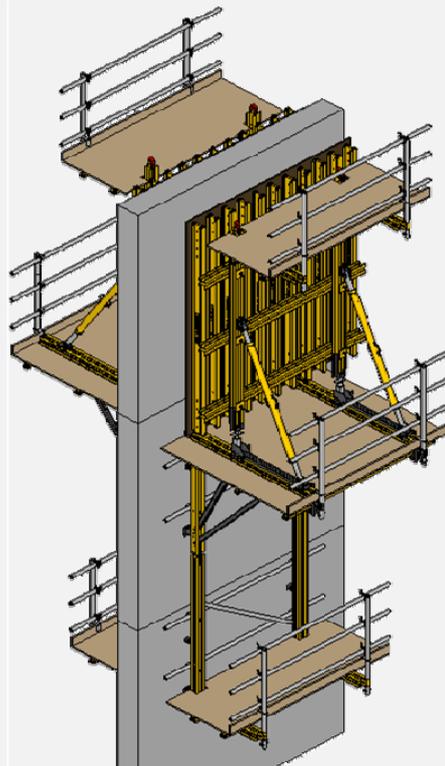


**User Guide**  
**BMK**  
**Climbing brackets**

02FIR12



DISCLAIMER:

Any safety provisions as directed by the appropriate governing agencies must be observed when using our products.

The pictures in this brochure are snapshots of situations at different stages of assembly, and therefore are not complete images. For the purpose of safety, they shall not be deemed as definite.

All instructions regarding safety and operation contained in this brochure, and the data on stress and loads must be respected. ULMA Construcción's Technical Department must be consulted any time that field changes alter our equipment installation drawings.

The loads featured in this document, related to the basic parts of the product, are approximate.

Our equipment is designed to work with accessories and items produced by our company only. Combining such equipment with other brands is not only dangerous without having made all corresponding verifications, it also voids any and all our warranties.

The company reserves the right to introduce any modifications deemed necessary for the technical development of the product.



Safety sign



Control sign



Warning sign



Information sign

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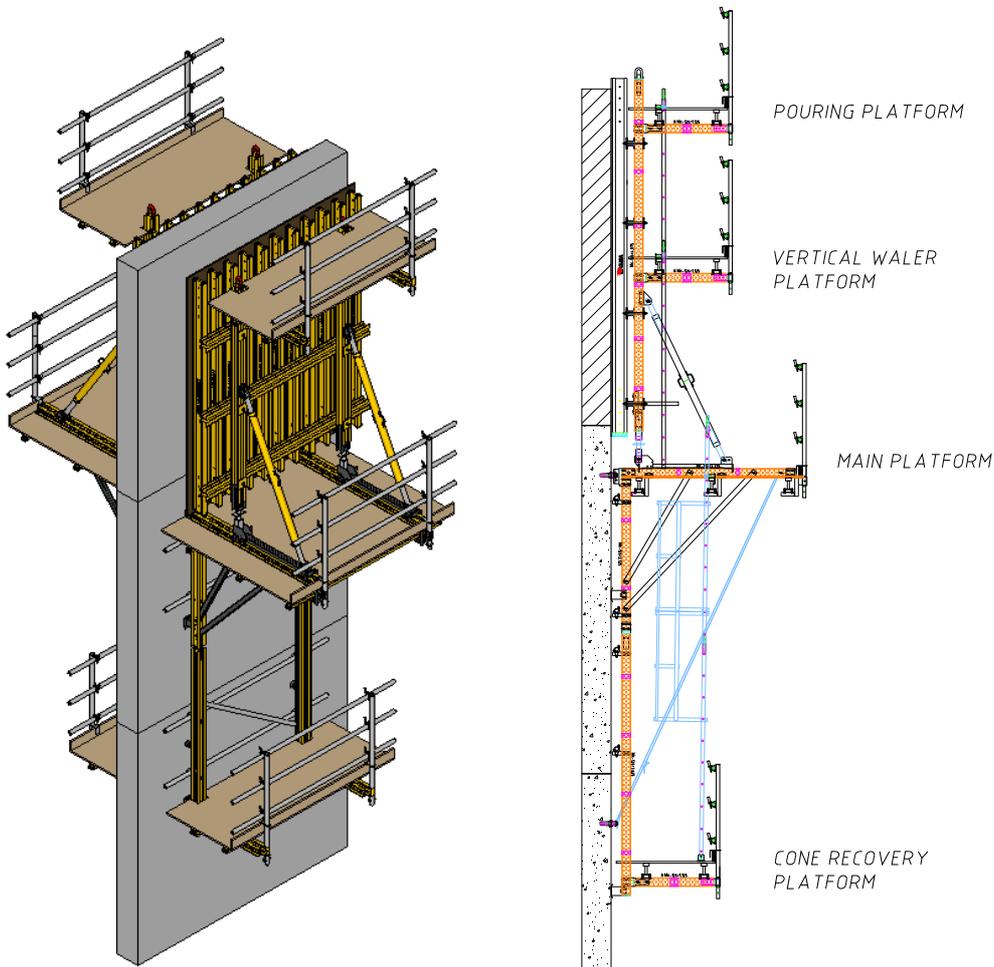
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## 1. PRODUCT DESCRIPTION

