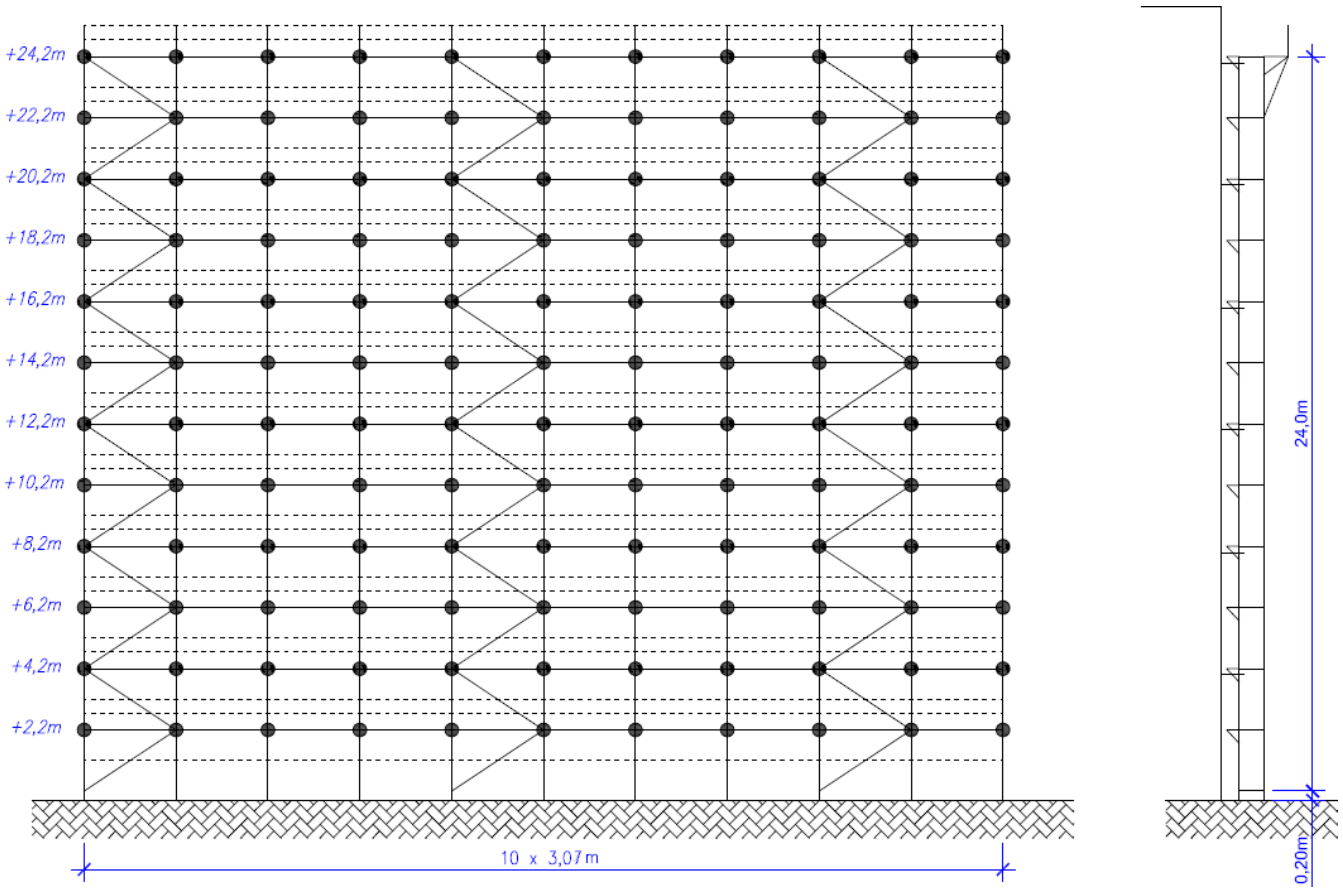
Scaffolding platforms - wooden-lined on each storey.
Safety rails are installed in each bay on each storey.
Bracing system: multi-faceted and/or tower.
The scaffolding is placed on a sufficiently durable surface (no settling).
The height of the position of the adjustment nut of the screw jack in relation to the foot max - 0.20 m.
Maximum distance between the scaffolding and the wall (the distance between the platform edge and the wall) - 0.20 m.
The scaffolding is set up at a partially open façade (max 60% of the openings evenly spaced) or a closed façade.

Consoles: narrow consoles on each storey from the wall side and a wide console on the last storey from the outside of the scaffolding.
Coverage: tarpaulin.

All storeys anchored in each bay.
Anchoring by means of short anchoring connectors fastened to one frame stand.

Anchoring forces required:
- component perpendicular to the wall: 7.76 kN,
- component parallel to the wall: 0.69 kN.

Design forces per foot 14.43 kN.



7.7 VARIANT VII

Technical assumptions:

bay length - max 3.07 m,
storey height - 2 m,
scaffolding height - 24.2 m,
payload - 2 kN/m^2.

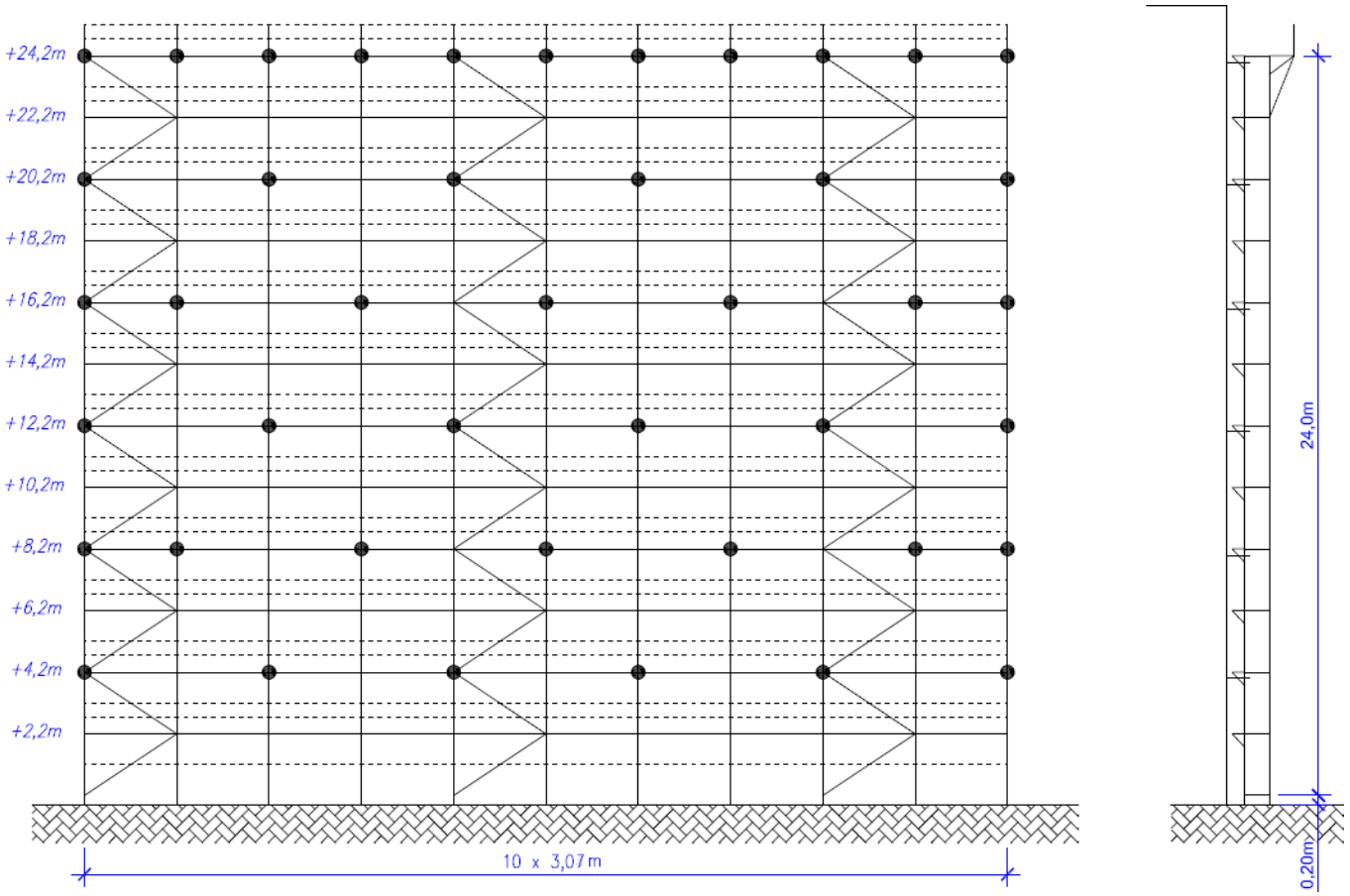
Scaffolding platforms - wooden-lined on each storey.
Safety rails are installed in each bay on each storey.
Bracing system: multi-faceted and/or tower.
The scaffolding is placed on a sufficiently durable surface (no settling).
The height of the position of the adjustment nut of the screw jack in relation to the foot max - 0.20 m.
Maximum distance between the scaffolding and the wall (the distance between the platform edge and the wall) - 0.20 m.
The scaffolding is placed next to the closed façade.

Consoles: narrow consoles on each storey from the wall side and a wide console on the last storey from the outside of the scaffolding.
Coverage: none.

The highest storey, anchored in each bay.
Anchoring by means of short anchoring connectors fastened to one frame stand.

Anchoring forces required:
- component perpendicular to the wall: 4.98 kN,
- component parallel to the wall: 2.24 kN.

Design forces per foot 15.18 kN.



7.8 VARIANT VIII

Technical assumptions:

bay length - max 3.07 m,
storey height - 2 m,
scaffolding height – 66.2 m,
payload - 2 kN/m^2.

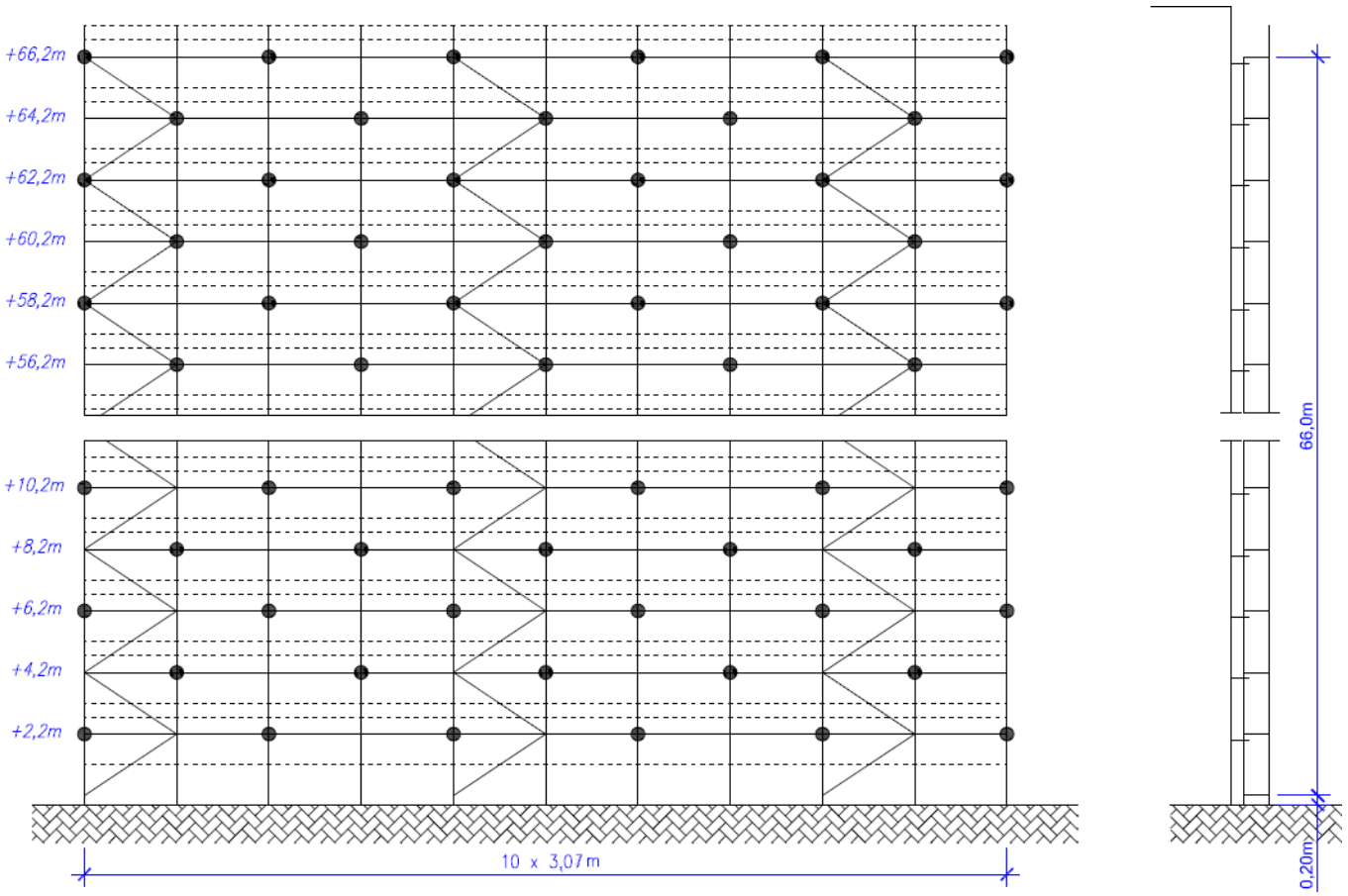
Scaffolding platforms - wooden-lined on each storey.
Safety rails are installed in each bay on each storey.
Bracing system: multi-faceted and/or tower.
The scaffolding is placed on a sufficiently durable surface (no settling).
The height of the position of the adjustment nut of the screw jack in relation to the foot max - 0.20 m.
Maximum distance between the scaffolding and the wall (the distance between the platform edge and the wall) - 0.20 m.
The scaffolding is set up at a partially open façade (max 60% of the openings evenly spaced) or a closed façade.

Consoles: none.
Coverage: none.

The highest storey, anchored in every second bay.
Anchoring by means of short anchoring connectors fastened to one frame stand.

Anchoring forces required:
- component perpendicular to the wall: 3.49 kN,
- component parallel to the wall: 1.00 kN.

Design forces per foot 22.54 kN.



7.9 VARIANT IX

Technical assumptions:

bay length - max 3.07 m,
storey height - 2 m,
scaffolding height – 66.2 m,
payload - 2 kN/m^2.

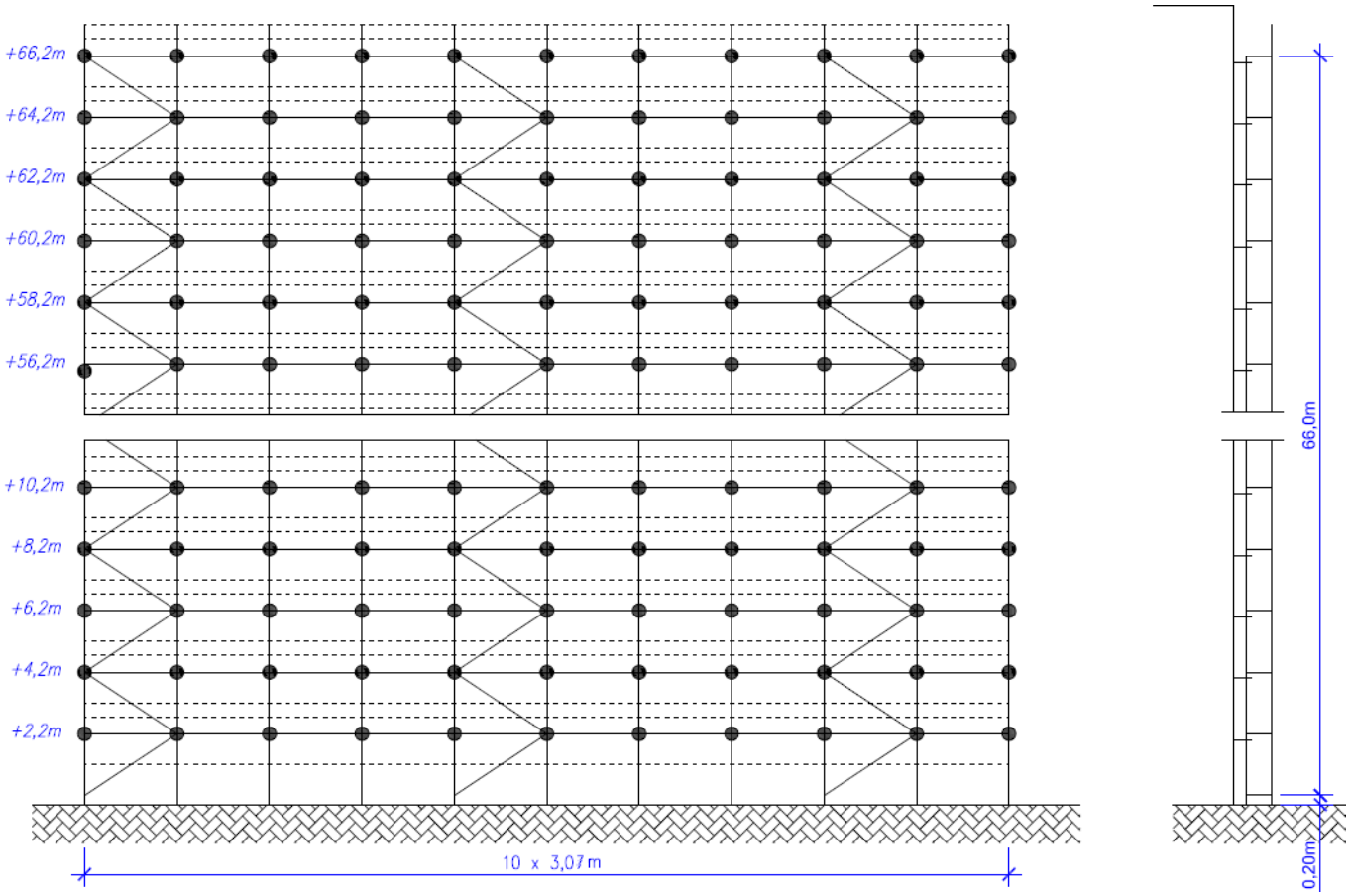
Scaffolding platforms - wooden-lined on each storey.
Safety rails are installed in each bay on each storey.
Bracing system: multi-faceted and/or tower.
The scaffolding is placed on a sufficiently durable surface (no settling).
The height of the position of the adjustment nut of the screw jack in relation to the foot max - 0.20 m.
Maximum distance between the scaffolding and the wall (the distance between the platform edge and the wall) - 0.20 m.
The scaffolding is set up at a partially open façade (max 60% of the openings evenly spaced) or a closed façade.

Consoles: none.
Coverage: net.

All storeys anchored in each bay.
Anchoring by means of short anchoring connectors fastened to one frame stand.

Anchoring forces required:
- component perpendicular to the wall: 7.20 kN,
- component parallel to the wall: 0.75 kN.

Design forces per foot 22.34 kN.



7.10 VARIANT X

Technical assumptions:

bay length - max 3.07 m,
storey height - 2 m,
scaffolding height - 66.2 m,
payload - 2 kN/m^2.

