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.

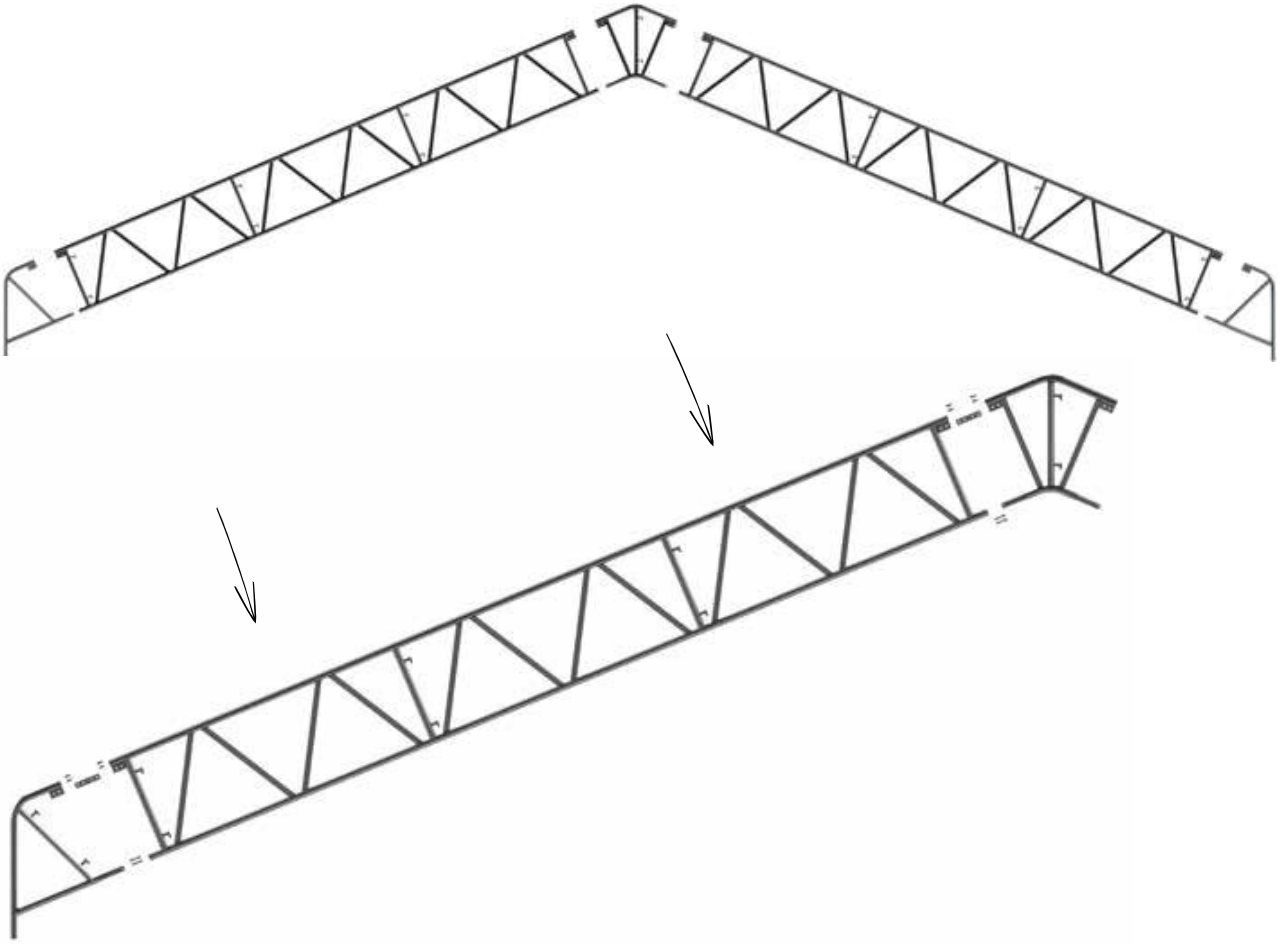


Fig. 48/49. Arrangement of the components of the roof span.

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

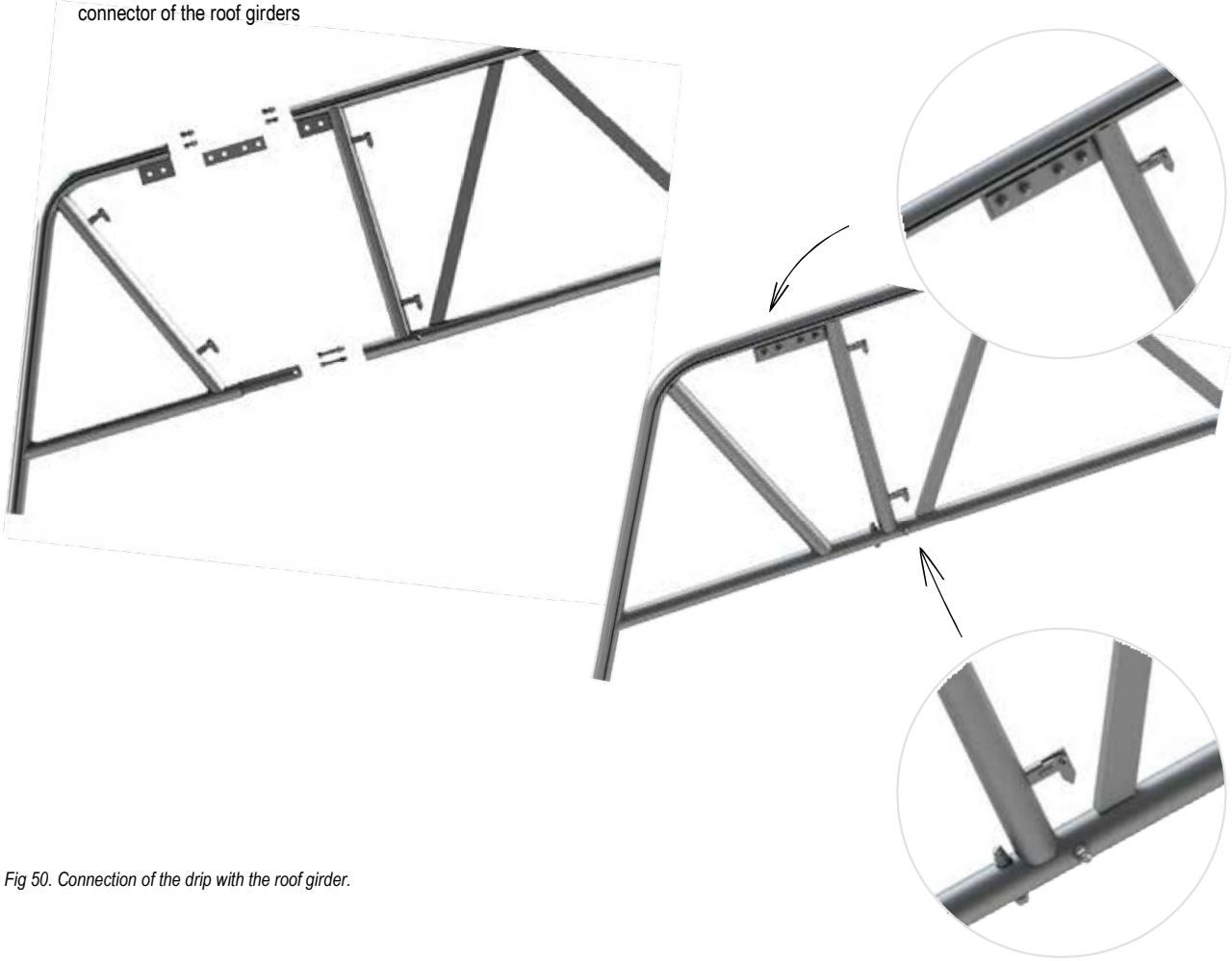


Fig 50. Connection of the drip with the roof girder.