The Climbing Bracket BMK system is mainly used for the construction of double-sided walls and piers. It is supported on anchor cones embedded in the concrete wall from a previous pouring stage.

The system allows of two different stripping options:

- With rack and pinion system: The formwork is supported on a carriage which enables to move it back up to 80 cm from the wall. This system eases the cleaning and placing of steel reinforcement.
- With tilt-back system: The formwork can be separated some 5 cm from the wall for stripping and moreover it can be tilted.



The formwork together with the climbing structure is moved up to the next pouring stage with crane.

Apart from all other necessary components for the formwork, the working platforms can be highlighted as constituting factors for product safety.

<i>PLATFORM TYPES</i>	<i>FUNCTION</i>
<i>CONCRETE POURING PLATFORM</i>	It is used for concrete pouring and for the hooking of the crane.
<i>VERTICAL WALER PLATFORM</i>	It is used to place and release the tie rods.
<i>MAIN PLATFORM</i>	This is the amplest working platform. It is used as working area for the stripping, approaching and plumbing of the formwork panel as well as for the placing of the steel reinforcement, tie rods and for the cleaning of the panel.
<i>CONE RECOVERY PLATFORM</i>	It is used to recover the cones left in the concrete from previous pouring stages and for the placing of the wind sling fixers.

The main features of the Climbing Bracket BMK system are:

- Use with **different formwork products**: Mainly with ORMA modular formwork, beam-based formwork (ENKOFORM V-100 and ENKOFORM VMK) and metal formwork.
- The climbing brackets/frames consist of **standard walers MK with accessories bolted** to them. This entails the following advantages:
  - **Very versatile system**: It offers the versatility of the MK system and enables different configurations by making use of some MK accessories.
  - **Transport saving**: The brackets/frames can be delivered disassembled to the building site which contributes to the reduction of transport cost.
- The climbing brackets are already equipped with a stripping system, **with rack and pinion** or **tilt-back system**.
- The formwork panels are adjusted of height with levelling jacks, and push-pull props to enable their plumbing.
- Capability to adapt to complex wall geometries (**inclined walls, curved walls** etc.)
- The **working platforms provide a high level of safety** due to their ample space to carry out all required construction works.
- Possibility to use two anchor types: DW15/M24 or DW20/M30.