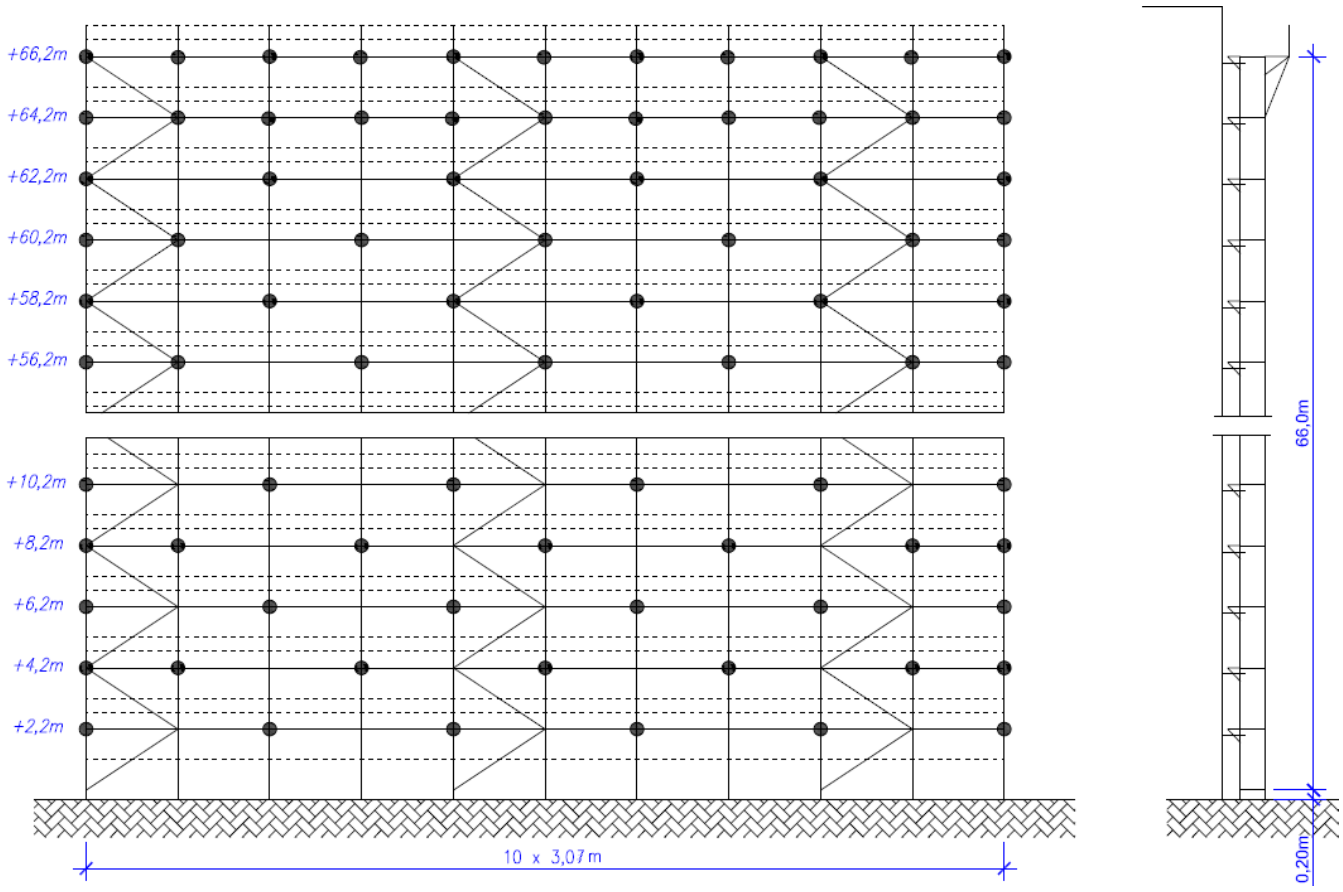
Scaffolding platforms - wooden-lined on each storey.
Safety rails are installed in each bay on each storey.
Bracing system: multi-faceted and/or tower.
The scaffolding is placed on a sufficiently durable surface (no settling).
The height of the position of the adjustment nut of the screw jack in relation to the foot max - 0.20 m.
Maximum distance between the scaffolding and the wall (the distance between the platform edge and the wall) - 0.20 m.
The scaffolding is set up at a partially open façade (max 60% of the openings evenly spaced) or a closed façade.

Consoles: narrow consoles on each storey from the wall side and a wide console on the last storey from the outside of the scaffolding.
Coverage: none.

The penultimate and last storey, anchored in each bay.
Anchoring by means of short anchoring connectors fastened to one frame stand.

Anchoring forces required:
- component perpendicular to the wall: 5.29 kN,
- component parallel to the wall: 1.41 kN.

Design forces per foot 25.65 kN.



7.11 VARIANT XI

Technical assumptions:

bay length - max 3.07 m,
storey height - 2 m,
scaffolding height – 46.2 m,
payload - 2 kN/m^2.

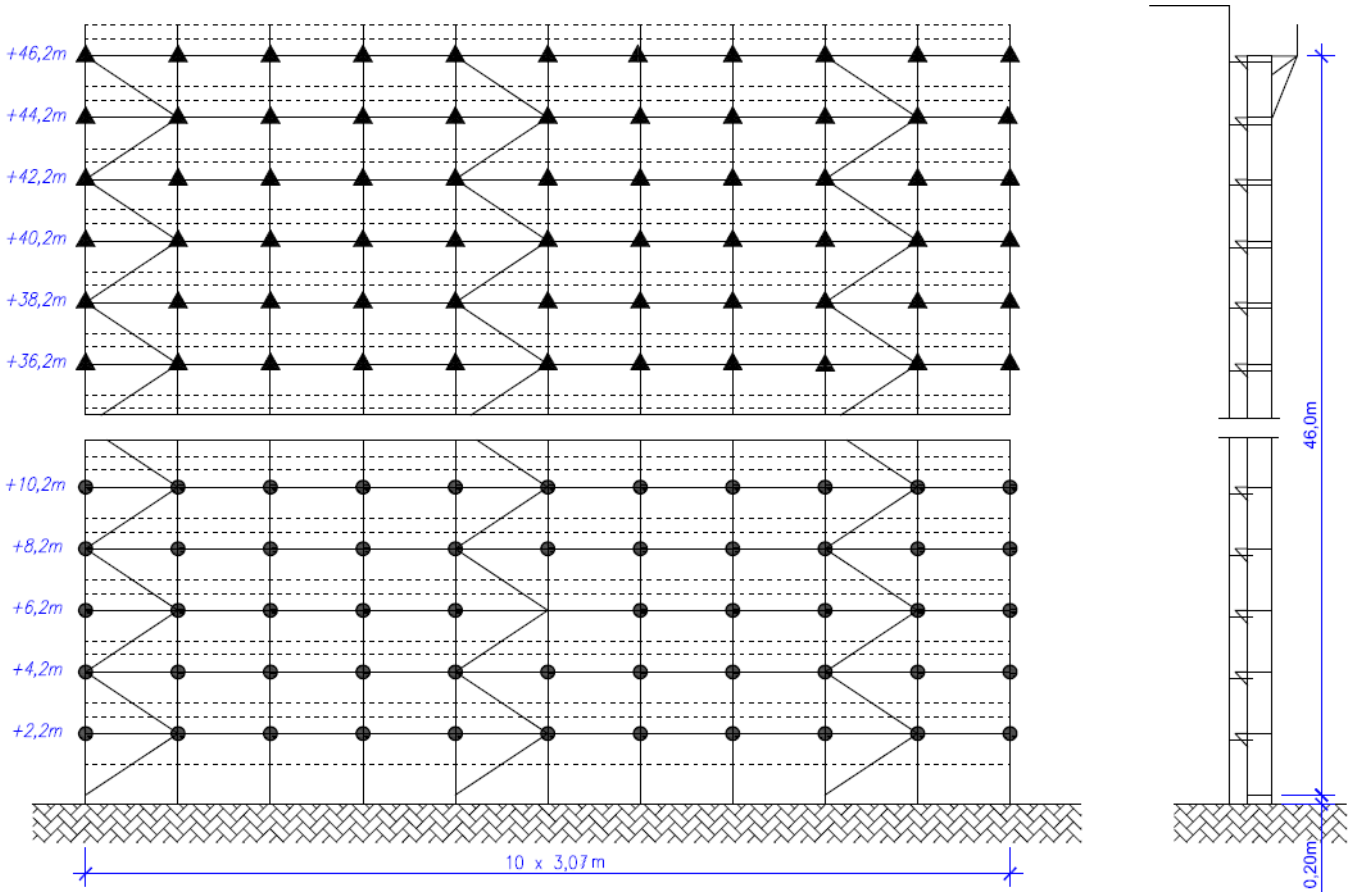
Scaffolding platforms - wooden-lined on each storey.
Safety rails are installed in each bay on each storey.
Bracing system: multi-faceted and/or tower.
The scaffolding is placed on a sufficiently durable surface (no settling).
The height of the position of the adjustment nut of the screw jack in relation to the foot max - 0.20 m.
Maximum distance between the scaffolding and the wall (the distance between the platform edge and the wall) - 0.20 m.
The scaffolding is set up at a partially open façade (max 60% of the openings evenly spaced) or a closed façade.

Consoles: narrow consoles on each storey from the wall side and a wide console on the last storey from the outside of the scaffolding.
Coverage: tarpaulin.

All storeys anchored in each bay.
Anchoring by means of short anchoring connectors fastened to one frame stand up to 30m, above anchoring with long anchoring connectors fastened to two frame stands.

Anchoring forces required:
- component perpendicular to the wall: 9.36 kN,
- component parallel to the wall: 0.72 kN.

Design forces per foot 19.48 kN.



7.12 VARIANT XII

Technical assumptions:

bay length - max 3.07 m,
storey height - 2 m,
scaffolding height – 46.2 m,
payload - 2 kN/m^2.

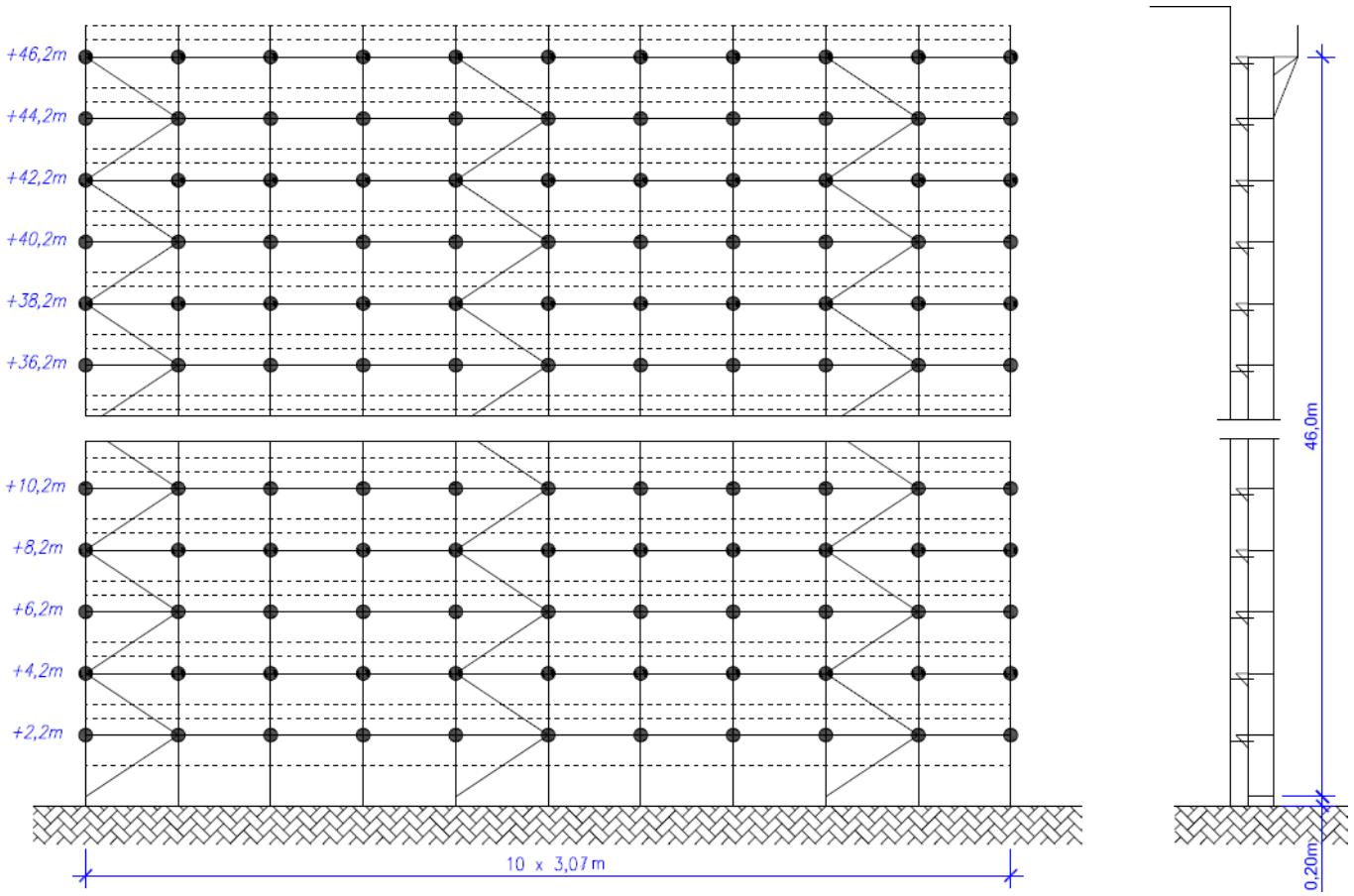
Scaffolding platforms - wooden-lined on each storey.
Safety rails are installed in each bay on each storey.
Bracing system: multi-faceted and/or tower.
The scaffolding is placed on a sufficiently durable surface (no settling).
The height of the position of the adjustment nut of the screw jack in relation to the foot max - 0.20 m.
Maximum distance between the scaffolding and the wall (the distance between the platform edge and the wall) - 0.20 m.
The scaffolding is set up at a partially open façade (max 60% of the openings evenly spaced) or a closed façade.

Consoles: narrow consoles on each storey from the wall side and a wide console on the last storey from the outside of the scaffolding.
Coverage: net.

All storeys anchored in each bay.
Anchoring by means of short anchoring connectors fastened to one frame stand.

Anchoring forces required:
- component perpendicular to the wall: 4.46 kN,
- component parallel to the wall: 0.72 kN.

Design forces per foot 19.48 kN.



7.13 VARIANT XIII

Technical assumptions:

bay length - max 3.07 m,
storey height - 2 m,
scaffolding height – 46.2 m,
payload - 2 kN/m^2.

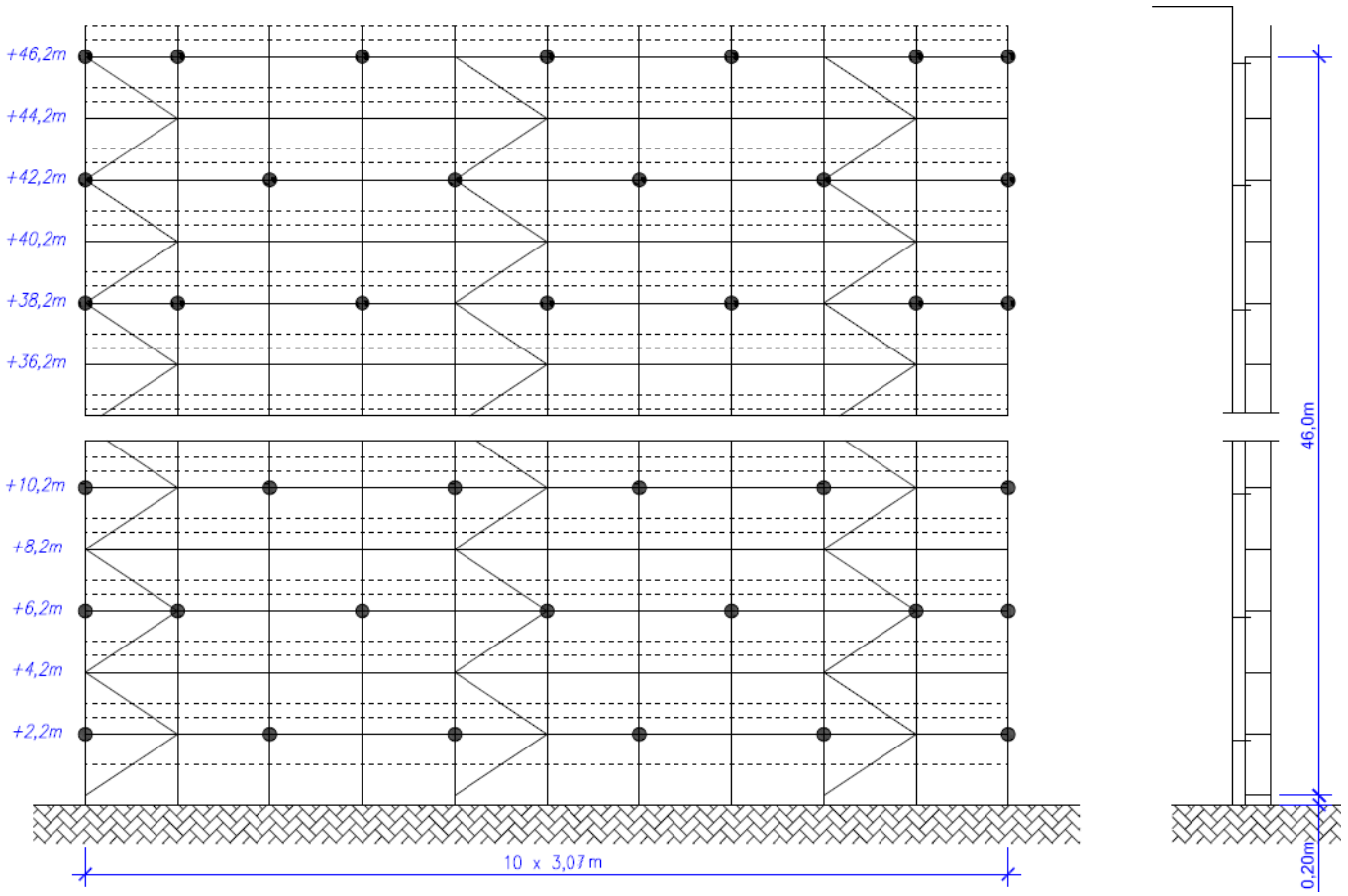
Scaffolding platforms - wooden-lined on each storey.
Safety rails are installed in each bay on each storey.
Bracing system: multi-faceted and/or tower.
The scaffolding is placed on a sufficiently durable surface (no settling).
The height of the position of the adjustment nut of the screw jack in relation to the foot max - 0.20 m.
Maximum distance between the scaffolding and the wall (the distance between the platform edge and the wall) - 0.20 m.
The scaffolding is set up at a partially open façade (max 60% of the openings evenly spaced) or a closed façade.

Consoles: none.
Coverage: none.

The highest storey, anchored in every second bay.
Anchoring by means of short anchoring connectors fastened to one frame stand.

Anchoring forces required:
- component perpendicular to the wall: 6.30 kN,
- component parallel to the wall: 2.53 kN.

Design forces per foot 16.54 kN.



7.14 VARIANT XIV

Technical assumptions:

bay length - max 3.07 m,
storey height - 2 m,
scaffolding height - 46.2 m,
payload - 2 kN/m^2.

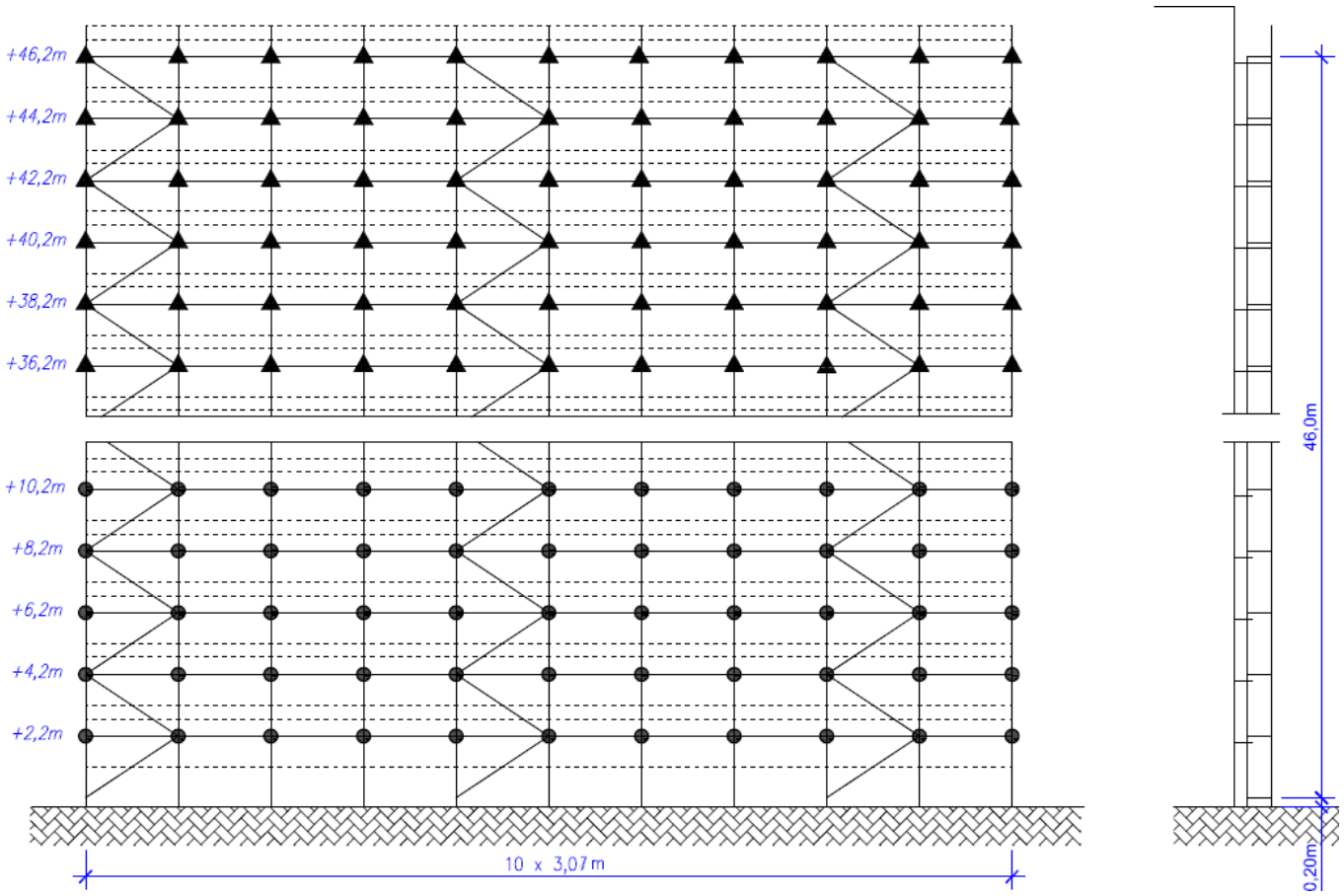
Scaffolding platforms - wooden-lined on each storey.
Safety rails are installed in each bay on each storey.
Bracing system: multi-faceted and/or tower.
The scaffolding is placed on a sufficiently durable surface (no settling).
The height of the position of the adjustment nut of the screw jack in relation to the foot max - 0.20 m.
Maximum distance between the scaffolding and the wall (the distance between the platform edge and the wall) - 0.20 m.
The scaffolding is set up at a partially open façade (max 60% of the openings evenly spaced) or a closed façade.