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.

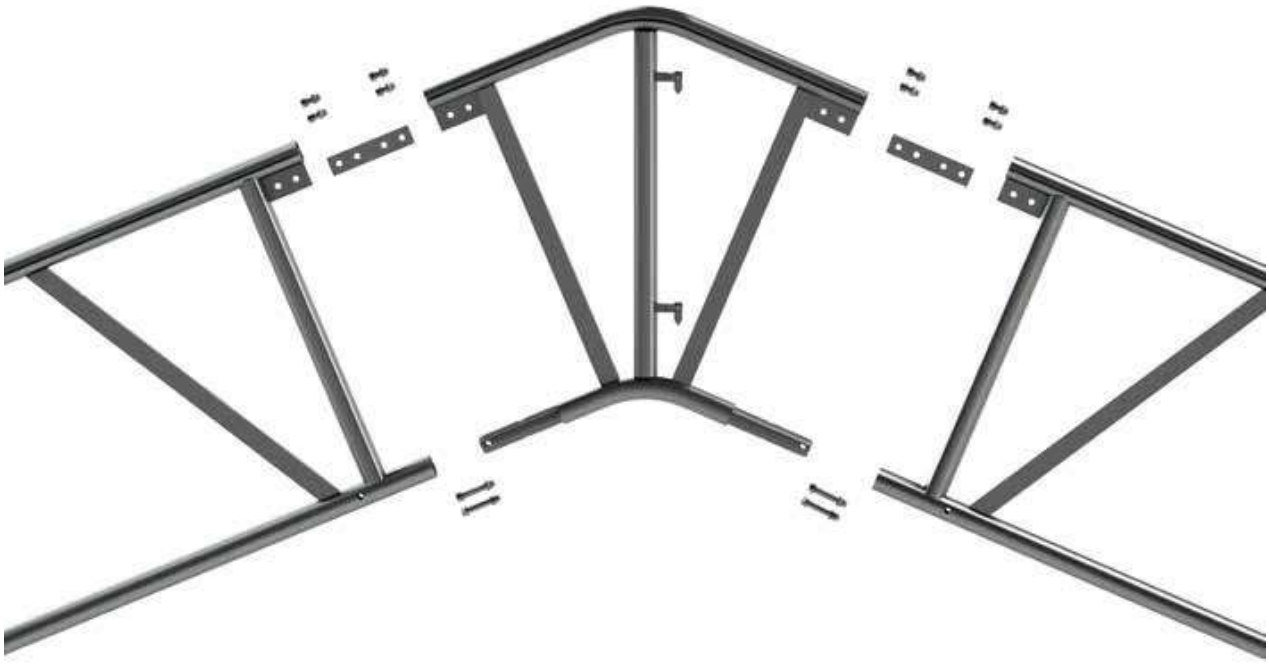


Fig. 51. Connection of the roof connector with the roof girder.

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.

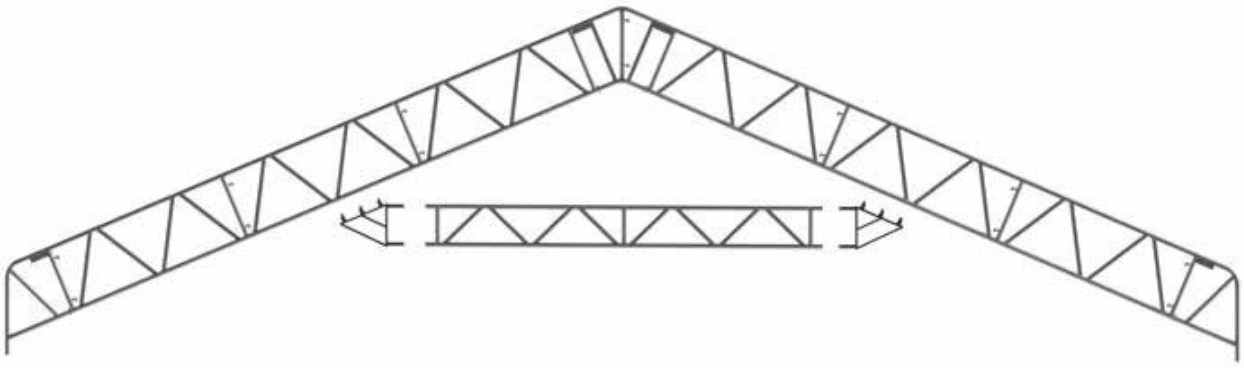


Fig. 53. Arrangement of roof collar components.

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.