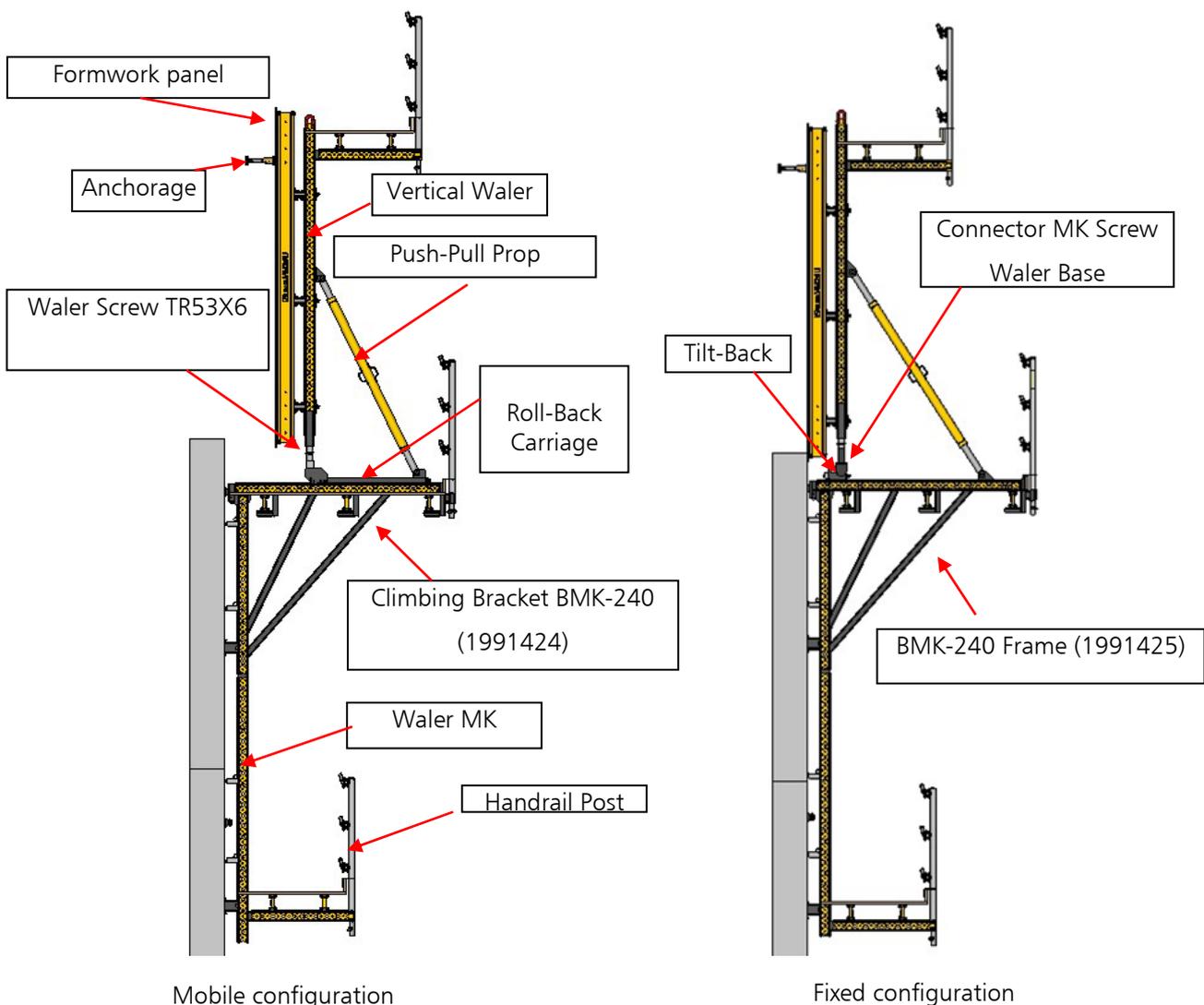
The basic range of Climbing Brackets BMK is as follows:

- **Climbing Bracket BMK-240**
- **Climbing Bracket BMK-170**

### 1.1. CLIMBING BRACKET BMK-240

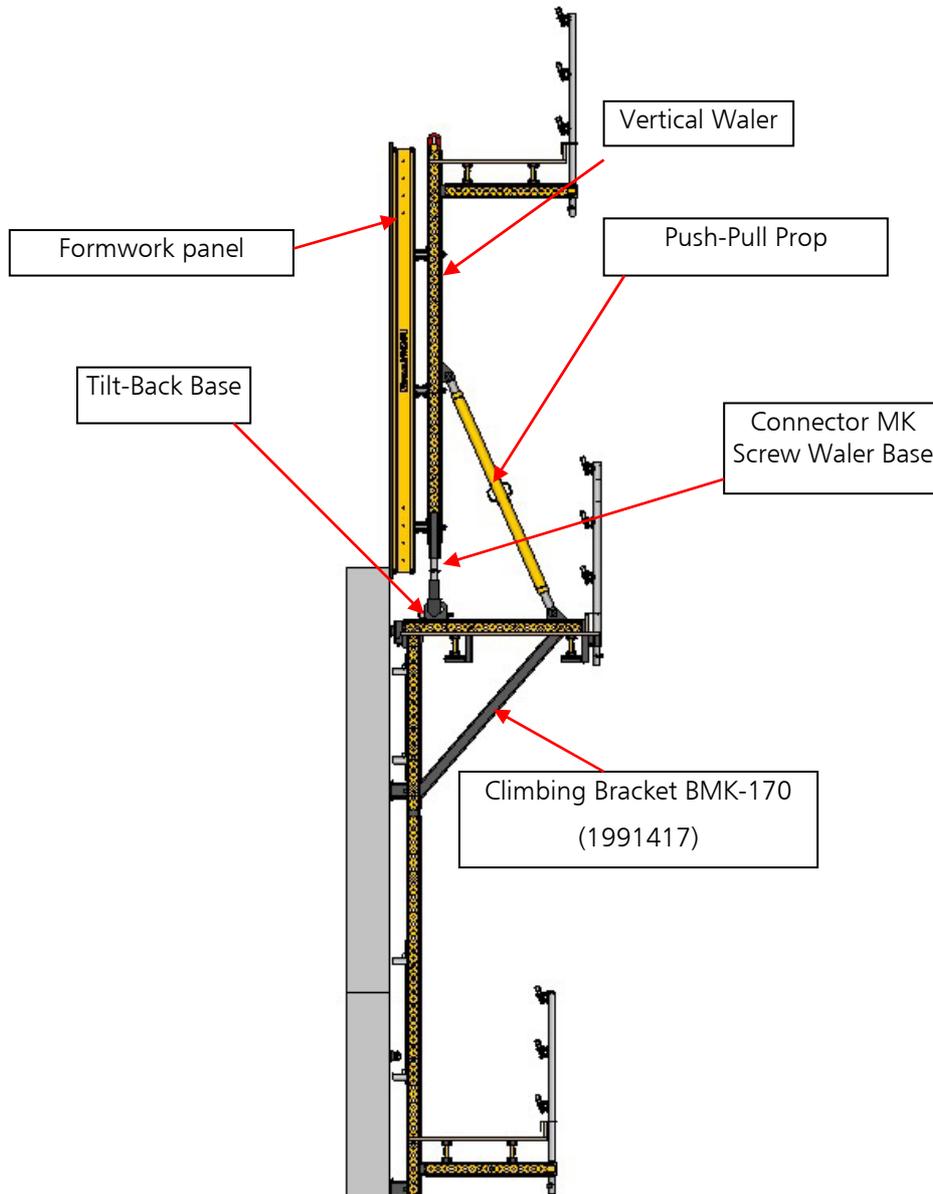
This bracket system offers 2 configurations or rather different assembly types: the mobile configuration with roll-back carriage and the fixed configuration with tilt-back system.

- **Mobile configuration with Roll-Back Carriage:** The formwork is joined to the main platform through the Roll-Back Carriage (1991444) which is operated by a rack and pinion mechanism to separate the panels from the wall at stripping. A push-pull prop serves to plumb the formwork and the height adjustment of the panels is enabled by the Waler Screw TR53X6 (0302020) which connects the vertical waler to the Roll-back carriage.
- **Fixed configuration with Tilt-Back System:** The formwork is joined to the main platform through the Tilt-Back MK-120 (1991467). The panels can be separated from the poured concrete wall by a distance of about 5 cm. The Connector MK Screw Waler Base (1991517) enables the panel height adjustment by connecting the vertical waler to the stripping mechanism.