Consoles: none.
Coverage: tarpaulin.

All storeys anchored in each bay.
Anchoring by means of short anchoring connectors fastened to one frame stand up to a height of 30m, above anchoring with long anchoring connectors fastened to two frame stands.

Anchoring forces required:
- component perpendicular to the wall: 9.44 kN,
- component parallel to the wall: 0.74 kN.

Design forces per foot 16.40 kN.



7.15 VARIANT XV

Technical assumptions:

bay length - max 3.07 m,
storey height - 2 m,
scaffolding height - 46.2 m,
payload - 2 kN/m^2.

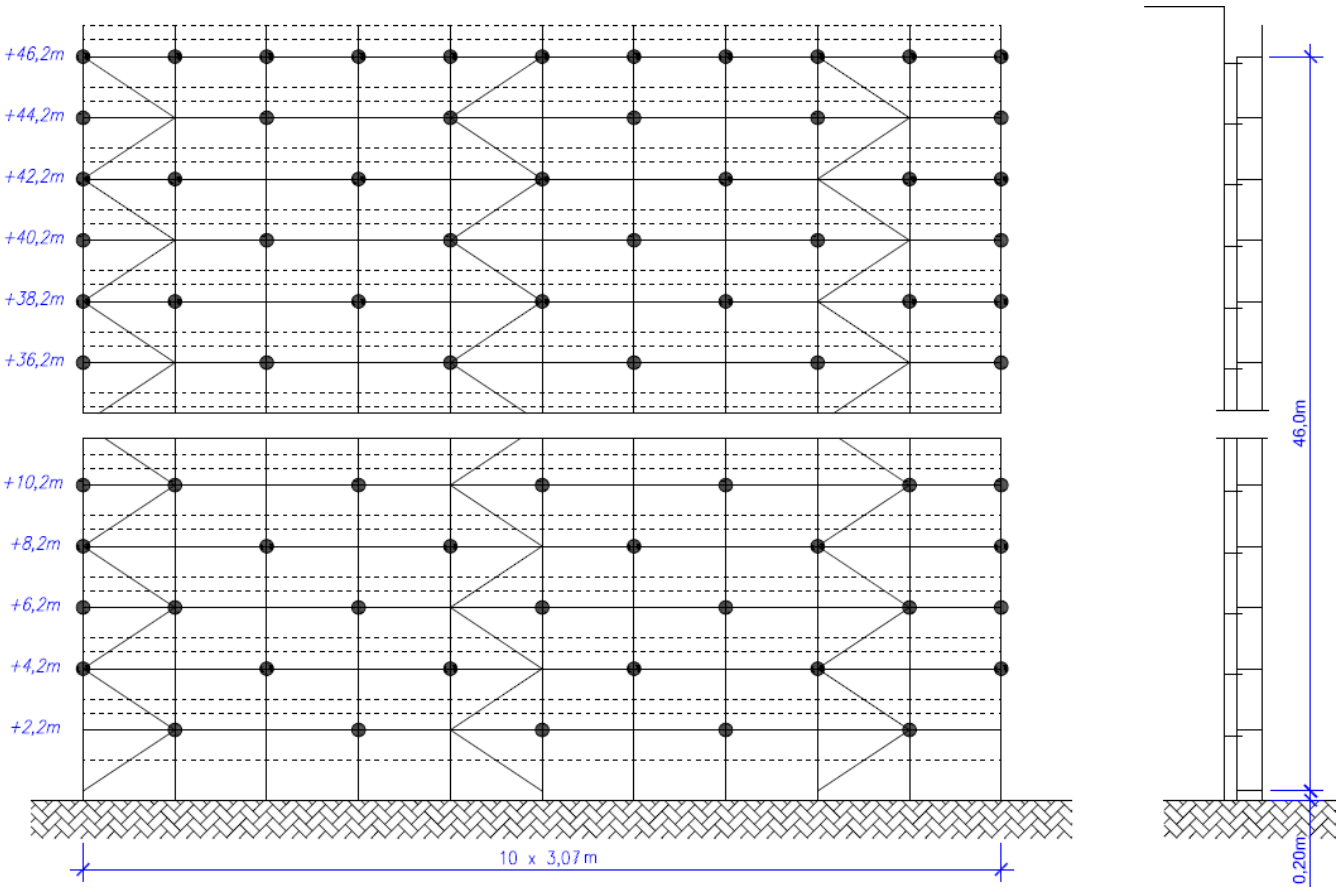
Scaffolding platforms - wooden-lined on each storey.
Safety rails are installed in each bay on each storey.
Bracing system: multi-faceted and/or tower.
The scaffolding is placed on a sufficiently durable surface (no settling).
The height of the position of the adjustment nut of the screw jack in relation to the foot max - 0.20 m.
Maximum distance between the scaffolding and the wall (the distance between the platform edge and the wall) - 0.20 m.
The scaffolding is set up at a partially open façade (max 60% of the openings evenly spaced) or a closed façade.

Consoles: none.
Coverage: net.

Top storeys anchored in each bay.
Anchoring by means of short anchoring connectors fastened to one frame stand.

Anchoring forces required:
- component perpendicular to the wall: 7.66 kN,
- component parallel to the wall: 1.23 kN.

Design forces per foot 16.53 kN.



7.16 VARIANT XVI

Technical assumptions:

bay length - max 3.07 m,
storey height - 2 m,
scaffolding height - 46.2 m,
payload - 2 kN/m^2.

Scaffolding platforms - wooden-lined on each storey.
Safety rails are installed in each bay on each storey.
Bracing system: multi-faceted and/or tower.
The scaffolding is placed on a sufficiently durable surface (no settling).
The height of the position of the adjustment nut of the screw jack in relation to the foot max - 0.20 m.
Maximum distance between the scaffolding and the wall (the distance between the platform edge and the wall) - 0.20 m.
The scaffolding is set up at a partially open façade (max 60% of the openings evenly spaced) or a closed façade.

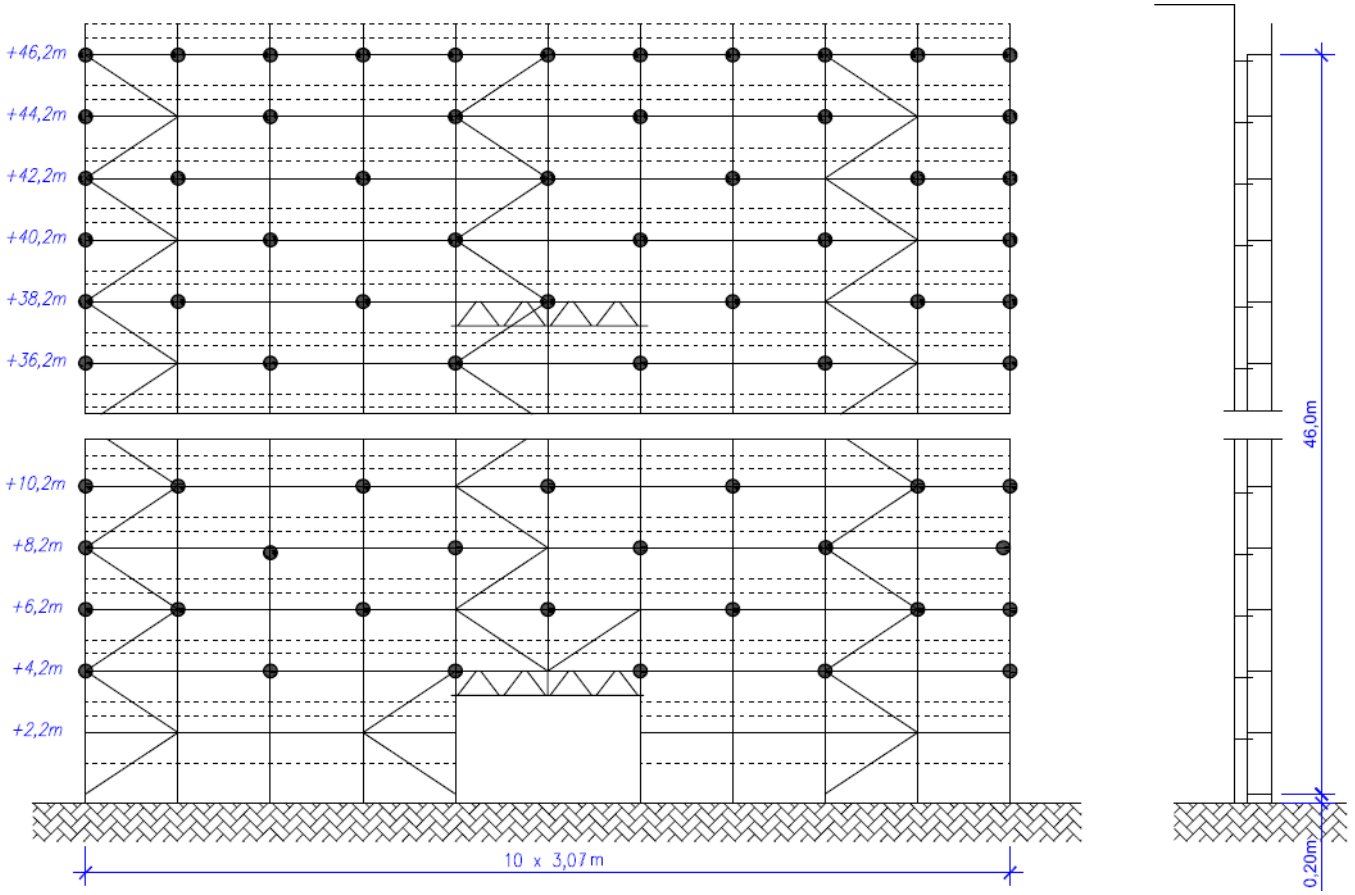
Consoles: none.
Coverage: net.

Top storeys anchored in each bay.
Anchoring by means of short anchoring connectors fastened to one frame stand.

Suspending the scaffolding with lattice girders on two storeys.
At the highest girder, dilatation of the suspended frame is preserved.

Anchoring forces required:
- component perpendicular to the wall: 7.66 kN,
- component parallel to the wall: 1.23 kN.

Design forces per foot 24.07 kN.



8 MOBILE SCAFFOLDING DELTA 73

The DELTA 73 mobile scaffolding is mainly based on façade scaffolding components. The main advantage of DELTA 73 mobile scaffolding is mobility - it can be assembled and disassembled so that their dimensions can be adapted to given working conditions. They are often places with very limited space.

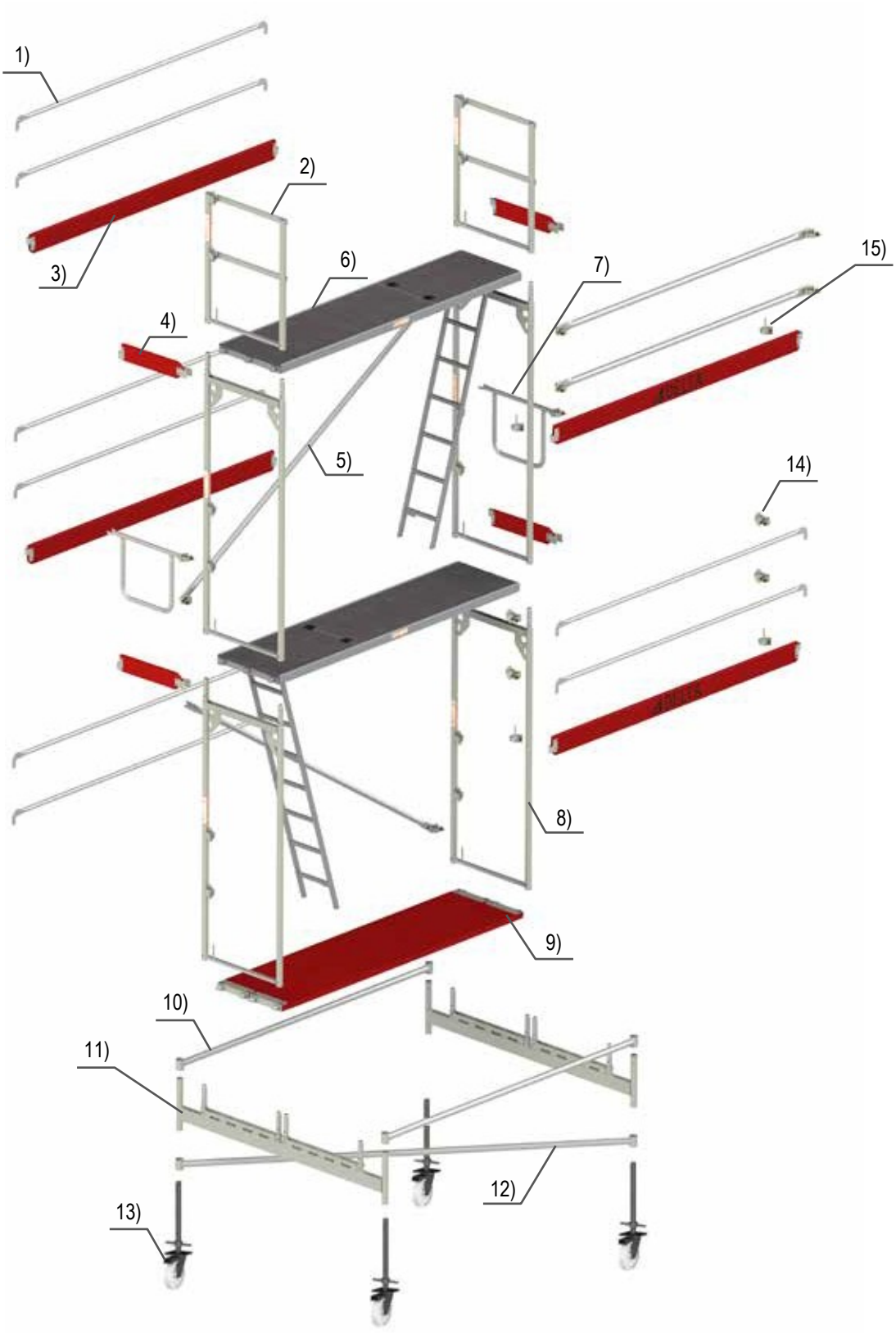
8.1 MOBILE SCAFFOLDING DELTA 73 SINGLE

When assembling the DELTA 73 scaffolding, it should be checked at every stage that it is fully level and vertical, because, among other things, the safety of work depends on it. The verticality and horizontality are set by means of plastic rollers (castors) with an adjustable threaded spindle, mounted to the beam of the mobile scaffold. Then, on each level, we assemble the DELTA 73 scaffolding frames and all the others façade scaffolding components - aluminum slab filled with plywood with a ladder and scaffolding stiffening components (bracings, handrails) and securing components (curbs and side rails).

The following points should be considered:

- mobile scaffolding with a circulation path meets Polish and European scaffolding standards ,
- the maximum height of the working platform is:
  - closed room - 10,45 m,
  - open space - 8,45 m,
- load of the working platform (alu-plywood cover) is 2,00 kN/m^2,
- the ballast and its values are included in the tables on page 93.

Fig. 34. Single-sided mobile scaffolding DELTA 73.



1)	LN 002 257	- Longitudinal railing 2.57 m
2)	LN 006 073	- Upper edge frame
3)	LN 003 257	- Longitudinal curb 2.57 m
4)	LN 004 073	- Side curb 0.73 m
5)	LN 001 257	- Vertical brace 2.57 m
6)	LN 164 257	- Transition platform, aluminum-plywood 2.57 m
7)	LN 005 073	- Double side railing
8)	LN 073 201	- Vertical aluminum frame
9)	LN 032 257	- Wooden platform 2.57 m
10)	LN 011 004	- Horizontal brace 2.57 m
11)	LN 011 002	- Travel beam
12)	LN 011 003	- Horizontal diagonal brace 2.57 m
13)	DL 011 002	- Roller foot (castor) with a brake
13)	LN 010 002	- Handrail connector
13)	DL 010 004	- Curb joint

Fig. 35. One-sided mobile scaffolding DELTA 73 - Exploded view.

Spacing of vertical frames 2.57 m									
No.	Cat. No.	Name of the component	Working height (m)	4.45	6.45	8.45	10.45	12.45	Weight of one component [kg]
			Scaffolding height (m)	3.45	5.45	7.45	9.45	11.45	
			Height of the last working platform (m)	2.45	4.45	6.45	8.45	10.45	
1.	LN 011 002	Travel beam		2	2	2	2	2	22.50
2.	DL 011 001	Roller with brake		4	4	4	4	4	5.70
3.	LN 011 004	Horizontal brace 2.57 m		2	2	2	2	2	7.30
4.	LN 011 003	Horizontal brace oblique to the bay 2.57 m		1	1	1	1	1	9.30
5.	LN 010 002	Handrail connector		4	8	12	16	20	1.10
6.	LN 073 200	Steel frame 2.0 x 0.73 m		2	4	6	8	10	18.50
7.	LN 002 257	Longitudinal steel handrail 2.57 m		6	10	14	18	22	4.70
8.	LN 001 257	Brace vertical to the bay 2.57 m		1	2	3	4	5	7.30
9.	LN 032 257	Wooden platform 2.57 m		2	2	2	2	2	20.90
10.	LN 264 257	Passage aluminum platform with a ladder 2.57 m		1	2	3	4	5	25.40
11.	LN 005 073	Double side railing		---	2	4	6	8	3.00
12.	LN 004 073	Side curb 0.73 m		2	4	6	8	10	1.70
13.	LN 003 257	Longitudinal curb 2.57 m		2	4	6	8	10	5.90
14.	DL 010 004	Curb joint		2	4	6	8	10	0.95
15.	LN 006 073	End frame		2	2	2	2	2	9.00
Ballast (kg) when used			in an enclosed space	---	---	16	61	109	
			outdoors	---	90	212	358	---	
Total weight of the set (not including ballast) [kg]				270.90	386.90	502.90	618.90	734.90	

Spacing of vertical frames 3.07 m									
No.	Cat. No.	Name of the component	Working height (m)	4.45	6.45	8.45	10.45	12.45	Weight of one component [kg]
			Scaffolding height (m)	3.45	5.45	7.45	9.45	11.45	
			Height of the last working platform (m)	2.45	4.45	6.45	8.45	10.45	
1.	LN 011 002	Beam with nipples for rollers		2	2	2	2	2	22.50
2.	DL 011 001	Roller (castor) with a brake		4	4	4	4	4	5.70
3.	LN 011 006	Horizontal brace 3.07 m		2	2	2	2	2	7.80
4.	LN 011 005	Horizontal brace oblique to the bay 3.07 m		1	1	1	1	1	10.00
5.	LN 010 002	Handrail connector		4	8	12	16	20	1.10
6.	LN 073 200	Steel frame 2.0 x 0.73 m		2	4	6	8	10	18.50
7.	LN 002 307	Longitudinal handrail 3.07 m		6	10	14	18	22	5.30
8.	LN 001 307	Brace vertical to the bay 3.07 m		1	2	3	4	5	8.60
9.	LN 032 307	Wooden platform 3.07 m		2	2	2	2	2	23.40
10.	LN 264 307	Passage aluminum platform with a ladder 3.07 m		1	2	3	4	5	30.50
11.	LN 005 073	Double side railing		---	2	4	6	8	3.00
12.	LN 004 073	Side curb 0.73 m		2	4	6	8	10	1.70
13.	LN 003 307	Longitudinal curb 3.07 m		2	4	6	8	10	7.80
14.	DL 010 004	Curb joint		2	4	6	8	10	0.95
15.	LN 006 073	End frame		2	2	2	2	2	9.00
Ballast (kg) when used			in an enclosed space	---	---	16	61	109	
			outdoors	---	90	212	358	---	
Total weight of the set (not including ballast) [kg]				291.40	420.00	548.60	677.20	805.80	

Table 3. List of components of an exemplary single mobile scaffold DELTA 73.