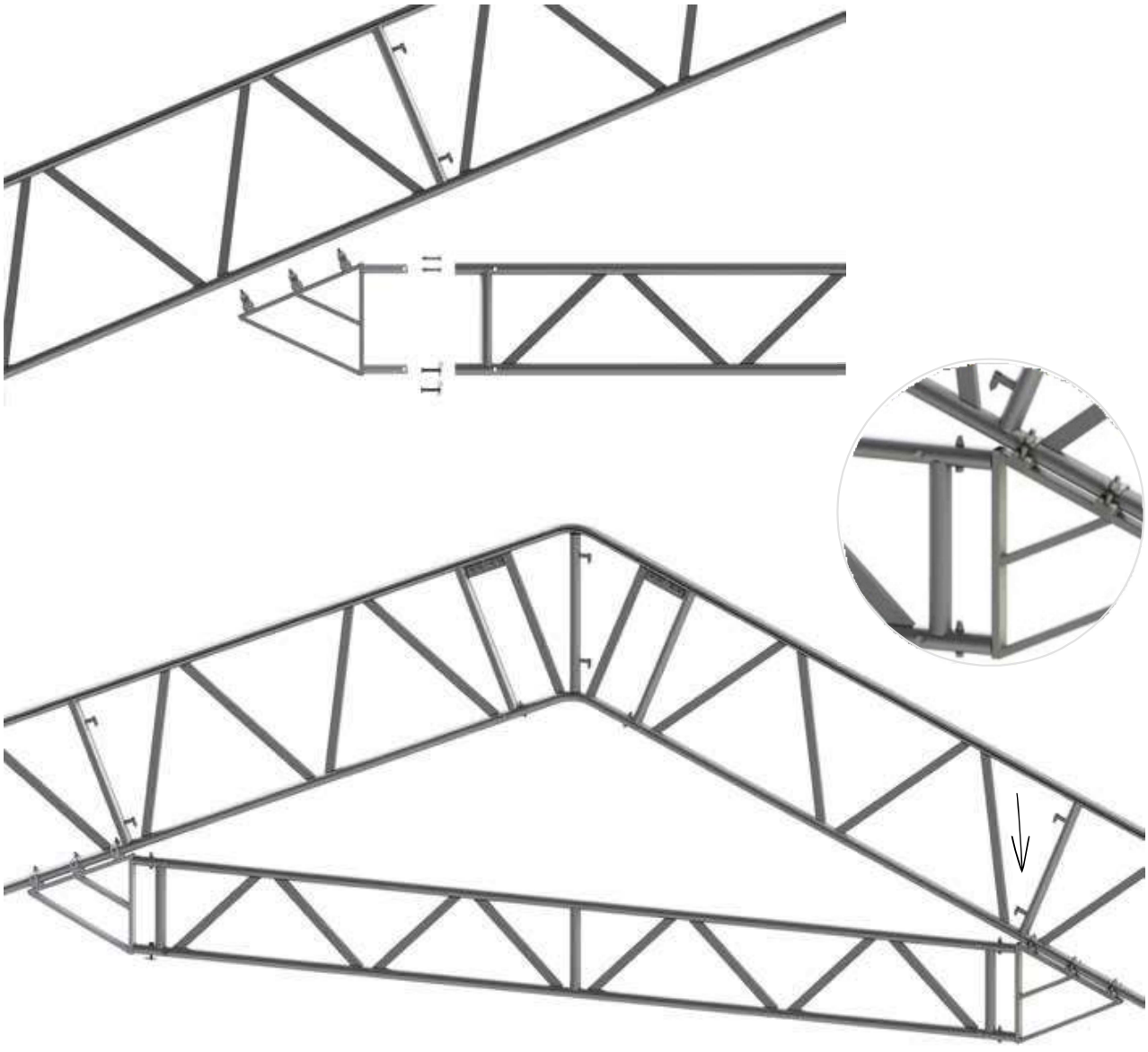


Fig. 54. Connection of clamp connectors with 0.40 m girders to the roof span.

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.

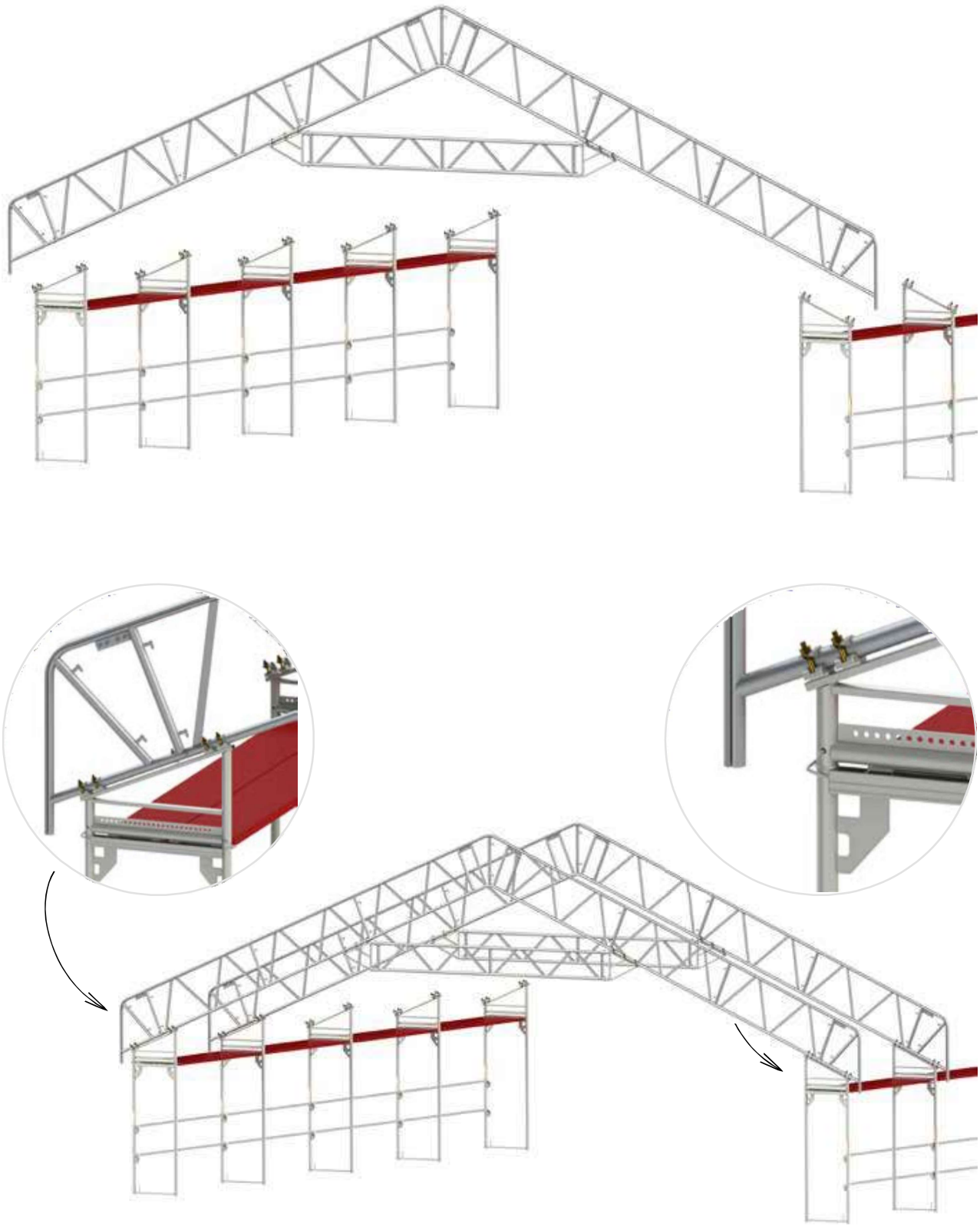


Fig. 55. Connection of the first roof span with the scaffolding.

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.