## 1.2. CLIMBING BRACKET BMK-170

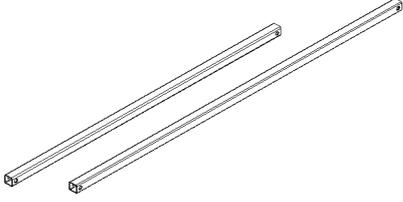
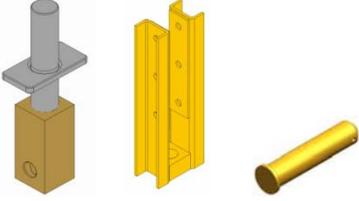
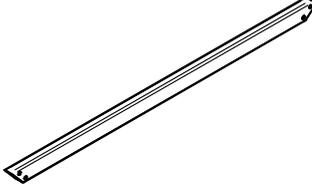
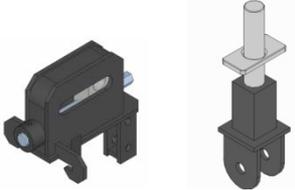
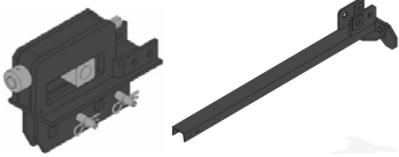
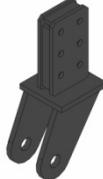
This climbing bracket only offers the fixed stripping configuration with which the formwork is detached from the wall by about 5 cm with the Tilt-Back MK-120 (1991467). The Connector MK Screw Waler Base (1991517) enables the panel height adjustment. The components are the same as for the fixed configuration of the climbing brackets BMK-240 and BMK-220.

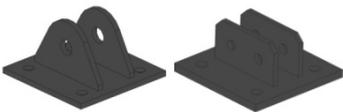
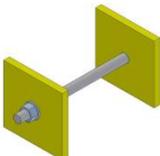


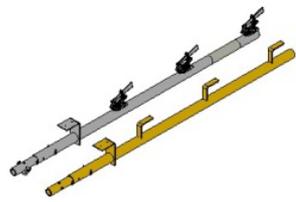
## 2. SYSTEM COMPONENTS AND ACCESSORIES

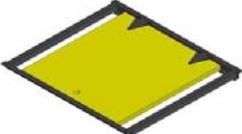
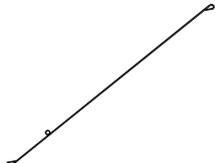
### 2.1. GRAPHIC DESCRIPTION

Item no.	Weight (kg)	Item name	Item no.	Weight (kg)	Item name
<b>SUPPORT ON WALL COMPONENTS</b>			1991425	194	BMK-240 FRAME
1991424	231	CLIMBING BRACKET BMK-240 			
1991417	163	CLIMBING BRACKET BMK-170 	1991410	14.4	FIXED HEAD  Painted black
1991444	38.5	ROLL-BACK CARRIAGE MK-120	1991503	6	MK HINGED HEAD  Painted black
1991456	0.8	GEAR MK	1991427	7.7	PLATFORM SUPPORT MK-120  Painted black
1991457	0.3	GEAR SHAFT MK	1991434	9,3	PLATFORM BACK SUPPORT MK-120  Painted black
9071300	0.02	SPRING PIN 5X30 DIN 1481	1991487	2.7	BOTTOM SUPPORT  Painted black
		 Painted black			
		 zinc-coated			
		 zinc-coated			
1991465	225	HINGED BMK-240 FRAME 			