Note:
The above list is an example list, any configuration of components is possible, e.g. steel or aluminum frames, steel, wooden or aluminum platforms with different working widths of 0.32 m or 0.63 m are available.

8.2 MOBILE SCAFFOLDING DELTA 73 DOUBLE

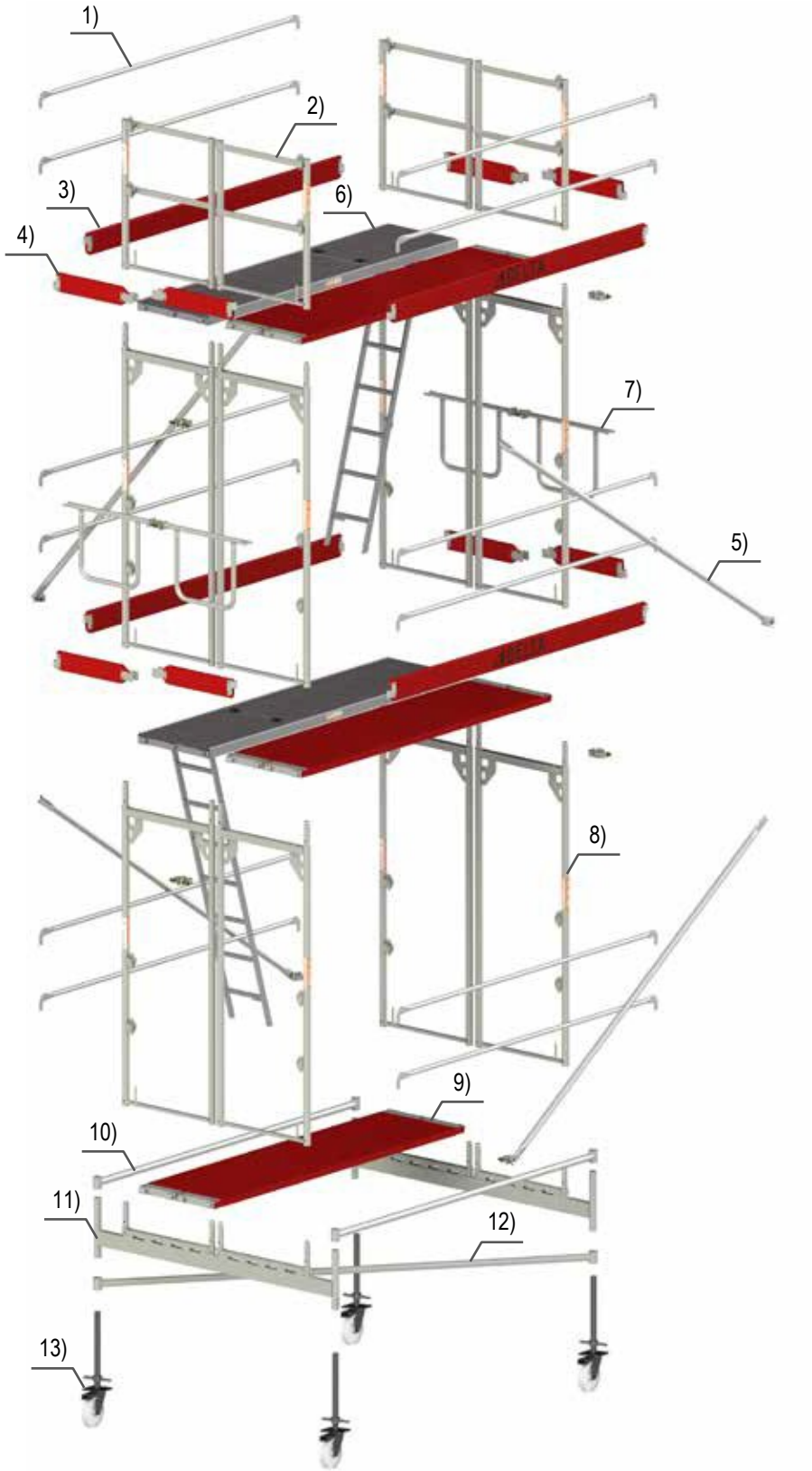
Double mobile scaffolding consists of two scaffolding risers, one of which is a circulation path with an aluminum-plywood board with a ladder.

Just like single scaffolding, double scaffolding is used for assembly, insulation and façade works. In order to take full advantage of the possibilities of such scaffolding, a suitable base must be prepared for manual movement of a given structure.

The following points should be considered:

- mobile scaffolding with circulation path meets Polish and European scaffolding standards,
- the maximum height of the working platform is:
  - closed room – 10.45 m,
  - open space – 8.45 m,
- load of the working platform (alu-plywood passage) is 2.00 kN/m^2,
- the ballast and its values are presented in the tables on page 96.

Fig. 36. Double-sided mobile scaffolding DELTA 73.



1) LN 002 257 - Longitudinal railing 2.57 m
2) LN 006 073 - Upper edge frame
3) LN 003 257 - Longitudinal curb 2.57 m
4) LN 004 073 - Side curb 0.73 m
5) LN 001 257 - Vertical brace 2.57 m
6) LN 164 257 - Transition platform, aluminum-plywood 2.57 m
7) LN 005 073 - Double side railing
8) LN 073 201 - Vertical aluminum frame
9) LN 032 257 - Double wooden deck 2.57 m
10) LN 011 004 - Horizontal brace 2.57 m
11) LN 011 002 - Travel beam
12) LN 011 003 - Horizontal diagonal brace 2.57 m
13) DL 011 002 - Roller foot (castor) with a brake

Fig. 37. Double-sided mobile scaffolding DELTA 73 - Exploded view.

Spacing of vertical frames 2.57 m									
No.	Cat. No.	Name of the component	Working height (m)	4.45	6.45	8.45	10.45	12.45	Weight of one component [kg]
			Scaffolding height (m)	3.45	5.45	7.45	9.45	11.45	
			Height of the last working platform (m)	2.45	4.45	6.45	8.45	10.45	
1.	LN 011 002	Travel beam		2	2	2	2	2	22.50
2.	DL 011 001	Roller with brake		4	4	4	4	4	5.70
3.	LN 011 004	Horizontal brace 2.57 m		2	2	2	2	2	7.30
4.	LN 011 003	Horizontal brace oblique to the bay 2.57 m		1	1	1	1	1	9.30
5.	LN 073 201	Aluminum frame 2.0 x 0.73 m		4	8	12	16	20	9.60
6.	LN 002 257	Longitudinal steel railing 2.57 m		8	12	16	20	24	4.70
7.	LN 001 257	Brace vertical to the bay 2.57 m		2	4	6	8	10	7.30
8.	LN 032 257	Wooden platform 2.57 m		4	6	8	10	12	20.90
9.	LN 264 257	Aluminum access platform with a ladder 2.57 m		1	2	3	4	5	25.40
10.	LN 005 073	Double side railing		---	4	8	12	16	3.00
11.	LN 004 073	Side curb 0.73 m		4	8	12	16	20	1.70
12.	LN 003 257	Longitudinal curb 2.57 m		2	4	6	8	10	5.90
13.	DL 010 001	Rotary joint		2	4	6	8	10	1.40
14.	LN 006 071	Aluminum end frame		4	4	4	4	4	6.90
Ballast (kg) when used			in an enclosed space	---	---	16	61	109	
			outdoors	---	90	212	358	---	
Total weight of the set (not including ballast) [kg]				340.30	512.70	685.10	857.50	1029.90	

Spacing of vertical frames 3.07 m									
No.	Cat. No.	Name of the component	Working height (m)	4.45	6.45	8.45	10.45	12.45	Weight of one component [kg]
			Scaffolding height (m)	3.45	5.45	7.45	9.45	11.45	
			Height of the last working platform (m)	2.45	4.45	6.45	8.45	10.45	
1.	LN 011 002	Travel beam		2	2	2	2	2	22.50
2.	DL 011 001	Roller with brake		4	4	4	4	4	5.70
3.	LN 011 006	Horizontal brace 3.07 m		2	2	2	2	2	7.80
4.	LN 011 005	Horizontal brace oblique to the bay 3.07 m		1	1	1	1	1	10.00
5.	LN 073 201	Aluminum frame 2.0 x 0.73 m		4	8	12	16	20	9.60
6.	LN 002 307	Longitudinal handrail 3.07 m		8	12	16	20	24	5.30
7.	LN 001 307	Brace vertical to the bay 3.07 m		2	4	6	8	10	8.60
8.	LN 032 307	Wooden platform 3.07 m		4	6	8	10	12	23.40
9.	LN 264 307	Aluminum access platform with a ladder 3.07 m		1	2	3	4	5	30.50
10.	LN 005 073	Double side railing		---	4	8	12	16	3.00
11.	LN 004 073	Side curb 0.7 m		2	4	6	8	10	1.70
12.	LN 003 307	Longitudinal curb 3.07 m		2	4	6	8	10	7.80
13.	DL 010 001	Rotary joint		2	4	6	8	10	1.40
14.	LN 006 071	Aluminum end frame		4	4	4	4	4	6.90
Ballast (kg) when used			in an enclosed space	---	---	16	61	109	
			outdoors	---	90	212	358	---	
Total weight of the set (not including ballast) [kg]				364.90	552.80	740.70	928.60	1116.50	

Table 4. List of components of an exemplary DELTA 73 double mobile scaffolding.

Note:
The above list is an example list, any configuration of components is possible, e.g. steel or aluminum frames, steel, wooden or aluminum platforms with different working widths of 0.32 m or 0.63 m are available.

9 STAIRCASES OF THE DELTA 73 SYSTEM

9.1 WIDE EXTENSION DECK

The DELTA 73 system also offers staircases. enabling safe communication through the scaffolding. This is a solution where traditional access platforms with ladders are not used or are inconvenient to transport materials. Staircases are available in two VARIANTS: single-flight or double-flight. The width of the standard stairs is 0.63 m, while the bay length on which the stairs are installed is optionally 2.57 m and 3.07 m. tubes with a diameter of 48.3 x 2.8 mm and fixed joints at least every 4 m vertically, respecting the principle of anchoring the wall scaffolding nodes in the places where the staircase frames are joined with the façade scaffolding. The staircase must be equipped with external, internal and front railings.

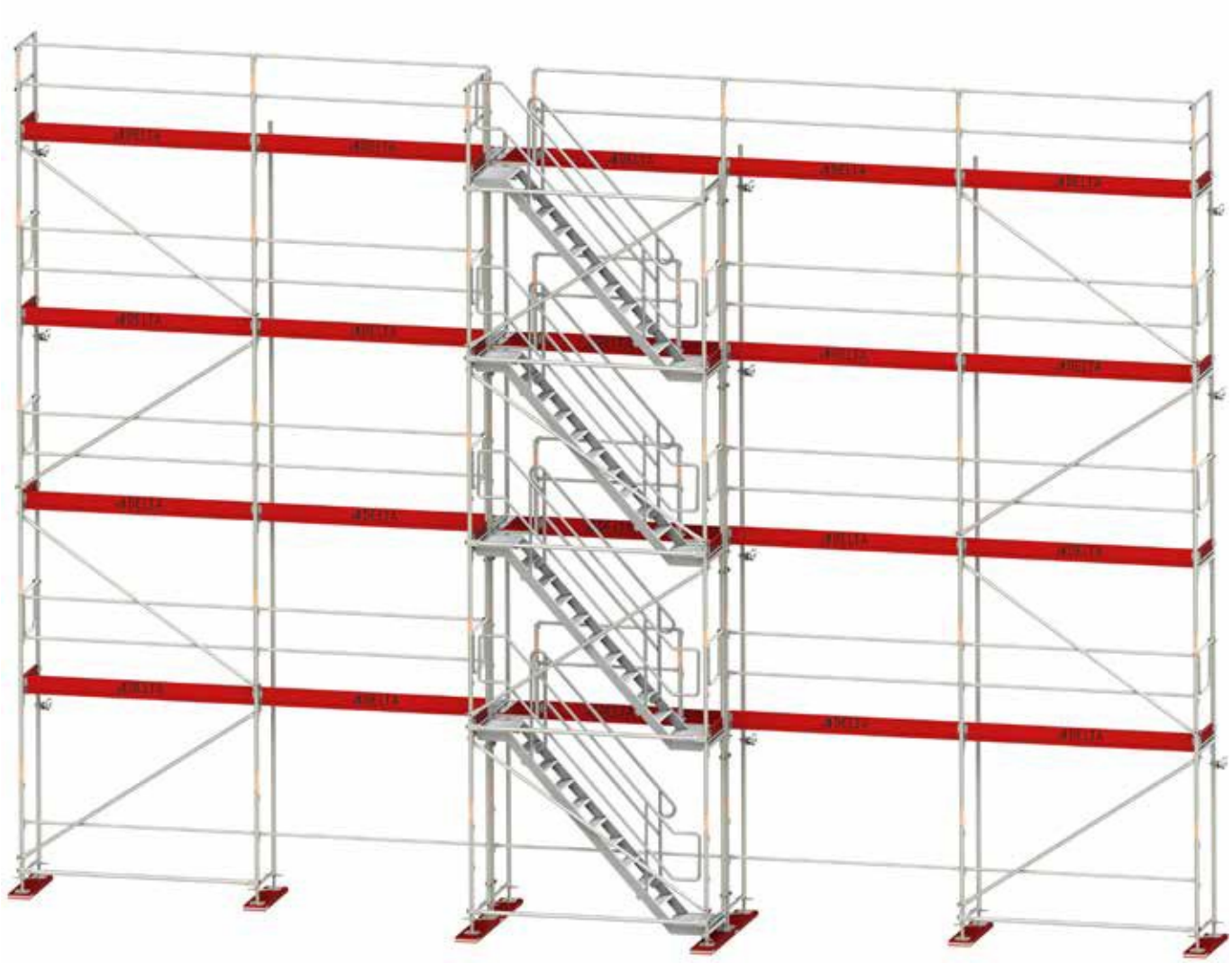


Fig. 38. Single-flight staircase at the facade scaffolding.

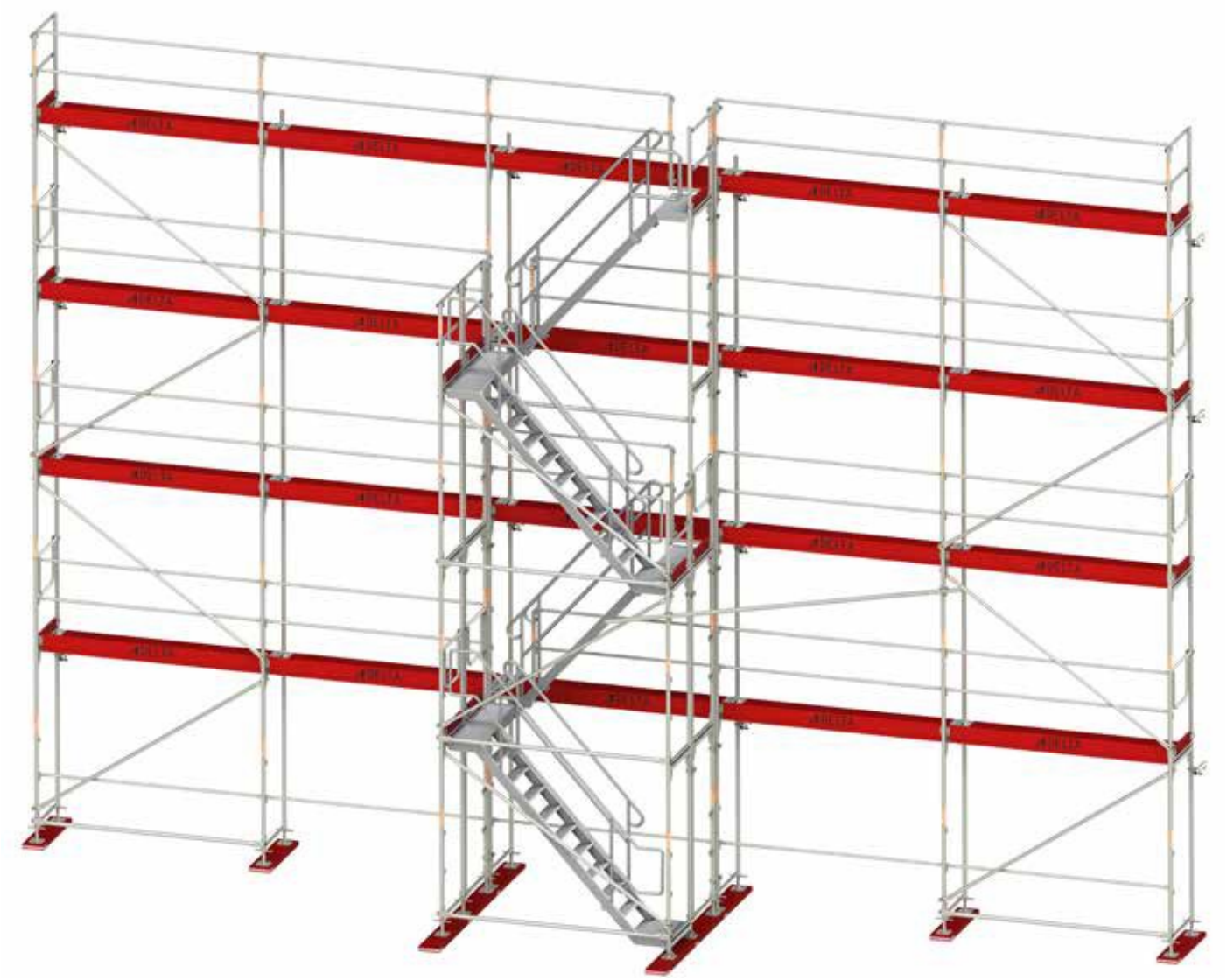


Fig. 39. Double-flight staircase next to the façade scaffolding.

9.2 INDIVIDUAL STAIRCASES

The individual staircase is shown in Fig. 47, it is an example of a double-flight staircase. Its assembly begins with placing six screw footings on the sleepers, then a starting beam should be mounted on two of them, which will be used to attach the first flight of stairs. We put frames on the so prepared supports, then we put a flight of stairs, diagonal brace and horizontal brace on the frame and the starting beam. To the first bay prepared in this way, screw the swivel joints to the frames, which will be used for the assembly of frames on which the second flight of stairs will rest (a mirror image of the first frames). The assembled frames are then fastened with diagonal and horizontal bracing. The stair flight should be secured with internal handrails and external handrails, which are slid over the stair flight profile and secured by twisting the fastening with a screw. Remember to install a horizontal brace on each frame near the node. The assembly of each subsequent storey is carried out in the same way, while the assembly of the last storey is carried out by placing platforms on two frames and securing them against lifting with an end frame, which should be slid over the frame's side. On the side of the stair flight, install an end railing in order to protect the space at the platforms. One should also remember to fix the frames with connectors at each level of the staircase.

Fig. 40. Installation of the staircase, stage I.

Fig. 41. Installation of the staircase, stage II.

Fig. 42. Installation of the staircase, stage III..

Fig. 43. Installation of the staircase, stage IV.

In order to facilitate the assembly of the stair flight and scaffolding frames, vertical sliding bolts should be mounted on the frames, on which wooden or steel platforms are then mounted, on which the fitter will rest during the assembly of the frames and the stair flight. The solution in question is presented in Fig. 44.

After the assembly works are completed, the temporary platform with transoms should be dismantled.

Fig. 44. Installation of the staircase, stage V.

Fig. 45. Installation of the staircase, stage VI.

Fig. 46. Installation of the staircase, stage VII.

Fig. 47. Complete staircase.