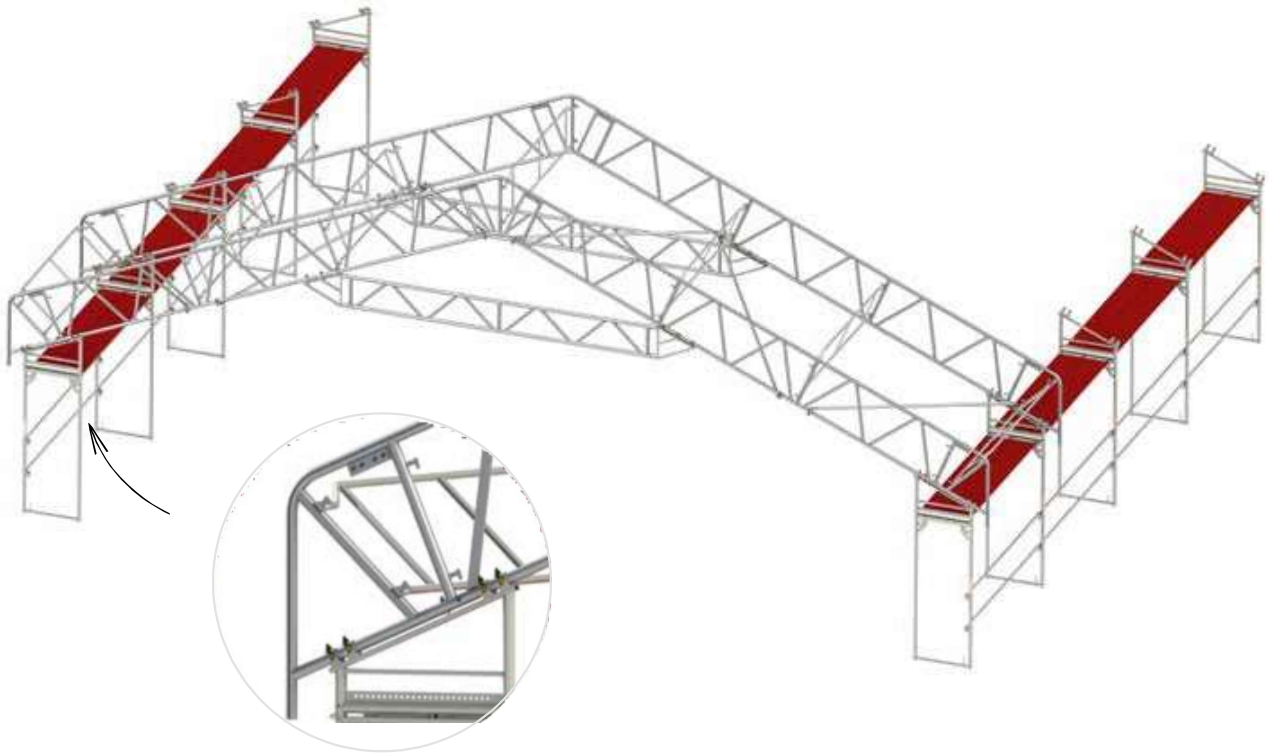


Fig. 56. Installation of handrails in the first base bay of the roof slope.

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.

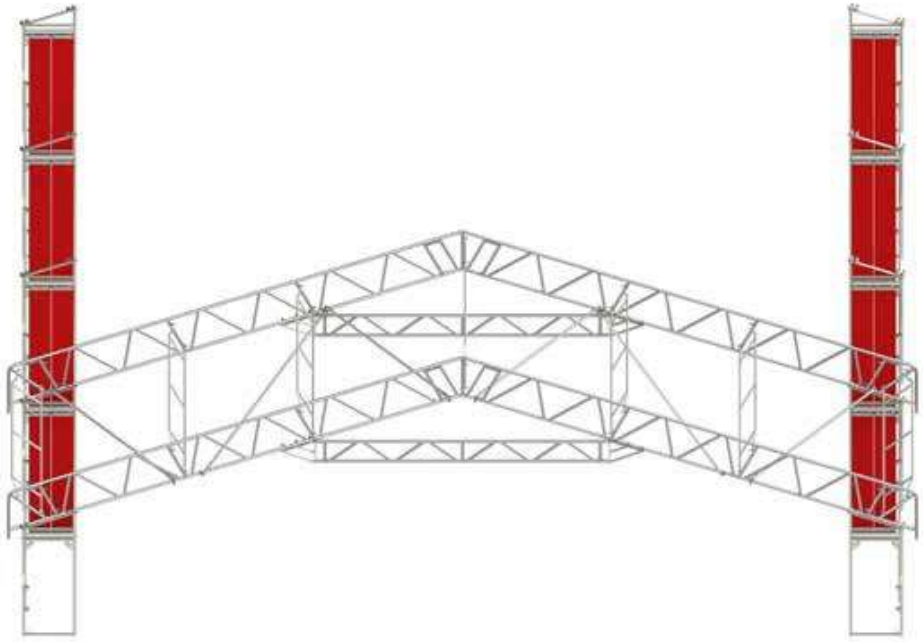


Fig. 57. Installation of braces in the first base bay.

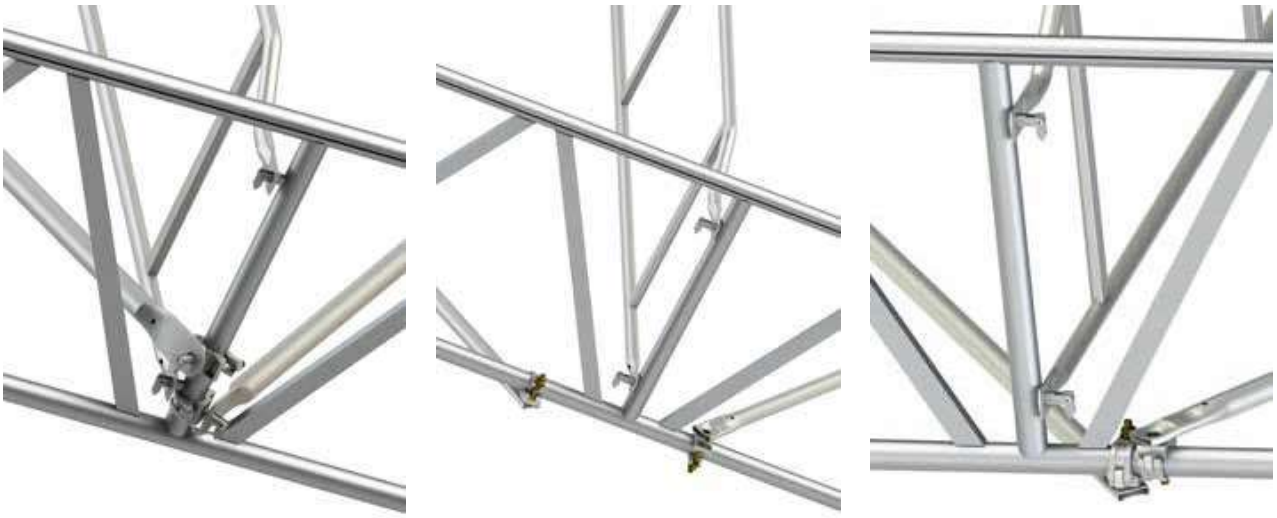


Fig. 58. Detail of roof bracing attachment.

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.