Item no.	Weight (kg)	Item name	Item no.	Weight (kg)	Item name
1991485 1991482	12.1 17.6	DIAGONAL MK 1.125X1.750/1797 DIAGONAL MK 2X2.125/2625  Painted black	0302020 1991570 0335153 0250000	10.8 13,5 0,40 0,03	WALER SCREW TR53X6 WALER MK-120 SCREW BRACKET PIN W/HEAD D20X100 PIN COTTER R/5  Bichromate treated    Painted yellow (Zinc screw)    Bichromate treated
1991498	21	DIAGONAL BMK-170  Painted black			
1991439	4.5	PUSH-PULL PROP HEAD MK-120  Painted black			
1990570	0.82	HANDRAIL HEAD MK  Painted black			
1991458	5,1	AXIAL NODE M 2-D20 MK  Painted black			
1991476	8.8	WALKWAY HINGED CONNECTOR  Painted black			
1991360	7.1	LIFTING HOOK MK  Yellow-painted steel			
			1991467 1991517	12 15.1	TILT-BACK MK-120 CONNECTOR MK SCREW WALER BASE  Painted black Zinc-coated axes
			0331013	2,6	HANDLE SCREW TR53  Painted black
			1991463 1991450	24.6 25	INCLINED TILT-BACK MK-120 ASSEMBLY RACK MK-120  Painted black, zinc-coated bolts and axes
			1991593	12.8	MK-120 SINGLE SIDED CONNECTOR  Painted black

Item no.	Weight (kg)	Item name	Item no.	Weight (kg)	Item name
0333014 1991514	46.5 41.7	PUSH-PULL PROP TR63 2.04-2.72 PUSH-PULL PROP TR63 1.52-2.2  Painted yellow (Zinc-coated screw jack)	1991567	5.8	ADJUSTMENT JACK MK-120  Painted Black (zinc-coated screw jack)
1960115 1960130 1960125	24.1 33.4 38.1	PUSH-PULL PROP E 1.51-2.2 PUSH-PULL PROP E 2.15-2.75 PUSH-PULL PROP E 2.7-3.3  Painted black (zinc-coated screw jack)	1990209 1990211 1990213 1990215 1990217 1990219 1990221 1990225 1990229 1990233 1990237 1990239 1990245	29.4 35.5 41.9 47.9 54.3 60.5 68.6 80.9 93.4 107.6 120.1 126.3 146.7	WALER MK-120 / 1.125 WALER MK-120 / 1.375 WALER MK-120 / 1.625 WALER MK-120 / 1.875 WALER MK-120 / 2.125 WALER MK-120 / 2.375 WALER MK-120 / 2.625 WALER MK-120 / 3.125 WALER MK-120 / 3.625 WALER MK-120 / 4.125 WALER MK-120 / 4.625 WALER MK-120 / 4.875 WALER MK-120 / 5.625  Profile painted yellow/ Space tube painted black
0333055 1960545	7 6.7	PUSH-PULL PROP SHOE TR63 PUSH-PULL PROP E SHOE 2 D20x48  Painted black	1990395	6.5	ORTHOGONAL JOINT MK  Painted black
0260001	6.12	CLAMP M20X330 (2P-150X150)  Painted yellow (Zinc-coated screw jack)	1960375	0.81	WALER-VM20 CLAMP 2T  Bichromate-treated and zinc-coated
1900448	1.41	WALER HOOK  Zinc-coated (Bichromate-treated nut)	0919259	1.7	PLATE CLAMP DU-DU  Painted black
0333004	2.3	WALER FIXING HOOK  Zinc-coated (Bichromate-treated nut)	1940191 1940172 1950129 1940144 1950130 1940146 1950112 1950113 1940149	7.25 9.12 12.25 14.5 16.5 18 19.5 24.5 29.5	BEAM VM 20/1.45 BEAM VM 20/1.9 BEAM VM 20/2.45 BEAM VM 20/2.9 BEAM VM 20/3.3 BEAM VM 20/3.6 BEAM VM 20/3.9 BEAM VM 20/4.9 BEAM VM 20/5.9