Spacing of vertical frames 2.57 m												
No.	Cat. No.	Name of the component	Working height (m)	4.2	6.2	8.2	10.2	12.2	14.2	16.2	18.2	Weight of one component [kg]
			Scaffolding height(m)	3.2	5.2	7.2	9.2	11.2	13.2	15.2	17.2	
			Height of the last flight of stairs (m)	2.2	4.2	6.2	8.2	10.2	12.2	14.2	16.2	
1.	LN 364 257	Aluminum staircase 2.57 m		1	2	3	4	5	6	7	8	21.55
2.	DL 365 252	External steel railing for stairs 2.57 m		1	2	3	4	5	6	7	8	16.80
3.	DL 366 300	Internal steel handrail for stairs		1	2	3	4	5	6	7	8	12.70
4.	DL 365 100	End railing of the stairway		1	1	1	1	1	1	1	1	17.85
5.	LN 000 073	Starting beam 0.73 m		1	1	1	1	1	1	1	1	3.00
6.	DL 038 060	Screw stand 0.6 m		6	6	6	6	6	6	6	6	3.30
7.	DL P00 100	Wooden shackled sleeper 1.0 m		4	4	4	4	4	4	4	4	5.75
8.	LN 073 200	Steel vertical frame 2.0 x 0.73 m		4	8	12	16	20	24	28	32	18.50
9.	LN 101 257	Horizontal brace 2.57 m		4	6	8	10	12	14	16	18	9.30
10.	LN 001 257	Brace vertical to the bay 2.57 m		2	4	6	8	10	12	14	16	7.30
11.	LN 032 257	Wooden platform 2.57 m		2	2	2	2	2	2	2	2	20.90
12.	LN 005 073	Double side railing 0.73 m		---	2	4	6	8	10	12	14	3.00
13.	LN 006 073	Upper edge frame made of steel		3	3	3	3	3	3	3	3	9.00
14.	LN 004 073	Side curb 0.73 m		3	5	7	9	11	13	15	17	1.70
15.	DL 010 110	Scaffold holder 1.10 m		---	2	4	6	8	10	12	14	3.70
16.	DL 010 000	Fixed joint		---	4	8	12	16	20	24	28	1.20
17.	DL 010 230	Ear pin		---	2	4	6	8	10	12	14	0.26
18.	DL 010 071	Expansion plug		---	2	4	6	8	10	12	14	0.01
19.	DL 010 001	Rotary joint		4	6	8	10	12	14	16	18	1.40
Total weight of the set [kg]				320.25	503.67	687.09	870.52	1053.94	1237.36	1420.78	1604.20	

Table 5. List of components of an exemplary DELTA 73 double-flight staircase.

Note:
The above list is an example list, any configuration of components is possible, e.g. steel or aluminum frames, steel, wooden or aluminum platforms with different working widths of 0.32 m or 0.63 m are available.

Spacing of vertical frames 3.07 m												
No.	Cat. No.	Name of the component	Working height (m)	4.2	6.2	8.2	10.2	12.2	14.2	16.2	18.2	Weight of one component [kg]
			Scaffolding height(m)	3.2	5.2	7.2	9.2	11.2	13.2	15.2	17.2	
			Height of the last flight of stairs (m)	2.2	4.2	6.2	8.2	10.2	12.2	14.2	16.2	
1.	LN 364 307	Aluminum staircase 3.07 m		1	2	3	4	5	6	7	8	26.20
2.	DL 365 302	External steel railing for stairs 3.07 m		1	2	3	4	5	6	7	8	17.90
3.	DL 366 300	Internal steel handrail for stairs		1	2	3	4	5	6	7	8	12.70
4.	DL 365 100	End railing of the stairway		1	1	1	1	1	1	1	1	17.85
5.	LN 000 073	Starting beam 0.73 m		1	1	1	1	1	1	1	1	3.00
6.	DL 038 060	Screw stand 0.6 m		6	6	6	6	6	6	6	6	3.30
7.	DL P00 100	Wooden shackled sleeper 1.0 m		4	4	4	4	4	4	4	4	5.75
8.	LN 073 200	Steel vertical frame 2.0 x 0.73 m		4	8	12	16	20	24	28	32	18.50
9.	LN 101 307	Horizontal brace 3.07 m		4	6	8	10	12	14	16	18	10.00
10.	LN 001 307	Brace vertical to the bay 3.07 m		2	4	6	8	10	12	14	16	7.80
11.	LN 032 307	Wooden platform 3.07 m		2	2	2	2	2	2	2	2	23.40
12.	LN 005 073	Double side railing 0.73 m		---	2	4	6	8	10	12	14	3.00
13.	LN 006 073	Upper edge frame made of steel		3	3	3	3	3	3	3	3	9.00
14.	LN 004 073	Side curb 0.73 m		3	5	7	9	11	13	15	17	1.70
15.	DL 010 110	Scaffold holder 1.10 m		---	2	4	6	8	10	12	14	3.70
16.	DL 010 000	Fixed joint		---	4	8	12	16	20	24	28	1.20
17.	DL 010 230	Ear pin		---	2	4	6	8	10	12	14	0.26
18.	DL 010 071	Expansion plug		---	2	4	6	8	10	12	14	0.01
19.	DL 010 001	Rotary joint		4	6	8	10	12	14	16	18	1.40
Total weight of the set [kg]				334.55	525.87	717.19	908.52	1099.84	1291.16	1482.48	1673.80	

Table 5a. List of components of an exemplary DELTA 73 double-flight staircase.

Note:
The above list is an example list, any configuration of components is possible, e.g. steel or aluminum frames, steel, wooden or aluminum platforms with different working widths of 0.32 m or 0.63 m are available.

10 TEMPORARY ROOFING DELTA ROOF

Temporary roofs are solutions that can be used wherever a large-area structure is required, to be installed in the shortest possible time.

The biggest advantages of such canopies are:

- simplicity of execution,
- easy assembly and disassembly,
- no permanent connection to the ground,
- no special building permits,
- light structure,
- wide range of module lengths,
- manual assembly possible,
- easy and quick possibility of moving the roof (mobile roof)

Our roofing constructions are perfect for works carried out, for example, during replacement, repairs, renovation of roofs and during the construction of viaducts, where the atmospheric influence is of great importance on the protected object. In addition, they are also used as temporary halls, warehouses, etc.

10.1 ASSEMBLY OF AN EXEMPLARY DELTA ROOF

10.1.1 The assembly should begin with placing individual girders and drips on an even surface, paying attention that the handles with a self-locking latch point upwards (towards the top connector). Then, the whole thing should be connected using M12 x 30 bolts and connectors of aluminum roof girders and M12 x 30 bolts.

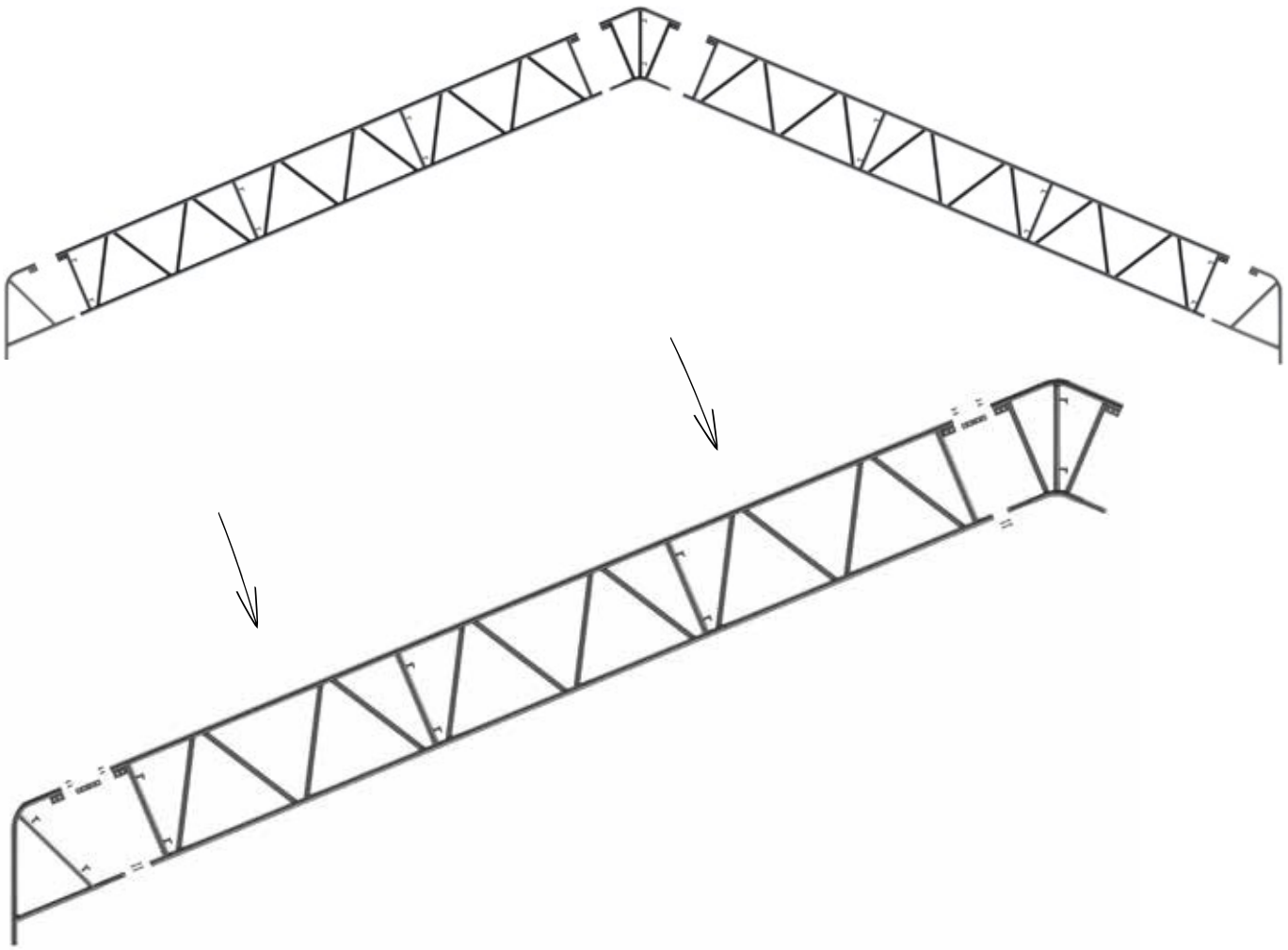


Fig. 48/49. Arrangement of the components of the roof span.

10.1.2 The drip can be connected to the girder using two M12 x 70 bolts and four M12 x 35 bolts with an aluminum connector of the roof girders

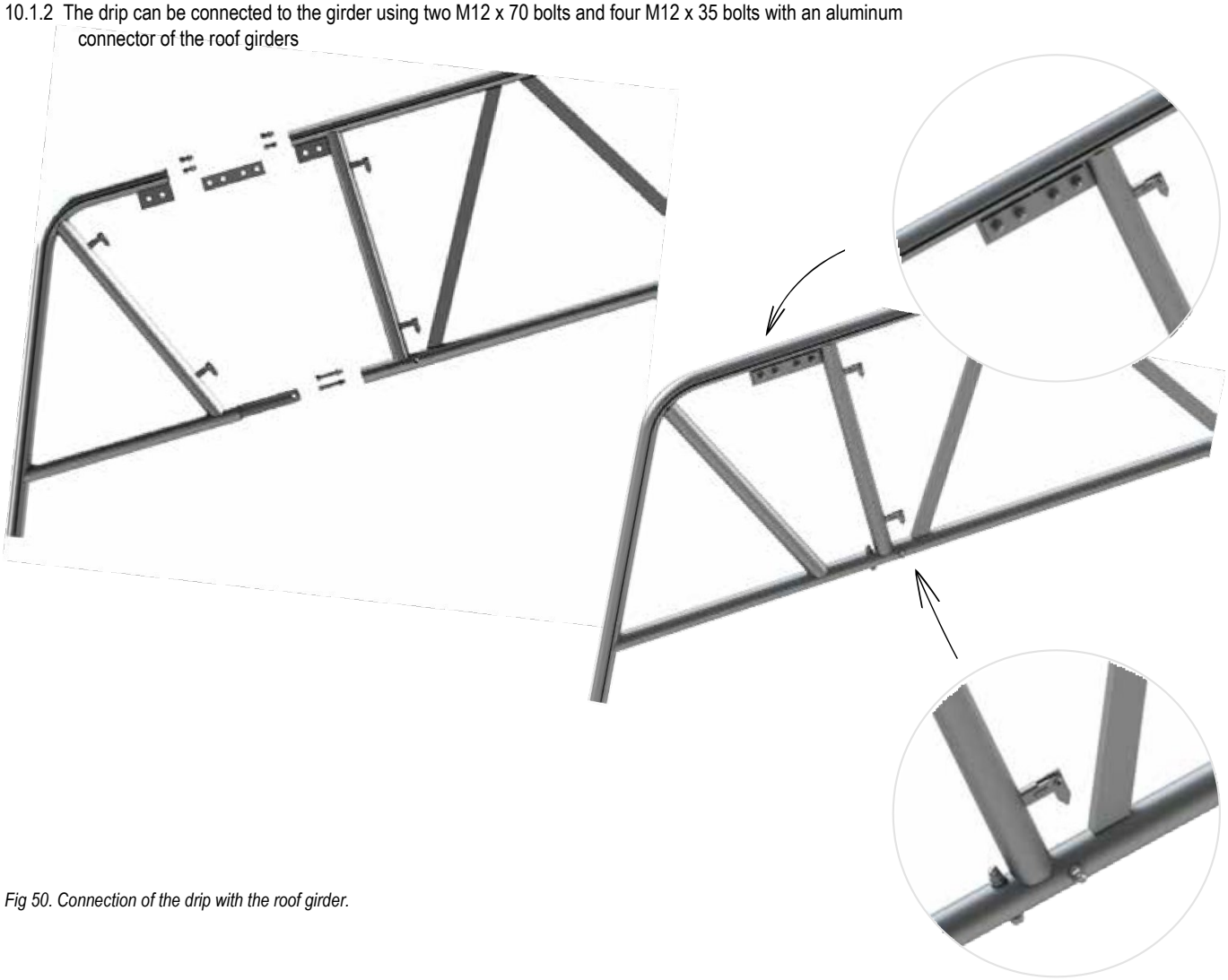


Fig 50. Connection of the drip with the roof girder.

10.1.3 The girders are connected with the aluminum roof lattice connector by means of four M12 x 35 bolts and the roof girder connector in the upper flange. The lower belt, on the other hand, is connected with two M12 x 70 bolts.

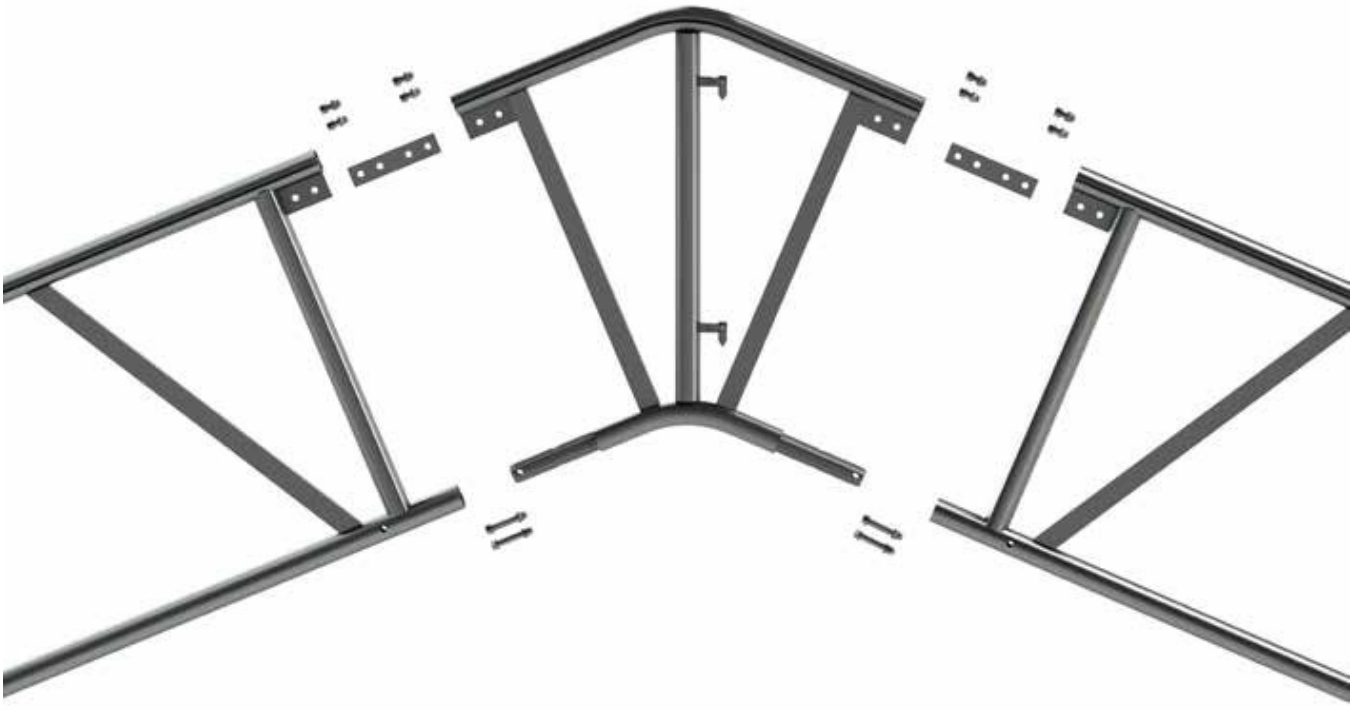


Fig. 51. Connection of the roof connector with the roof girder.

10.1.4 The girders are connected with successive girders in order to increase the roof width by means of four M12 x 35 bolts and a roof girder connector in the upper flange. The lower belt, on the other hand, is connected by means of a reinforced girder connector and four M12 x 70 bolts or four pins with a cotter pin.

Fig. 52. Connection of two adjacent roof girders

10.1.5 The next step is to fix the girder with tongs to strengthen the roof.
This is mainly used for wide spans of roofs.

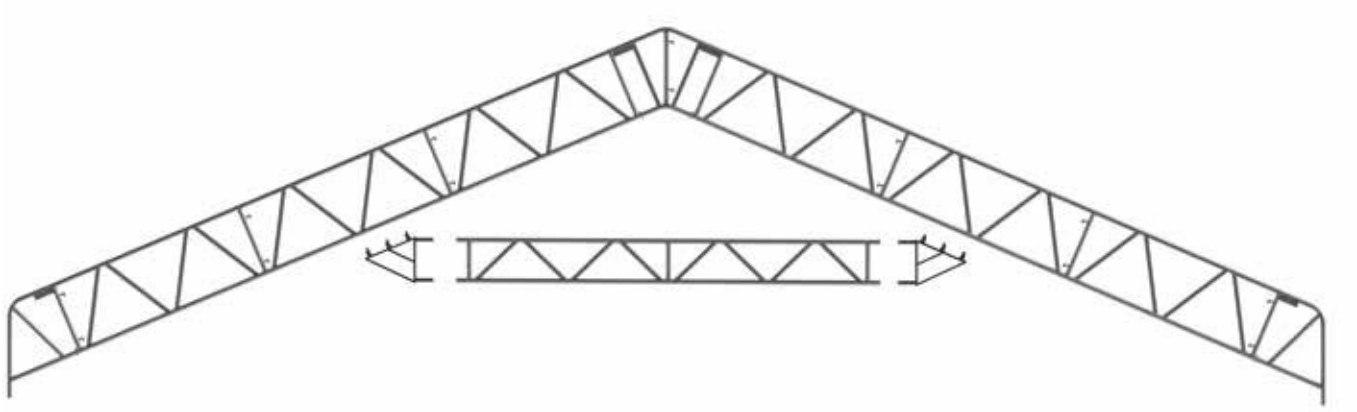


Fig. 53. Arrangement of roof collar components.

10.1.6 The clamp connector is connected to the roof lattice girder by screwing it with three half-connectors. It may happen that one of the half-couplings falls on the spar crossbar, therefore it is necessary that the other two are attached to the girder's lower flange. On the other hand, the other side of the connector is inserted into the lattice girder and fixed with four M12 x 70 bolts or four pins with cotter pins.