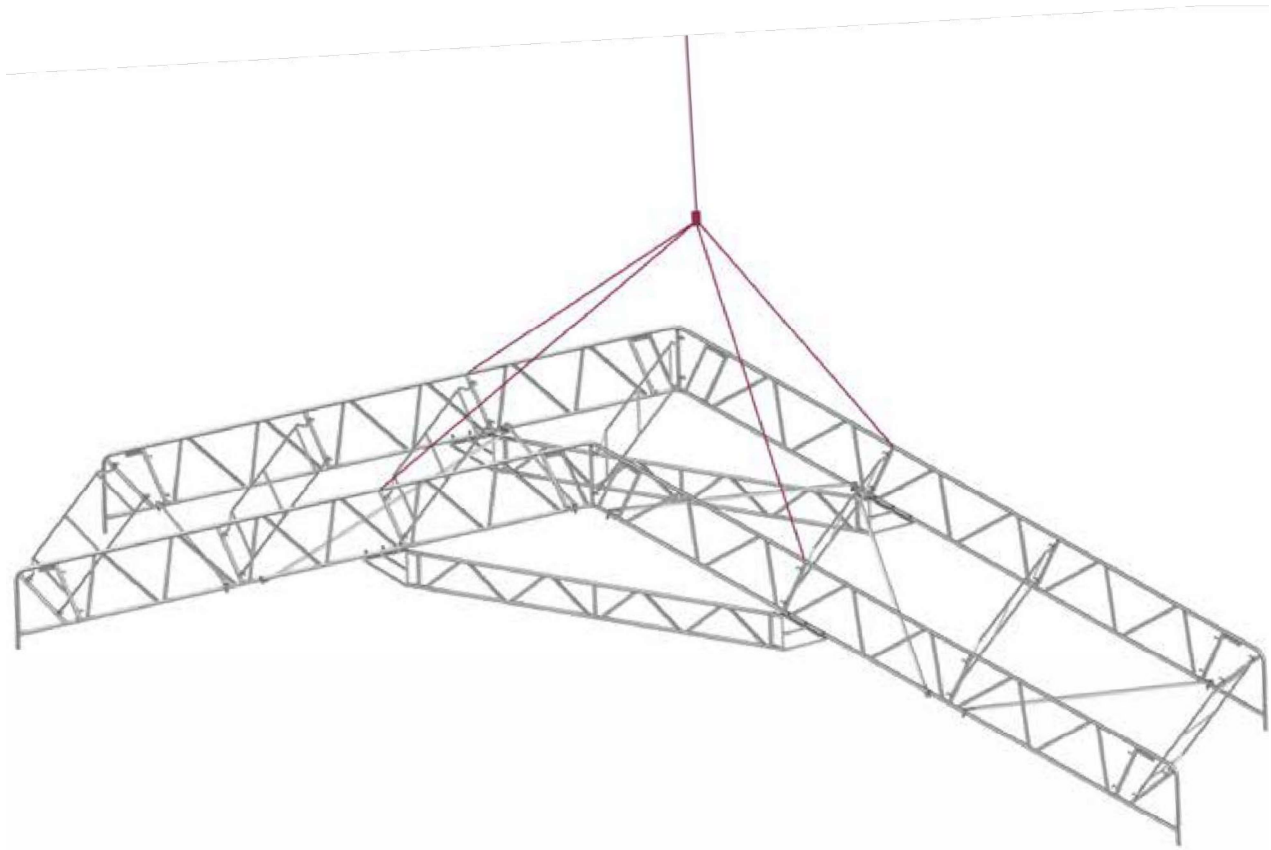


Fig. 59. Base bay prepared for transport by a crane.

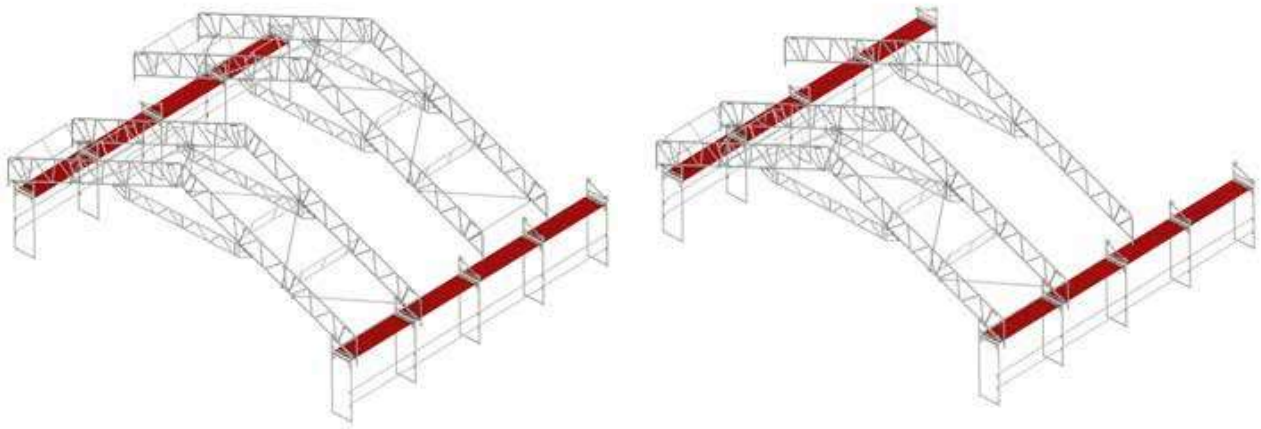


Fig. 60. Methods of transport and assembly of successive bays of the roof structure.

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.