Item no.	Weight (kg)	Item name	Item no.	Weight (kg)	Item name
		 Painted yellow	0333010 0333011	1.6 1.6	LADDER FIXER LADDER HANGER  Painted Yellow      Painted black (zinc-coated) coupler)
7251132 7251136	15 18.9	3 LAYER PLYWOOD 2000X503X27 3 LAYER PLYWOOD 2500X500X27 			
2211156 2211185	9.6 8	HANDRAIL POST 1.5 HANDRAIL POST 1.5 TBL  Zinc-coated      Painted yellow	1990109 1990111 1990113 1990115 1990117 1990119 1990121 1990125 1990129 1990133 1990137	13.7 16.9 20 23.1 26.2 29.3 32.4 38.6 44.8 51 57	PROFILE MK-120 / 1.125 PROFILE MK-120 / 1.375 PROFILE MK-120 / 1.625 PROFILE MK-120 / 1.875 PROFILE MK-120 / 2.125 PROFILE MK-120 / 2.375 PROFILE MK-120 / 2.625 PROFILE MK-120 / 3.125 PROFILE MK-120 / 3.625 PROFILE MK-120 / 4.125 PROFILE MK-120 / 4.625  Painted yellow
2125288 2125289 2125290 2125291 2125647 2125249 2125648 2125250 2125251 0200600	1.8 3.7 5.5 7 8.7 11.4 12.1 14.6 18 19.98	TUBE 48/0.5 TUBE 48/1.1 TUBE 48/1.6 TUBE 48/2.1 TUBE 48/2.6 TUBE 48/3.1 TUBE 48/3.6 TUBE 48/4.1 TUBE 48/5 TUBE 48/6  Galvanised (the 6 m one is painted)	2211165 1861122 7238001	6.9 0.39 0.22	VM HANDRAIL SUPPORT LONG PANEL BOLT HEXAGONAL NUT 15  Painted yellow      Zinc-coated
0260505	3.4	SIMPLE BRACING  Painted yellow	0121004	2.9	HANDRAIL SOCKET D50  Painted yellow
0333008 0333009	14.1 19.4	LADDER C2.1 LADDER C3  Painted yellow	2125148 2125147	1.2 1.3	RIGHT ANGLE COUPLER 48/48 SWIVEL COUPLER 48/48  Galvanised (bichromate-treated screw jack)

Item no.	Weight (kg)	Item name	Item no.	Weight (kg)	Item name
0333012	13,1	LADDER PROTECTION  Painted yellow	0230100 0234100	1.7 2.6	TIE ROD 15/1 TIE ROD 20/1 
0333013	11.7	LADDER HATCH  Structure painted black + board	1901250	3	CONE-WALER TIE 90  Zinc-coated (bichromate-treated nut)
0333018	2.83	WIND SLING 12 (5T) 	1900210 0238045 1900211	0.2 0.32 0.04	CONE POSITIONER M24 CONE POSITIONER M30 POSITIONER SPANNER  Zinc-coated
1901804 0333016	2 2.98	WIND SLING FIXER M24 WIND SLING FIXER M30  Painted black	0252070 0253215 0253413 0250000	0.28 1.05 1.1 0.03	PIN E20x70 PIN D32X150 PIN W/HEAD D34X135 COTTER PIN R/5  Zinc-coated      Zinc-coated Bichromate-treated
1904080 0238050	1 2	CONE DW15/M24 CONE DW20/M30  Bichromate-treated	0241690 0241670 0241645 0241614 0242080 0241600 0241601 0241608 0242008 9700225 9700226	0.16 0.14 0.10 0,24 0.26 0.03 0.01 0.04 0.06 3.9 0.2	BOLT M16X90 DIN 931-8.8 BOLT M16X70 DIN 933-8.8 C BOLT M16X45 DIN 933-8.8 C BOLT M16X140 DIN 931-8.8 BOLT M20x80 DIN 931-8.8 NUT M16 DIN 934 – 8 WASHER A16 DIN125 LOCKNUT M16 DIN985-8 LOCKNUT M20 DIN 985 – 8 TELESCOPIC RATCHET WRENCH 3/4 SOCKET 3/4 WIDTH ACROSS FLATS 24
1901089 0238043	1.6 1.62	CLIMBING RING DW15-NT20 CLIMBING RING NT20  Zinc-coated (DW 15-NT20) / Bichromate treated (NT 20)	9053013 0243013	0.54 0.92	BOLT M24X120 DIN-931-10.9 BOLT M30X130 DIN-931-10.9
0230005 0238025	0.56 0.97	FIXED ANCHOR DW15 FIXED ANCHOR DW20  Painted black			