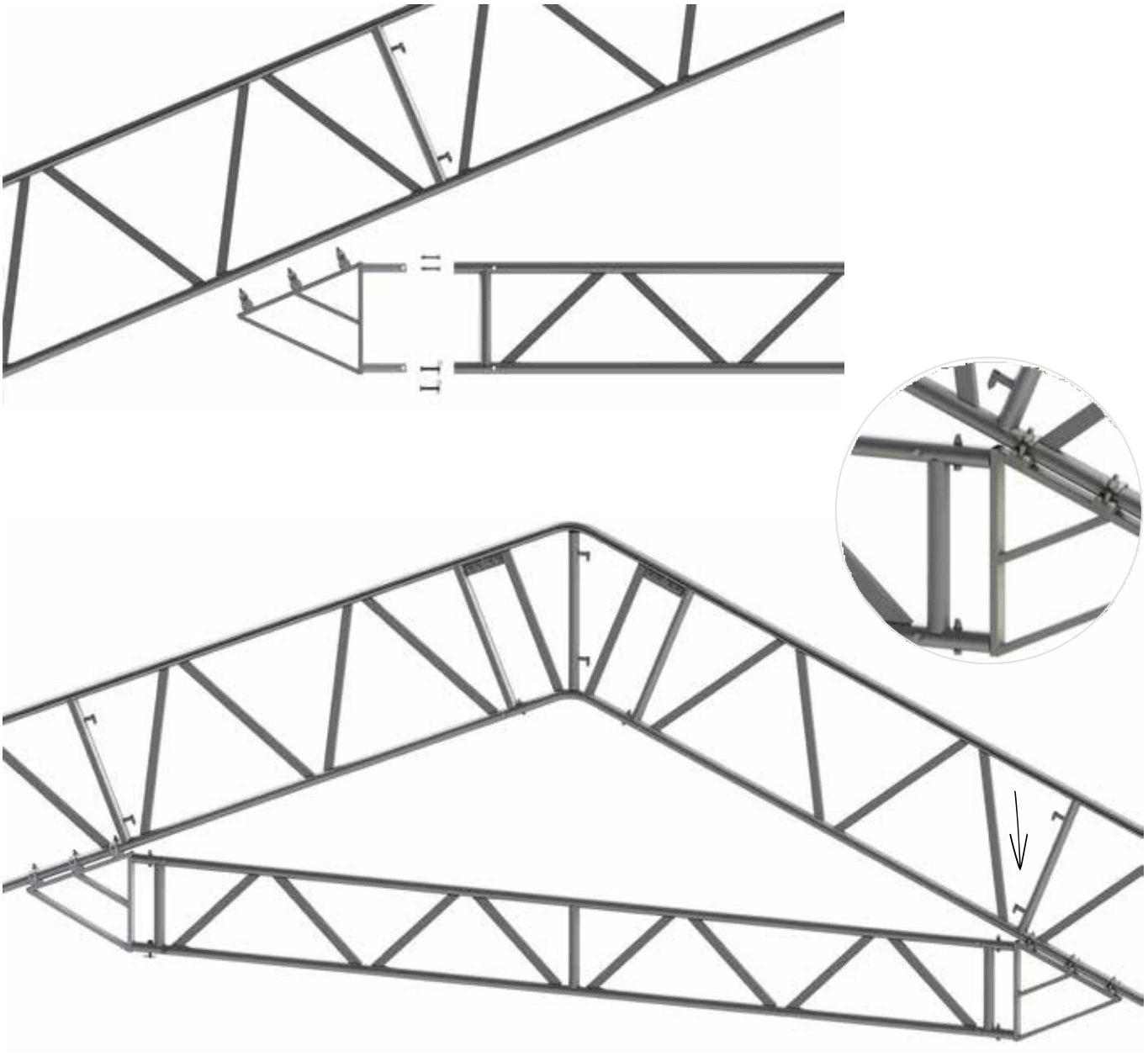


Fig. 54. Connection of clamp connectors with 0.40 m girders to the roof span.

10.1.7 Depending on whether we have a crane, a construction crane or not, we have two options for mounting the roof on the scaffolding. The first is manual assembly, where the first step is to install the steel roof frame connectors on the scaffolding supporting the roof, and then place the entire span on the frame connectors and tighten the whole with welded joints in the connector. The frame connector should be secured against lifting from the frame by means of a securing pin or M12 x 70 screws.

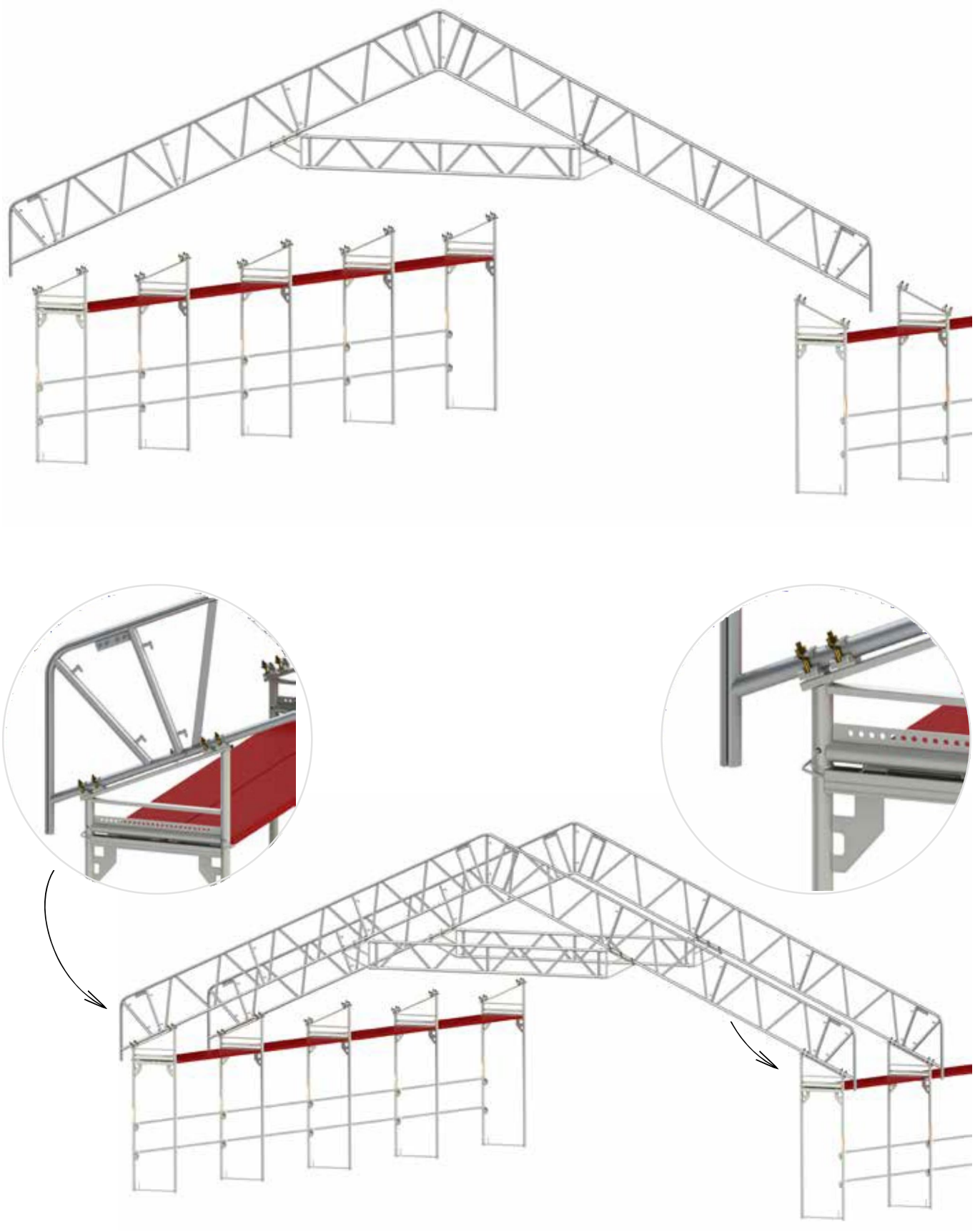


Fig. 55. Connection of the first roof span with the scaffolding.

10.1.8 After the assembly of two adjacent spans, the whole is to be secured, giving initial stiffness by installing roof rails. The handrails are mounted by putting their ends on the pins with a self-locking latch. Make sure that the pins with the cotter pins are always directed towards the top of the roof in order to avoid the handrail slipping.

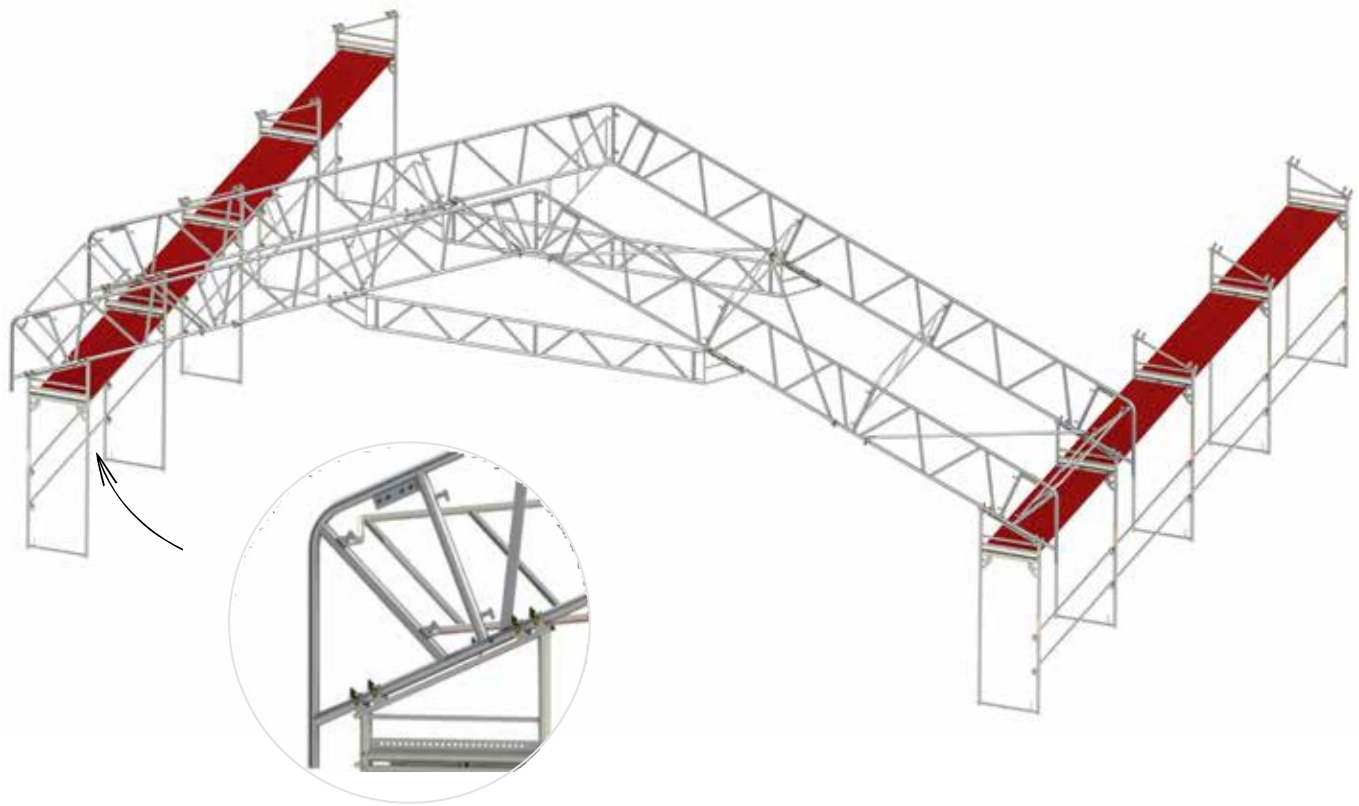


Fig. 56. Installation of handrails in the first base bay of the roof slope.

10.1.9 Next, the first bay is to be secured with braces, which are tightened to the lower flange of the girder by means of joints fixed at the ends of the brace. One bracing is for approximately two meters of the girder length. For example, in the case of a roof slope with a length of approx. 12 m, 6 bracings should be used. We use the bracing of the roof slopes at most every 4th roof bay. It is allowed to use alternatively vertical braces, which are attached to the railing joints by sliding both ends of the braces onto the pins with the self-locking cotter pin.
The joint, on the other hand, is attached to the lower flange of the girders or to the crossbar.

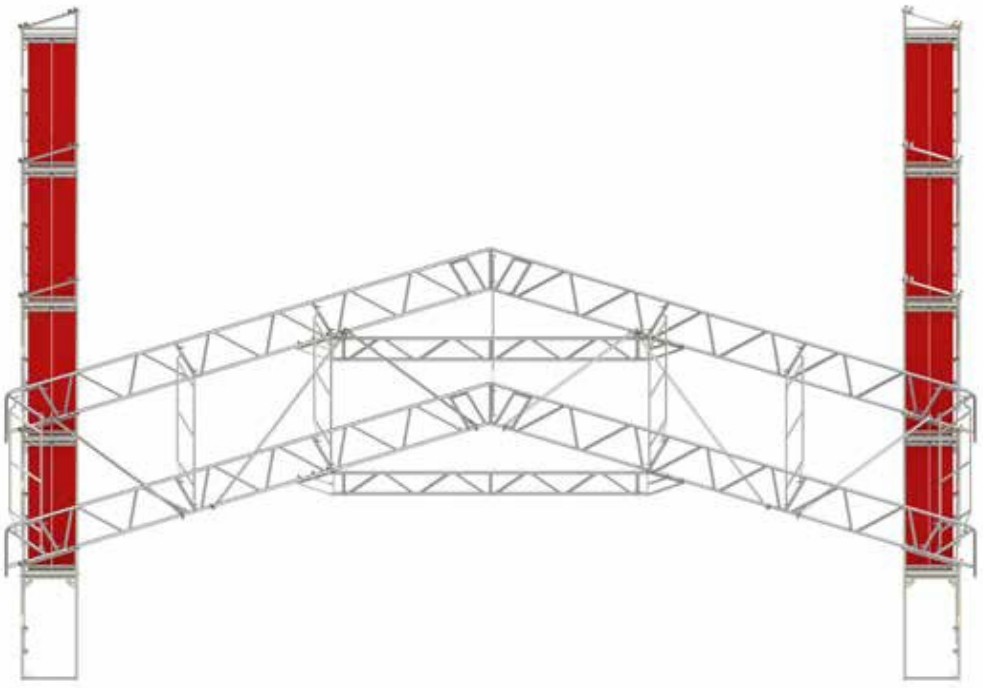


Fig. 57. Installation of braces in the first base bay.

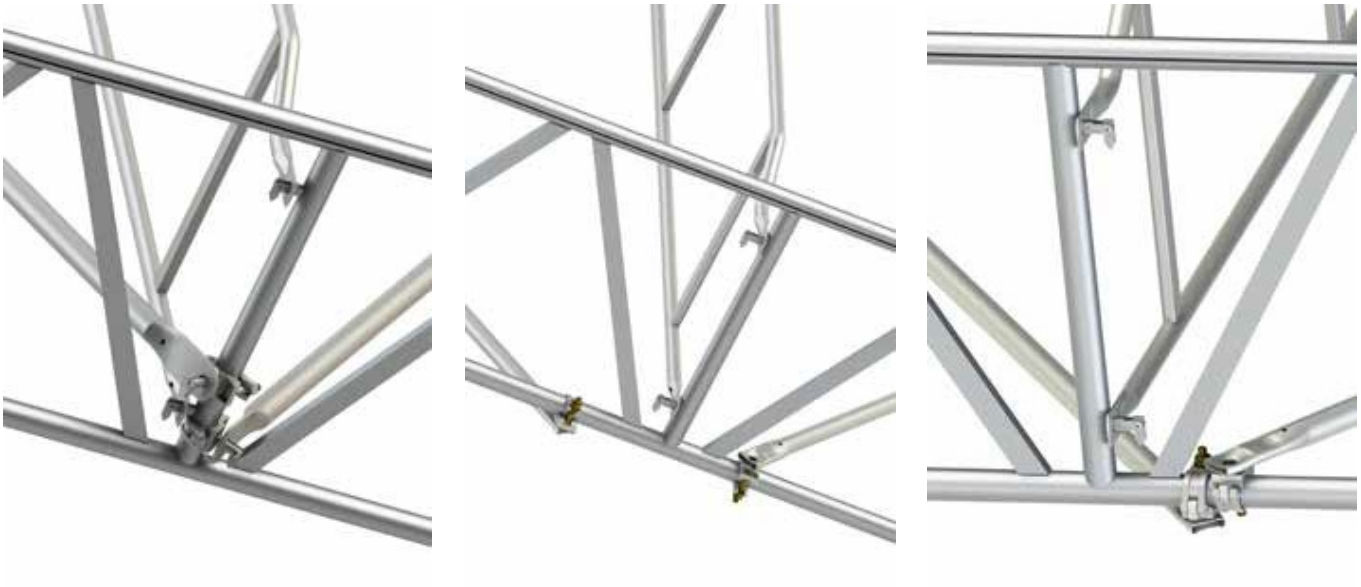


Fig. 58. Detail of roof bracing attachment.

10.1.10 After the base area of the roof structure prepared in this way, we can expand the structure until the desired size of the roof is obtained by repeating the steps as above. In order to facilitate the assembly of the first base bay, it is recommended to use mobile scaffolding or scaffolding platforms (towers) located under the roof slopes, if access from the ground level or the roof of the building above which the structure is located is difficult.

ASSEMBLY OF THE ROOF STRUCTURE USING A CRANE

10.1.11 In case of access to a crane or a hoist, the base span is installed entirely at ground level. As the first step, the components should be placed on the ground in the right order, as in the case of manual assembly, then the whole should be screwed, then the second roof span is screwed. Both spans assembled in this way are connected with each other by means of handrails and roof braces. The ready-made roof base bay should be fitted with slings from the crane grip, then the whole should be lifted above the scaffolding structure on which the roof structure will be based, and then lowered onto the frame connectors and connected by fixing them in the frame connector half-connectors.

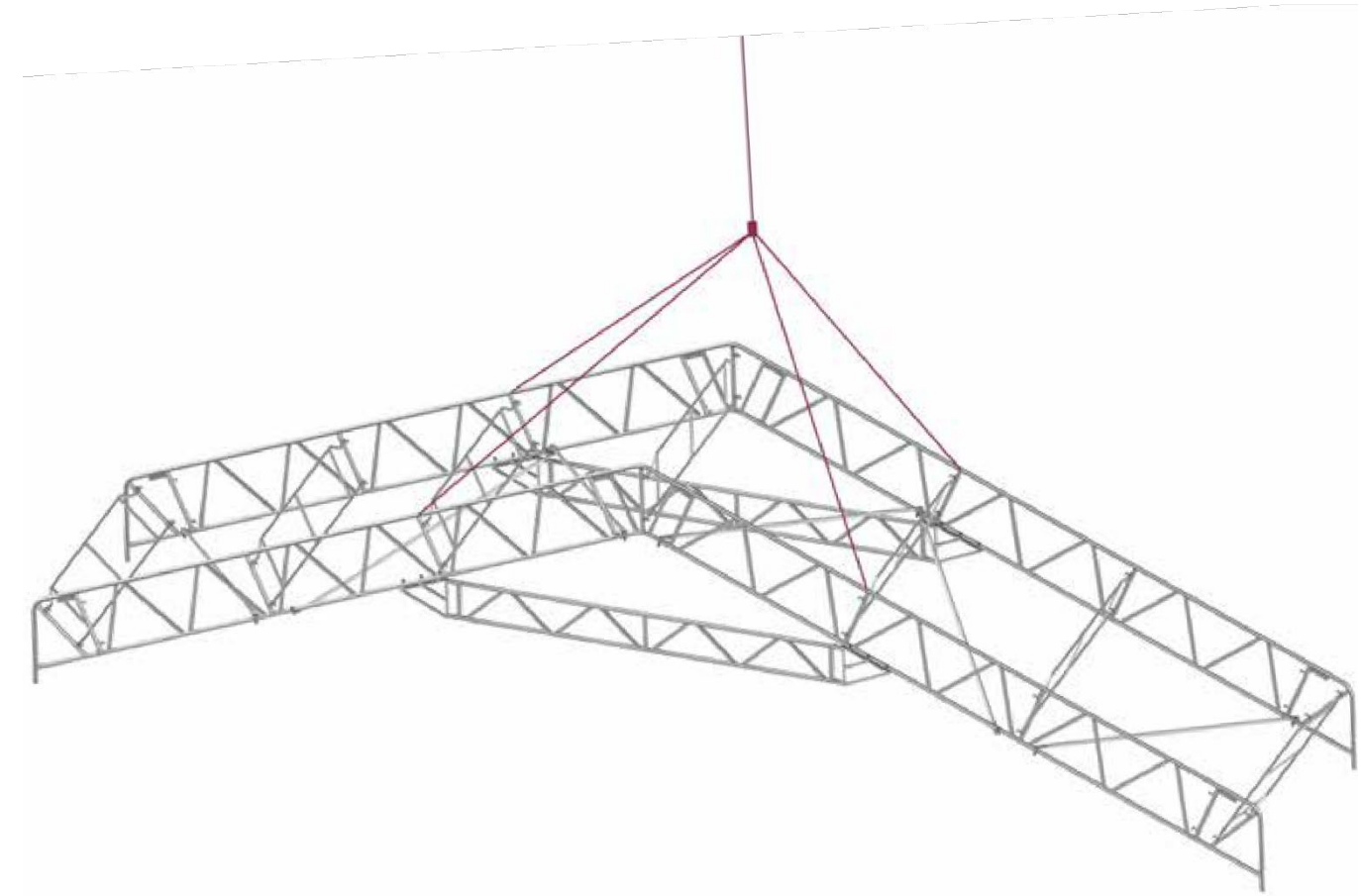


Fig. 59. Base bay prepared for transport by a crane.