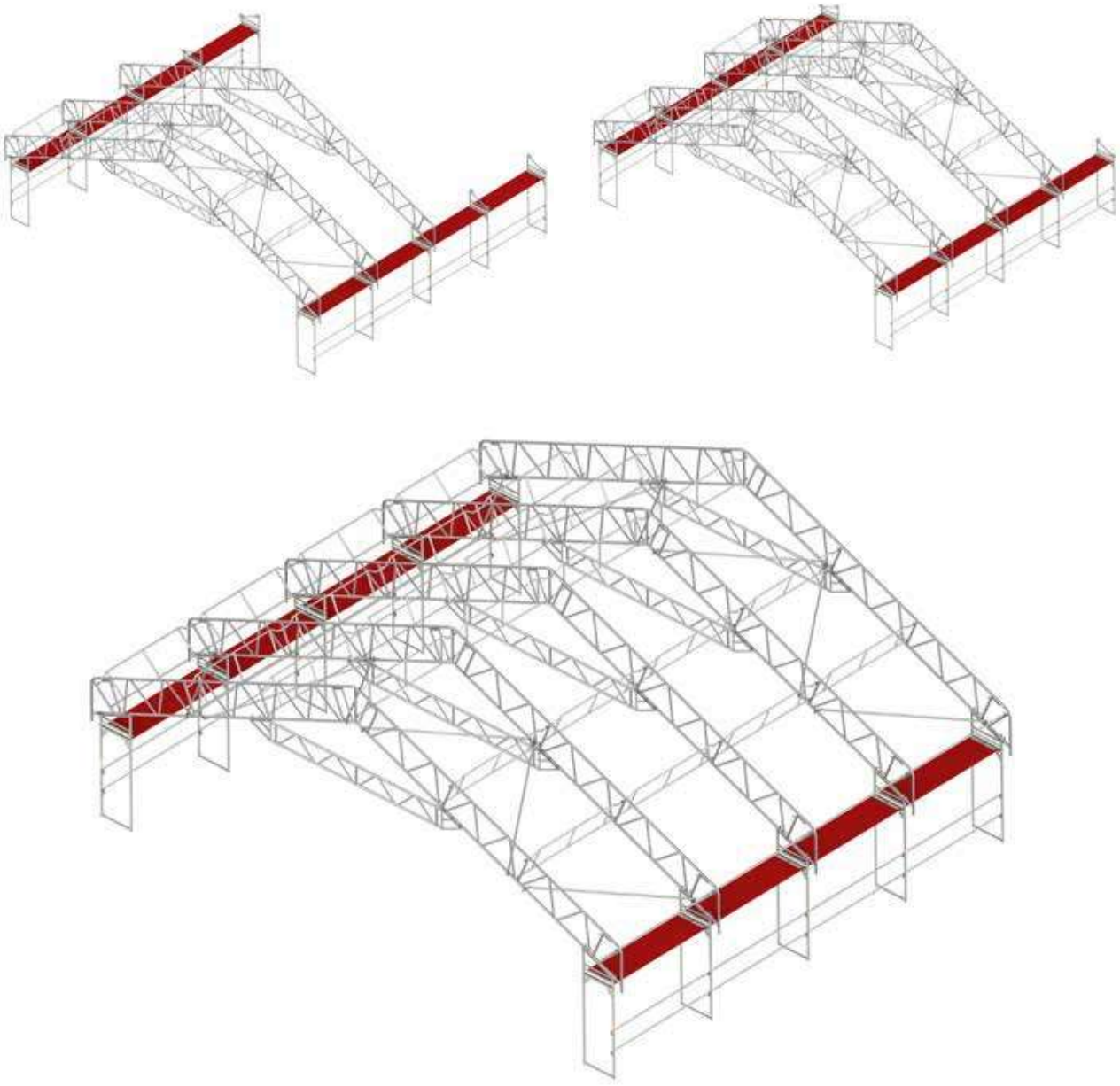


Fig. 61. Exemplary stages of roof assembly with the use of a crane.

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.

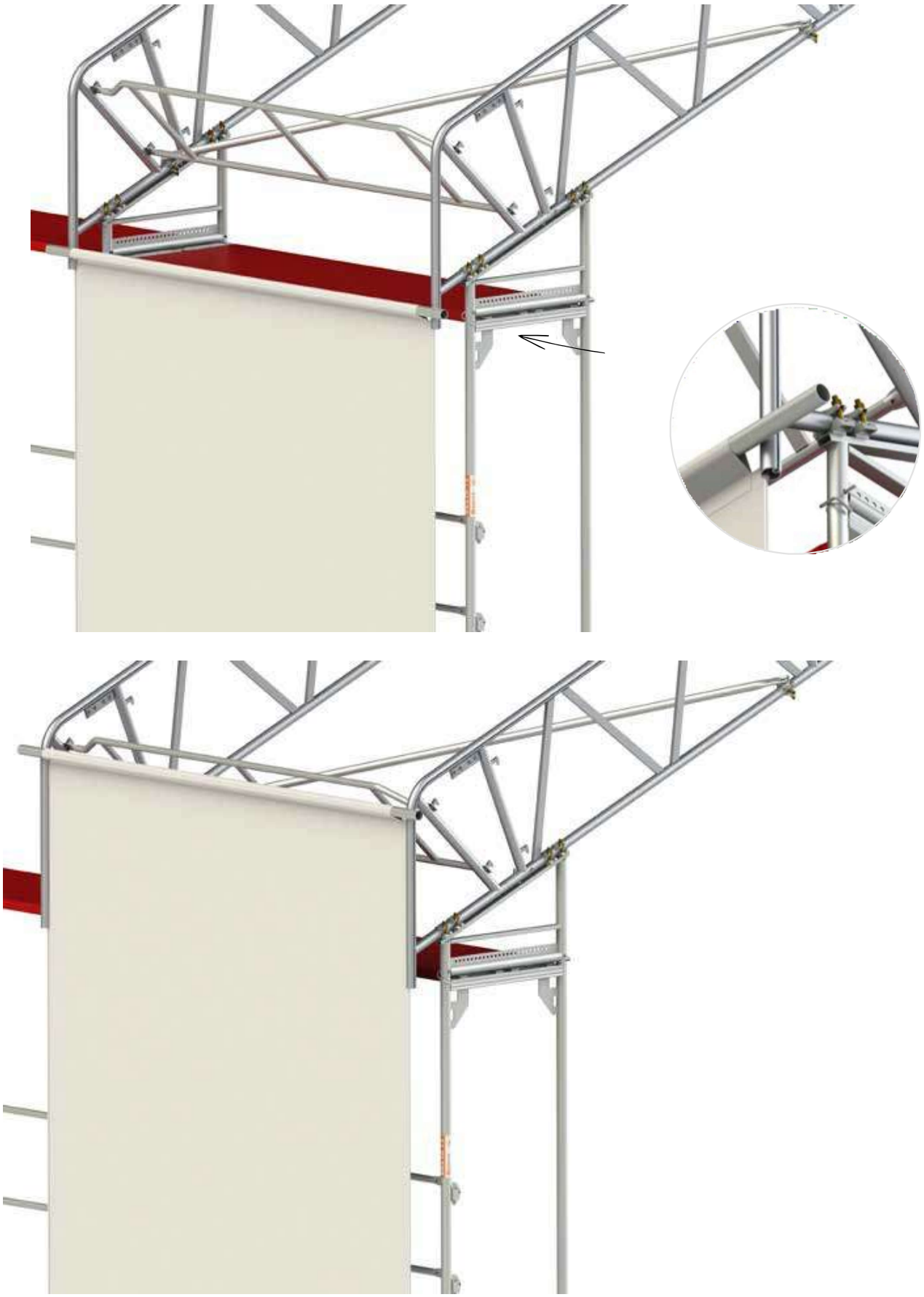


Fig. 62. Installation of tarpaulins in special DELTA ROOF system roof profiles.

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.

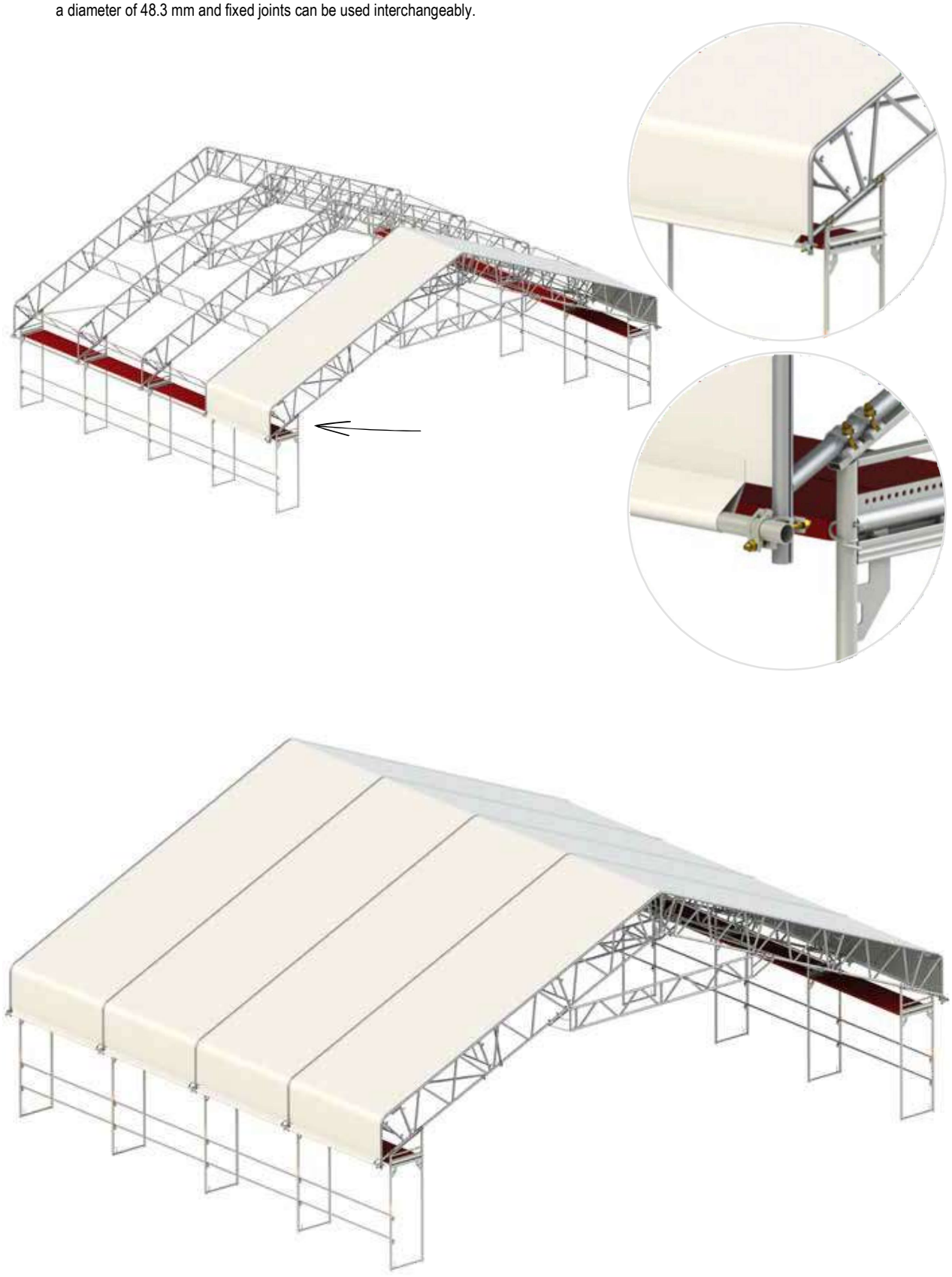


Fig. 63. Mounting and tensioning of DELTA ROOF tarpaulins.

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.

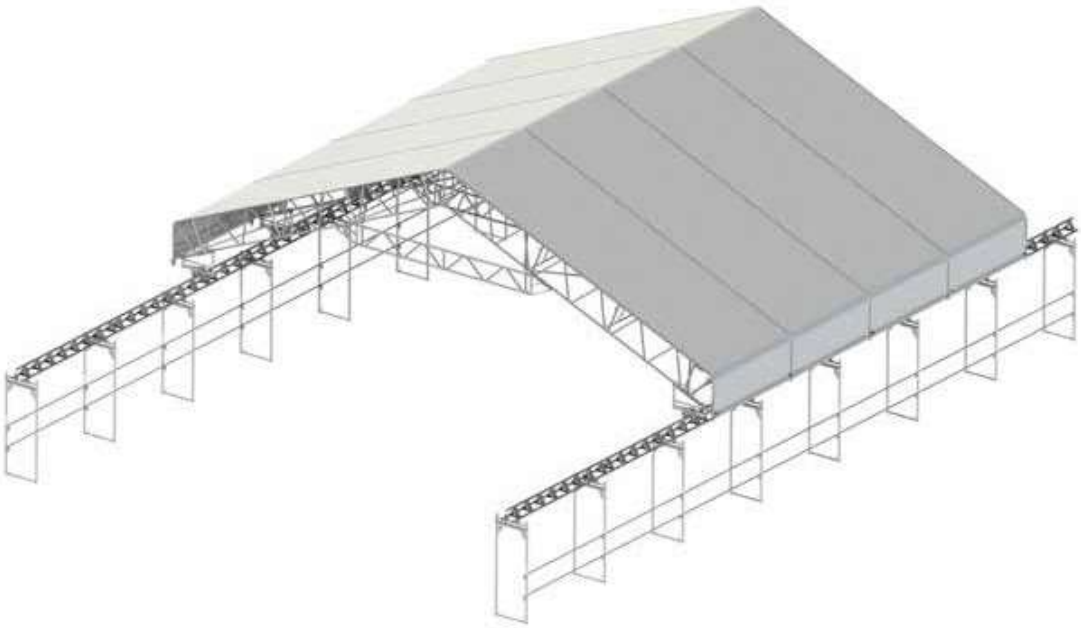


Fig. 64. Mobile structure of the roof of the DELTA ROOF system.

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.