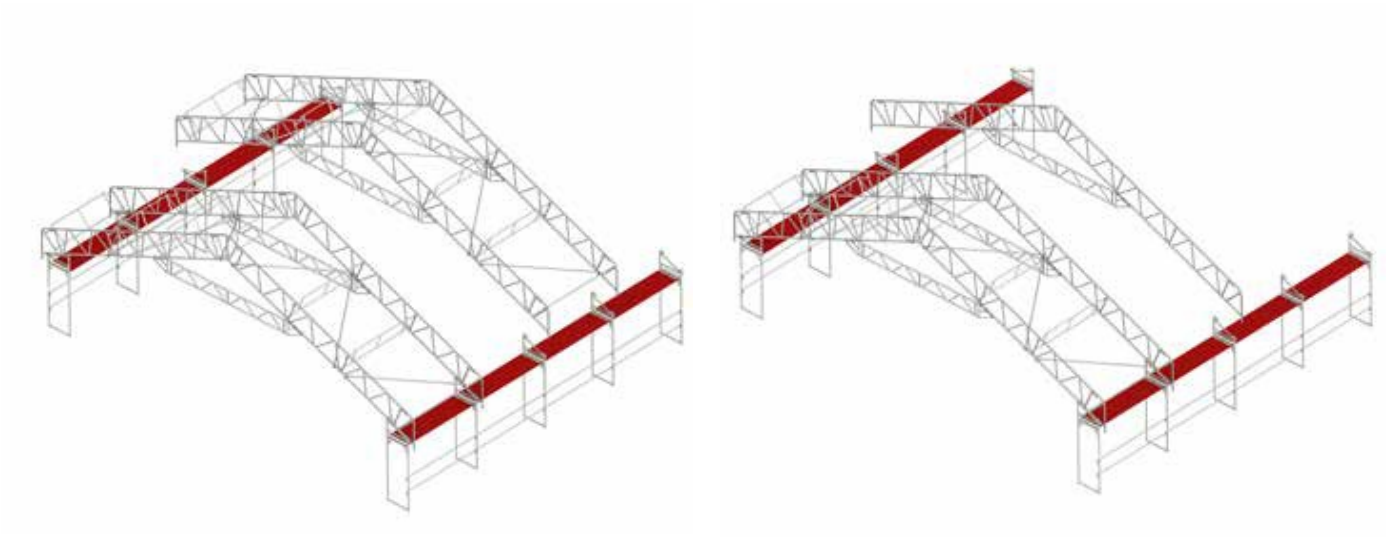


Fig. 60. Methods of transport and assembly of successive bays of the roof structure.

10.1.12 After the roof spans or entire bays have been moved by crane, the spaces between them should be filled with handrails, and the handrails should be installed as in the above points, while observing the safety rules. Depending on the length of the roof, repeat these steps until the construction is complete. The assembled roof is prepared for pulling the tarpaulins.

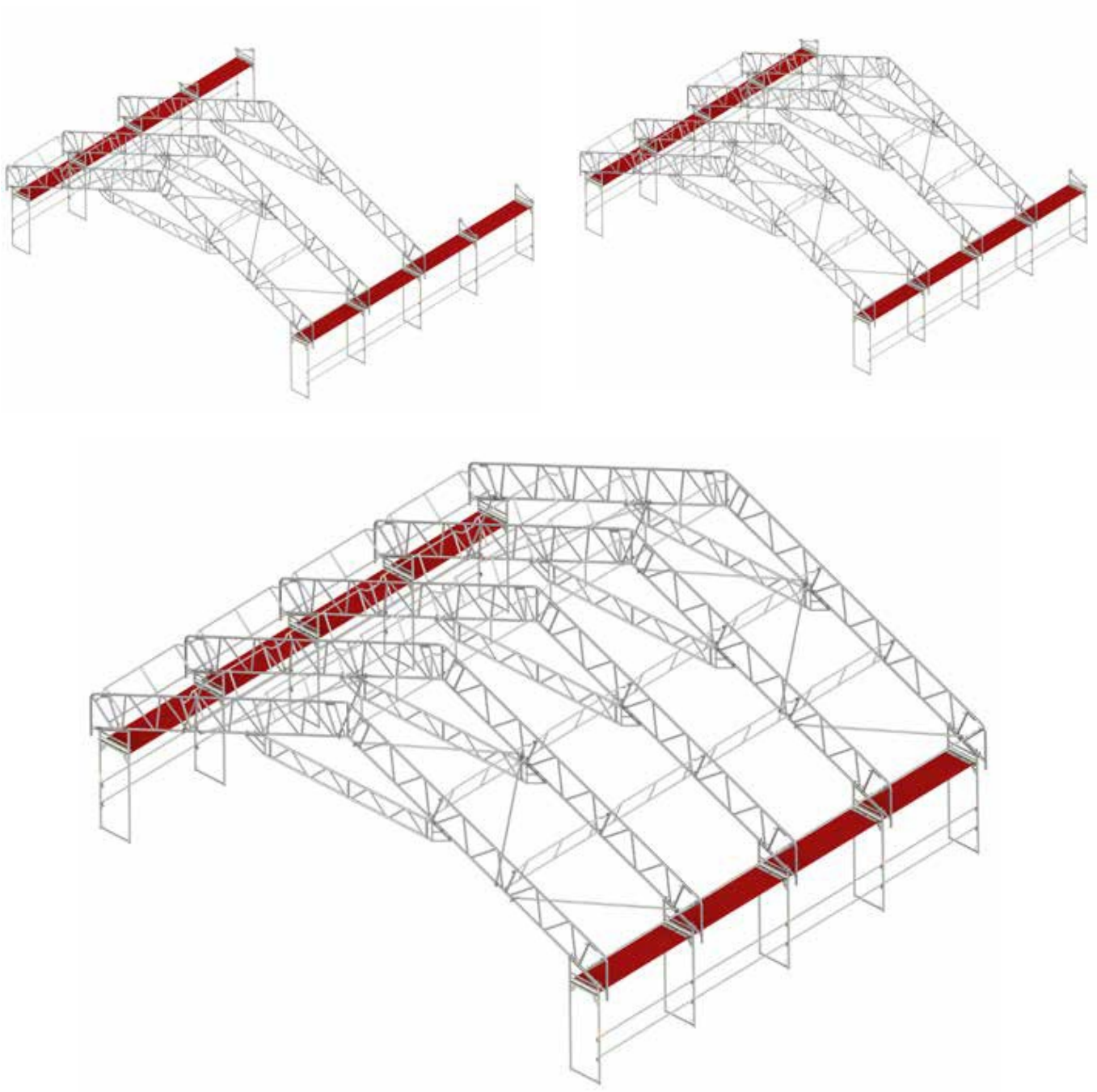
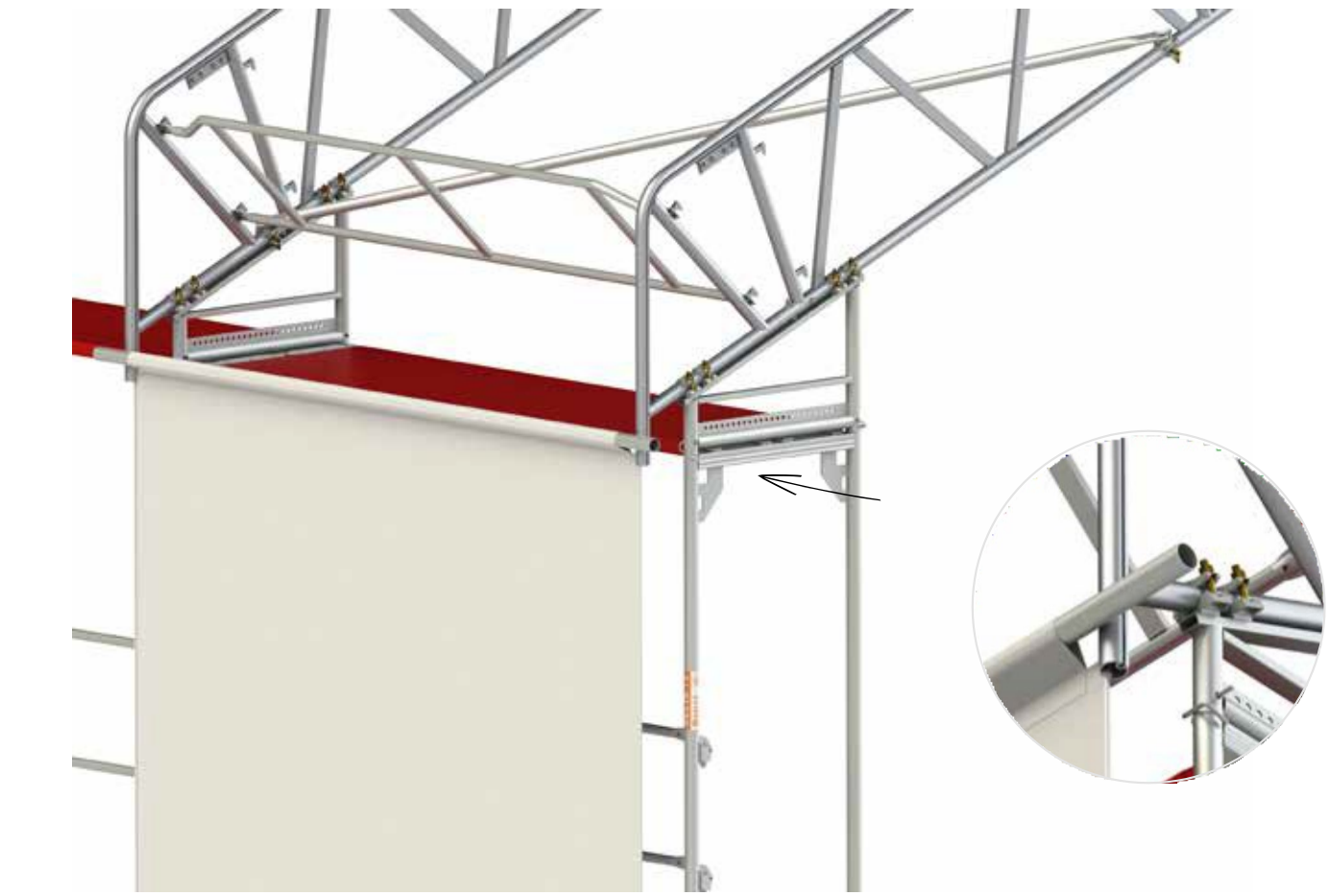


Fig. 61. Exemplary stages of roof assembly with the use of a crane.

10.1.13 After the structure is assembled, the tarpaulin should be pulled onto individual scaffold bays. The tarpaulin is inserted into the profiles in the girders using a keder system. It is inserted using the pocket at the ends of the tarpaulins, into which the pipe is inserted and with its help stretches the tarpaulin in a given slope - roof bays.



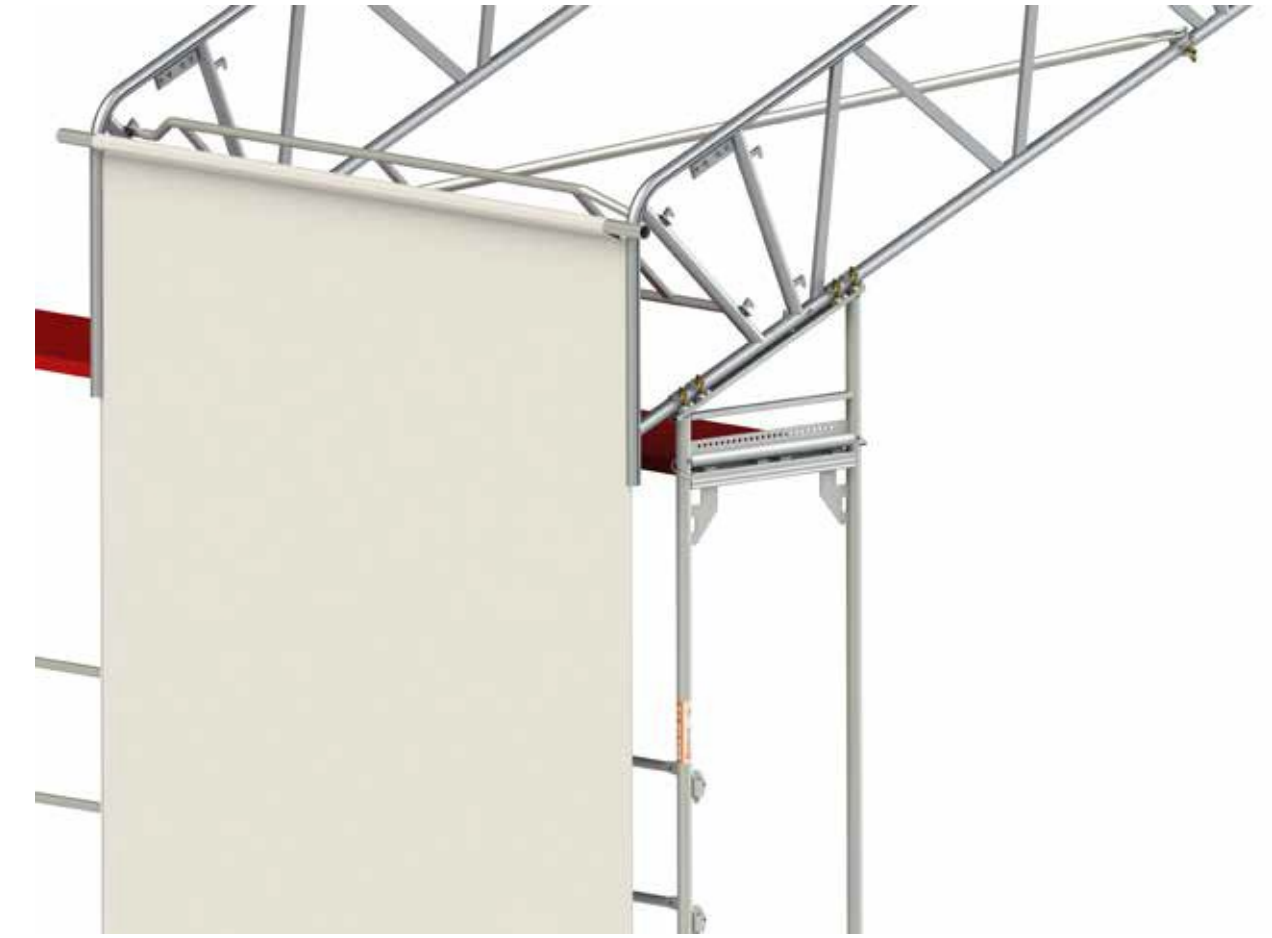


Fig. 62. Installation of tarpaulins in special DELTA ROOF system roof profiles.

10.1.14 After the tarpaulin is initially pulled in and stretched, the longitudinal railing should be inserted into the pockets at both ends and one of them should be attached to the railing joints, which in turn should be screwed to the drip. Instead, the other end with the handrail should be stretched until the desired rigidity of the tarpaulin is obtained, then the handrail should be placed on the pins with self-locking latches of the handrail joint, which must also be screwed to the drip. We repeat these activities until the tarpaulins are stretched in all bays. Instead of a handrail, a pipe with a diameter of 48.3 mm and fixed joints can be used interchangeably.

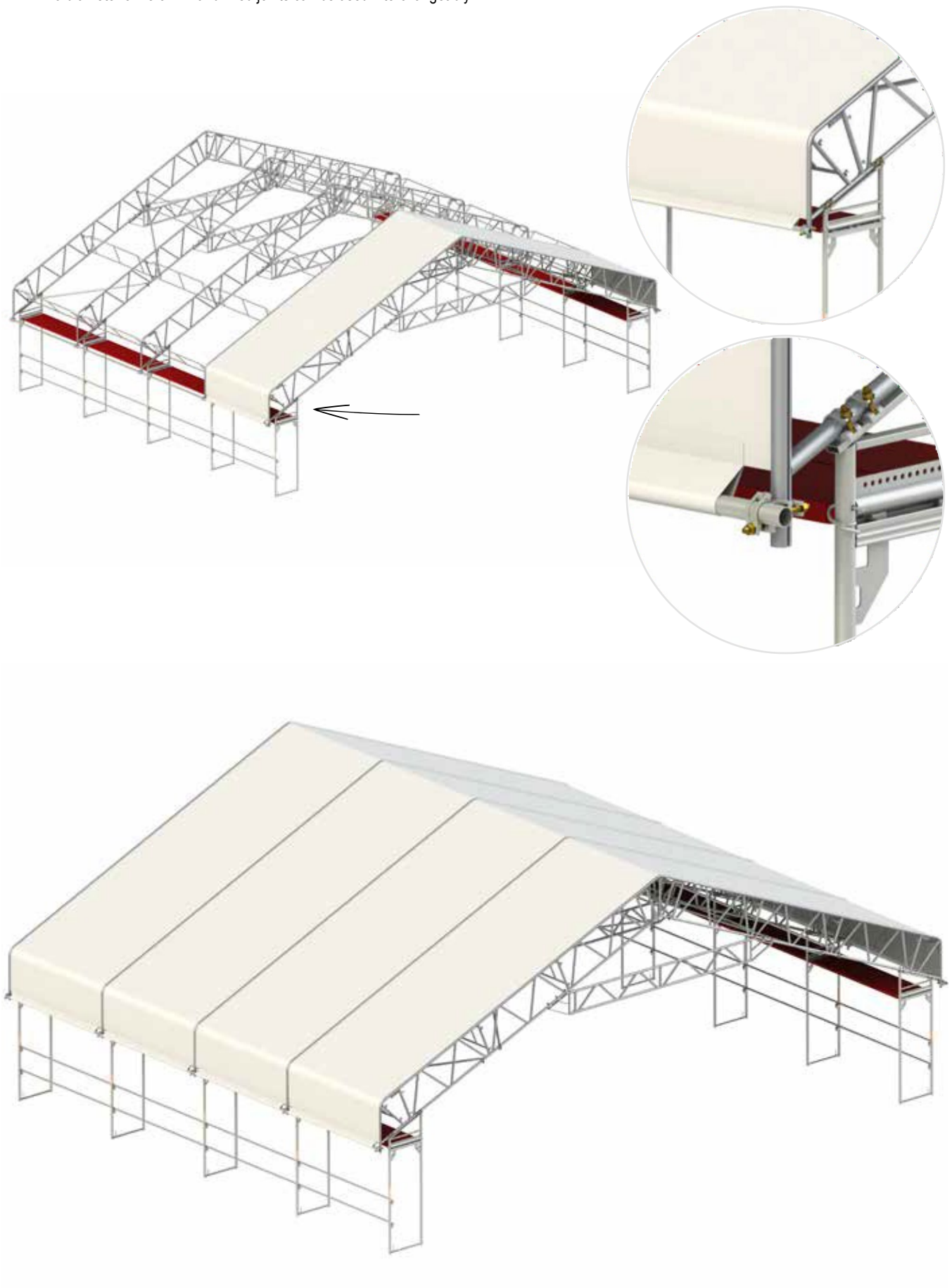


Fig. 63. Mounting and tensioning of DELTA ROOF tarpaulins.

10.1.15 The DELTA ROOF system also offers mobile roofs, they are used, for example, where the works carried out under the roof will be on a long distance, where there is no time to unfold the roof and its re-folding each time the work moves to the next section, e.g. works carried out on the railway traction, bridges. The system is equipped with special trolleys guided on a triangular girder based on a scaffolding. The trolleys are equipped with a number of rollers to facilitate the movement of the roof, as well as security preventing the roof from lifting, e.g. caused by strong wind.

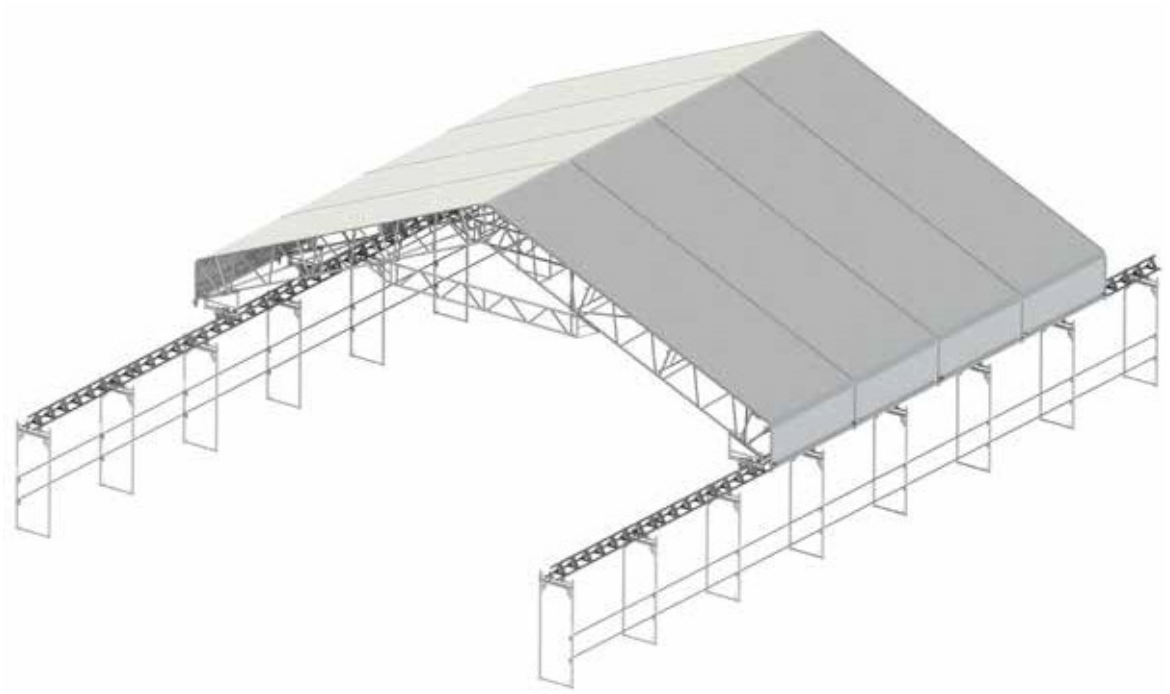


Fig. 64. Mobile structure of the roof of the DELTA ROOF system.