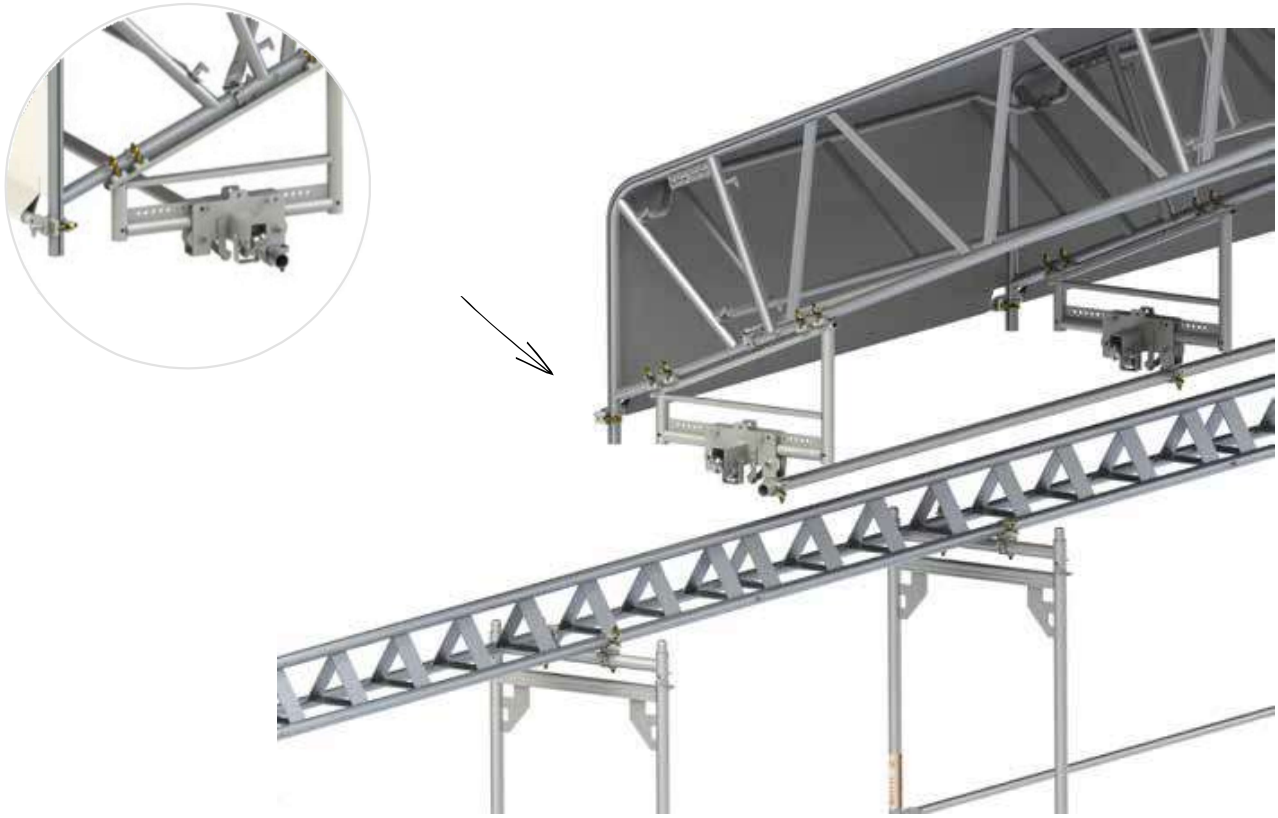


Fig. 66. Assembly of the travel trolley of the DELTA ROOF system.

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.

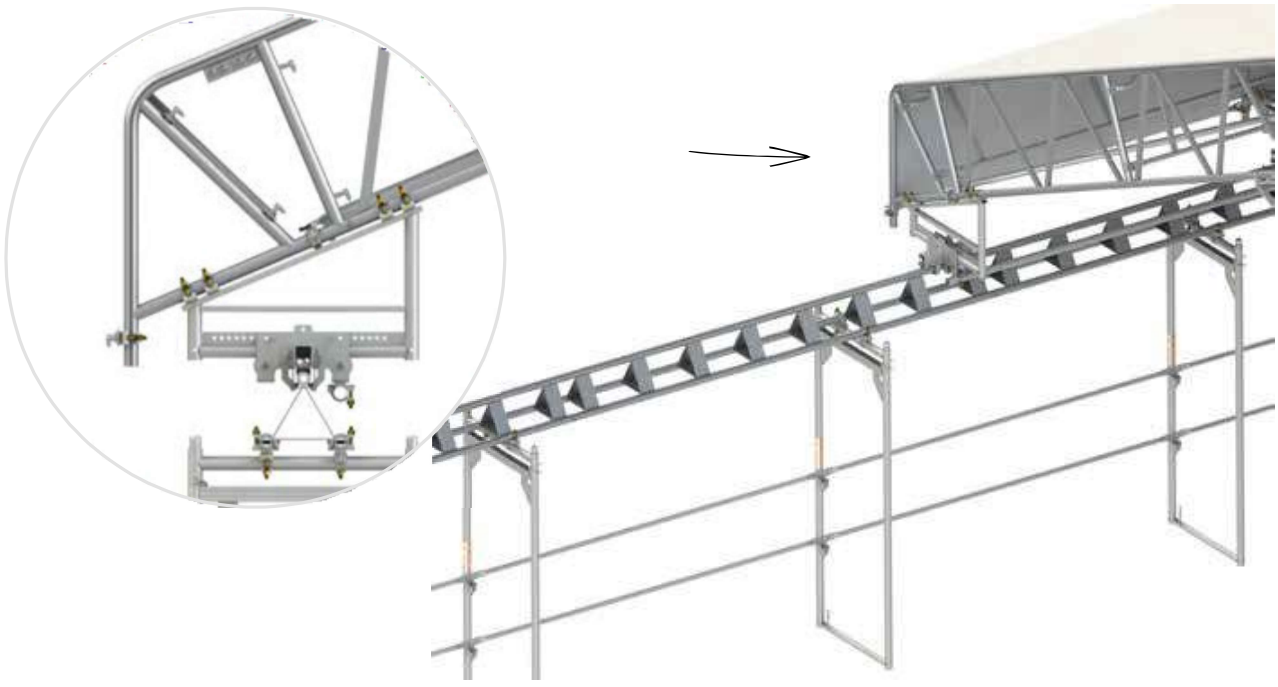
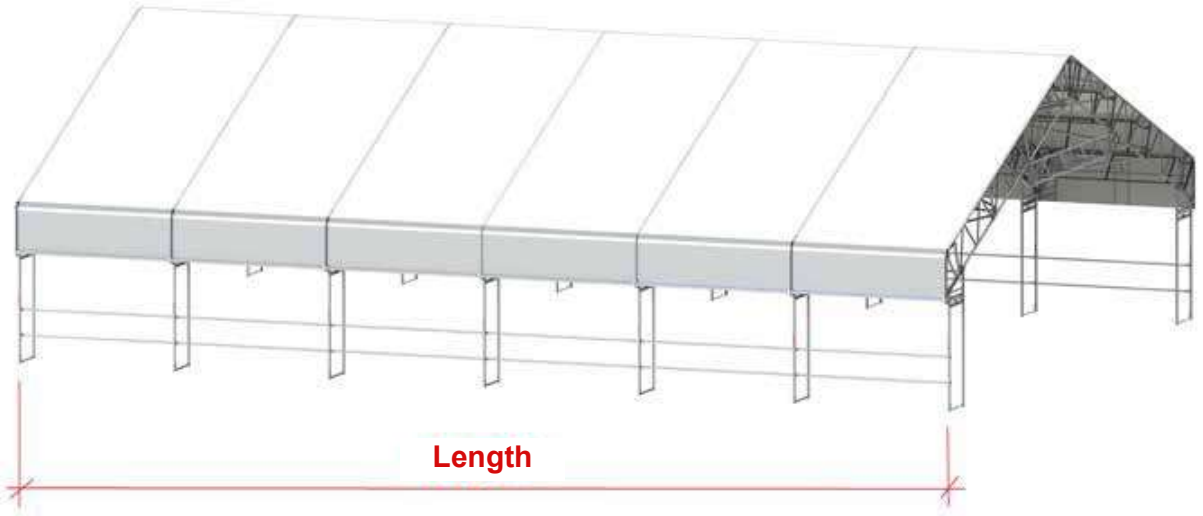
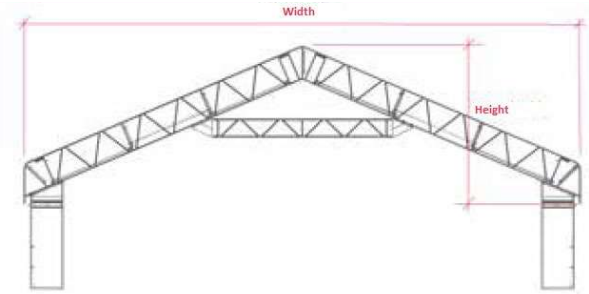


Fig. 67. The assembled roof travel system.





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.