10.1.16 The assembly is carried out by putting a rail connector with a frame on frame nipples, which should then be secured by installing securing cotter pins in the holes. Then, with the help of permanent joints, screw the roof-guiding girders as shown in the drawing below. These girders should be joined together along their length using M12 x 70 mm bolts.

Fig. 65. Mounting the roof guide rail and the rail connector with the frame.

10.1.17 The next step is to mount the trolleys to the frame connector, which is done by putting the connector on the rollers in the trolley and then piercing the holes in the trolley and the connector with pins with cotter pins. The position of the roof relative to the cart can be adjusted by using a series of holes in the frame connector. When moving the roof transversely against the scaffolding, remember to insert the pin with the cotter pin into the highest hole of the trolley, and only then release the pins connecting the trolley with the connector.

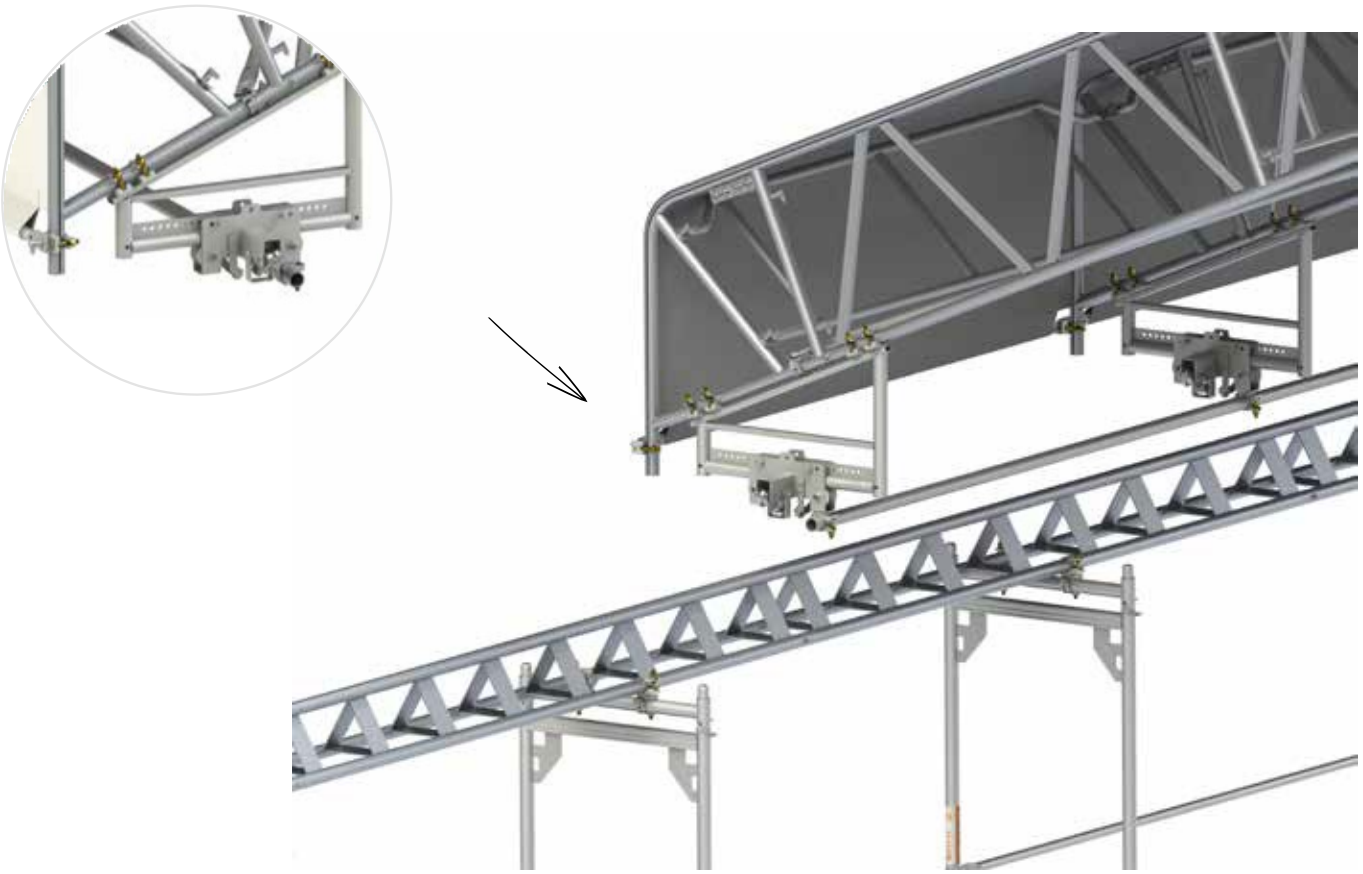


Fig. 66. Assembly of the travel trolley of the DELTA ROOF system.

10.1.18 Next, put the trolley on the guiding girder with the entire base bay assembled, the trolleys are equipped with locks with rollers preventing the roof from lifting when the trolley is placed on the girder, tighten the clamping screws so that the rollers press against the upper girder flange, and then you still need to install the lock by threading it with a pin with a cotter pin.

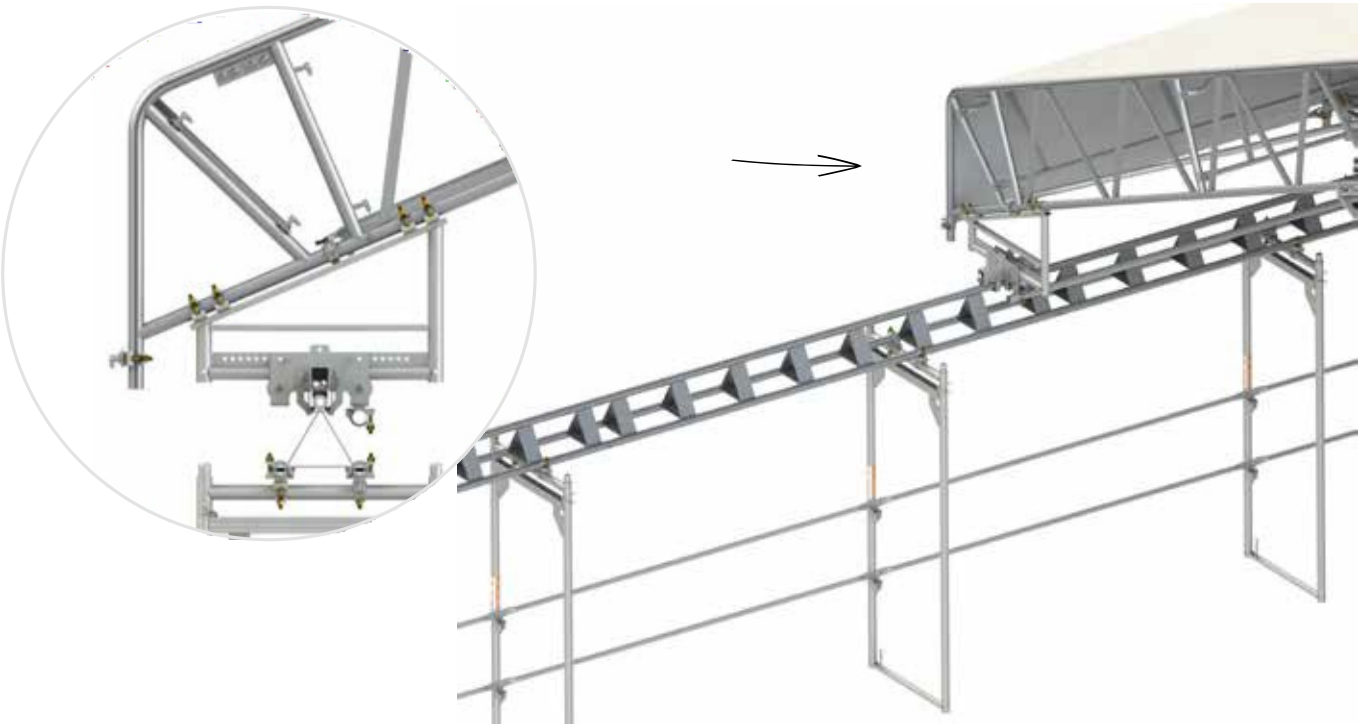
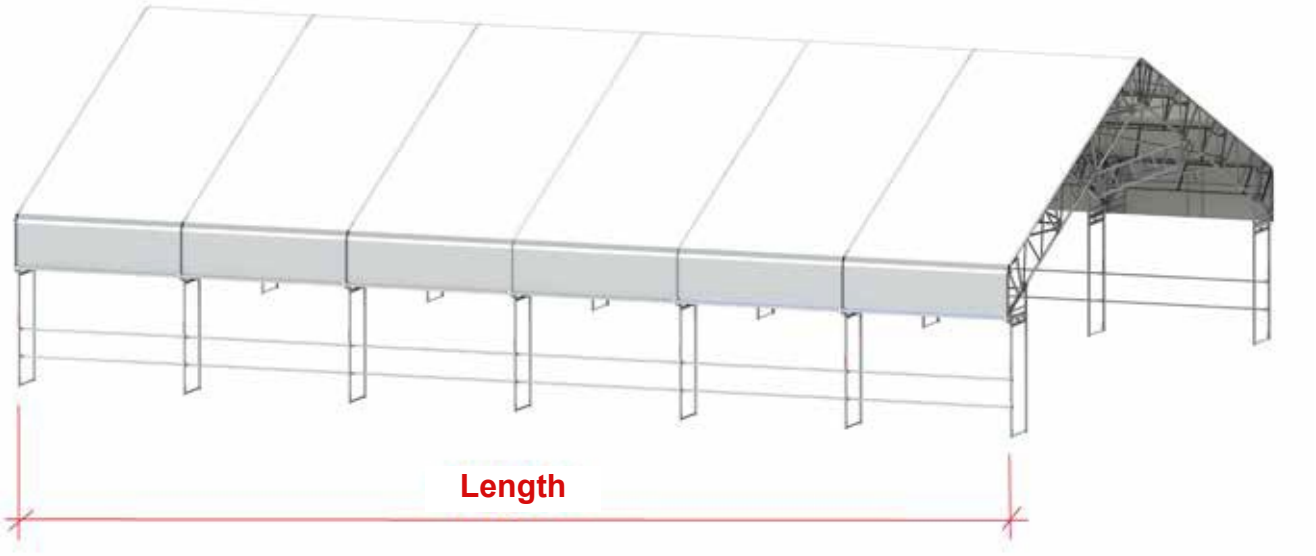
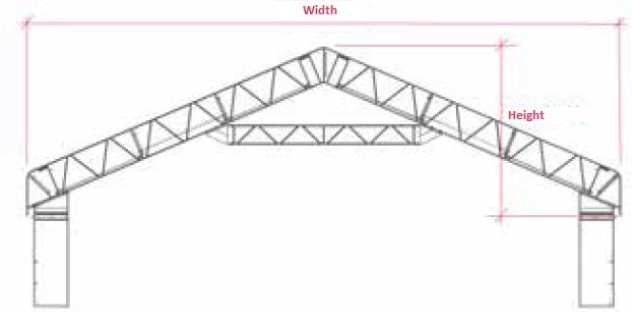


Fig. 67. The assembled roof travel system.





10.2 AN EXEMPLARY LIST OF DELTA ROOF COMPONENTS

Spacing of vertical frames 3.0 m													
No.	Cat. No.	Name of the component	Length [m]	21	30	60	15	21	30	15	21	30	Weight of one component [kg]
			Width [m]	24.6	24.6	24.6	16.8	16.8	16.8	13.08	13.08	13.08	
			Height [m]	6.14	6.14	6.14	4.5	4.5	4.5	3.7	3.7	3.7	
1.	DL 045 824	Roof lattice girder 8.24 m		x	x	x	12	16	22	x	x	x	41.6
2.	DL 045 624	Roof lattice girder 6.24 m		32	44	84	x	x	x	12	16	22	31.7
3.	DL 045 001	Roof lattice connector		8	11	21	6	8	11	6	8	11	5.2
4.	DL 044 003	Roof frame connector		16	22	42	12	16	22	12	16	22	10.0
5.	DL 045 004	Roof drip		16	22	42	12	16	22	12	16	22	4.9
6.	DL 046 300	Steel roof railing 3.0 m		91	130	260	45	63	90	35	49	70	12.0
7.	DL 045 307	Roof bracing 3.0 m		48	60	120	24	32	40	12	18	24	11.0
8.	DL 045 005	Tongs coupler		16	22	42	12	16	22	18	24	30	5.7
9.	DL 004 424	Lattice girder 4.24 m		x	x	x	x	x	x	6	8	11	17.1
10.	DL 004 624	Lattice girder 6.24 m		8	11	21	6	8	11	x	x	x	25.1
11.	DL 045 003	Aluminum girders connector		48	66	126	24	32	44	24	32	44	0.04
12.	DL 044 003	Reinforced girder connector		16	22	42	x	x	x	x	x	x	3.0
13.	DL M12 030	Connecting bolt M12 x 30		192	264	504	96	128	176	96	128	176	0.2
14.	DL M12 070	Connecting bolt M12 x 70		160	220	420	120	160	220	120	160	220	0.1
15.	x	Tarpaulin with a keder		7	10	20	5	7	10	5	7	10	x
16.	DL 010 002	Handrail connector		28	40	80	20	28	40	20	28	40	0.5
17.	DL 002 300	Longitudinal steel railing 3.0 m			20	40	10	14	20	10	14	20	5.2
Total weight of the set (without tarpaulins) [kg]				3398	4669	9126	1826	2475	3405	1442	1976	2728	

Table 6. List of sample components of the Delta Roof structure.

Note:
The above list does not include the scaffolding on which the roof structure will be erected.

11 ADVERTISING STRUCTURES

Using DELTA 73 scaffoldings, we can build structures of any size for free-standing advertising. Such structures are made of standard scaffolding components. Each advertising structure must be properly mounted to the ground. We use several methods of anchoring the structure. By means of steel ropes screwed to the highest protruding components of the scaffolding and attaching them to tubes or special drills screwed into the ground or to concrete blocks dug into the ground as shown in the figure below.

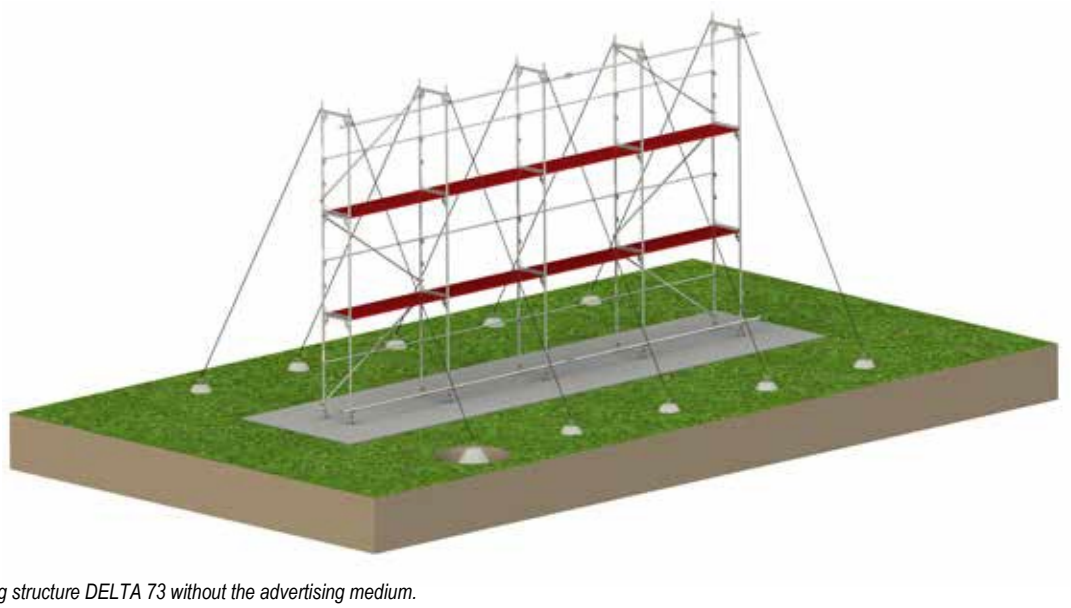


Fig. 68. Advertising structure DELTA 73 without the advertising medium.

Note:
In addition, please remember that the substrate on which the advertisement will be placed is sufficiently load-bearing, it is best to make a concrete screed to which screw bases should be screwed with expansion anchors. Such a solution will prevent the advertising structure from moving at the base by the wind. the diameter of steel ropes as well as the size and weight of ballast concretes are selected individually for each project.

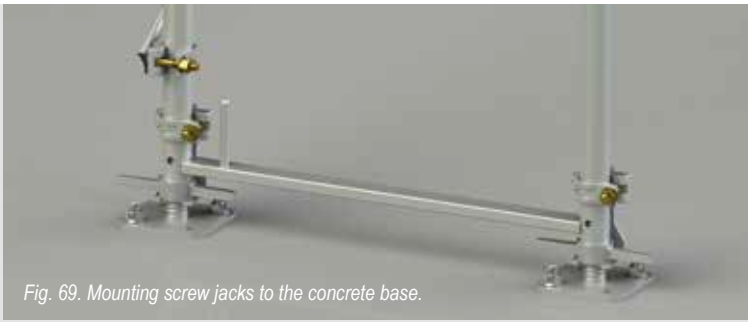


Fig. 69. Mounting screw jacks to the concrete base.

The advertising banner is mounted on the advertising structure by sliding the tubes with a diameter of 48.3 mm into the horizontal pockets at the top and bottom of the carrier. Then, in the places where the joints are mounted, cut appropriate holes in order to insert the connector. The carriers prepared in this way are screwed with the tubes to the stands of the vertical frames. Then the whole is stretched so as to give the appropriate stiffness to the banner and finally tighten the joints. If you need to stretch the sides of the advertising medium, insert the longitudinal rails into the pockets, cut the holes for the straps and, using the straps, stretch the banner to the vertical stand of the frame until the appropriate stiffness is obtained.

Fig. 70. Advertising structure DELTA 70 with an advertising medium.

SCAFFOLDING ACCEPTANCE PROTOCOL

1. Protocol registration number: .....
2. Date of receipt of the scaffolding: .....
3. Contractor for scaffolding assembly/disassembly: ……
4. User of the scaffolding (assembly client): ……
5. Place of assembly/disassembly of the scaffolding and its surface (volume): ……

……

……

6. Scaffolding type: ……
7. Permissible load capacity of working platforms: 1,5 kN/m^2, 2 kN/m^2; 2,5 kN/m^2 ……
8. The contractor provided the user with the following acceptance documents:
   a) scaffolding technical documentation (statics) ……
   b) scaffolding operation manual ……
   c) other: ……
9. Statement:
   The contractor states that the scaffolding described in this protocol has been assembled/disassembled in accordance with the good building practice, technical and operational documentation and assembly instructions issued by the manufacturer, and in accordance with the requirements of occupational health and safety. Installation was performed by authorized fitters.
   * At the user's request, the scaffolding was assembled at a distance of more than 20 cm from the wall.
   No protection of the platforms on the wall side. DELTA is not responsible for any possible effects of defective protection (or lack thereof) against falling from the wall side.

   The commissioning committee states that the scaffolding can be used without any comments.
10. Remarks:

.....
.....

11. Composition of the acceptance committee:

..... – Contractor .....
..... – User .....
..... – User .....
(full names) (signatures)

……
(stamp, legible signature and ID card no.)

(Journal of Laws No. 47 of March 19, 2003 § 123)
The scaffolding assembly, operation and disassembly is prohibited:

1) If good visibility lighting is not provided at dusk
2) In dense fog, rain, snow and black ice
3) During storms or winds with a speed exceeding 10 m/s

Note:
Alterations to the scaffolding structure may only be made by the scaffolding assembly contractor! Before using the scaffolding, check: technical condition of the scaffolding and its completeness. The client is responsible for maintaining the scaffolding in proper technical condition.

Release Date: Warsaw, June 2020

DELTA®

SCAFFOLDING ▪ FORMWORK

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