## 2.2. ITEMS DESCRIPTION

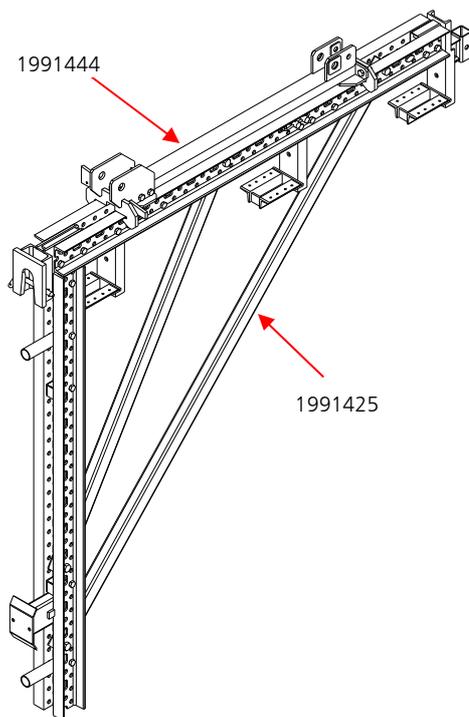
### 2.2.1. Climbing Bracket BMK-240 (1991424)

The shown climbing bracket is equipped with the mobile stripping configuration, that is, with roll-back carriage.

The means of transmission of all acting loads to the concrete are the anchor cones.

The climbing bracket consists of:

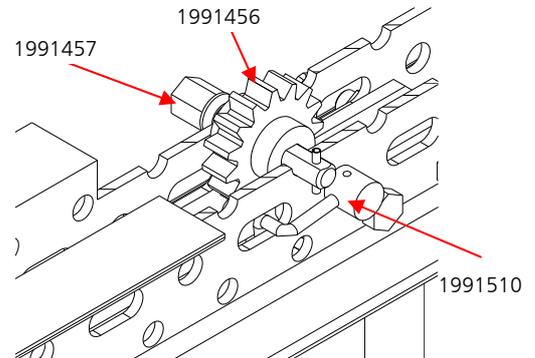
- BMK-240 Frame (1991425)
- Roll-Back Carriage MK (1991444)
- Gear MK (1991456), Gear Shaft MK (1991457)
- Gear Locker MK (1991510), Cotter Pin R/4 (9023100)



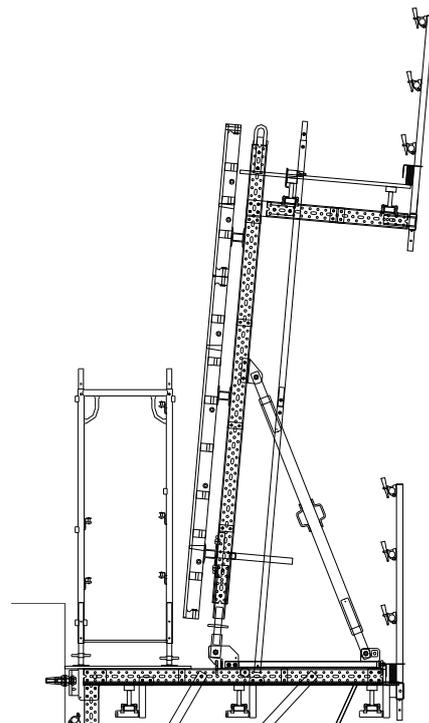
The Roll-back carriage allows moving the formwork back to different distances depending on the formwork product:

	STRIPPING DISTANCE
ORMA	915mm
Enkoform V-100	815mm
Enkoform VMK	795mm

As mentioned, the stripping system works with a rack and pinion mechanism assembled to the centre part of the horizontal beam of the climbing bracket.



The obtained stripping distance is sufficient to be able to use BRIO or DORPA scaffolding to place the steel reinforcement.



### 2.2.3. BMK-240 Frame (1991425)

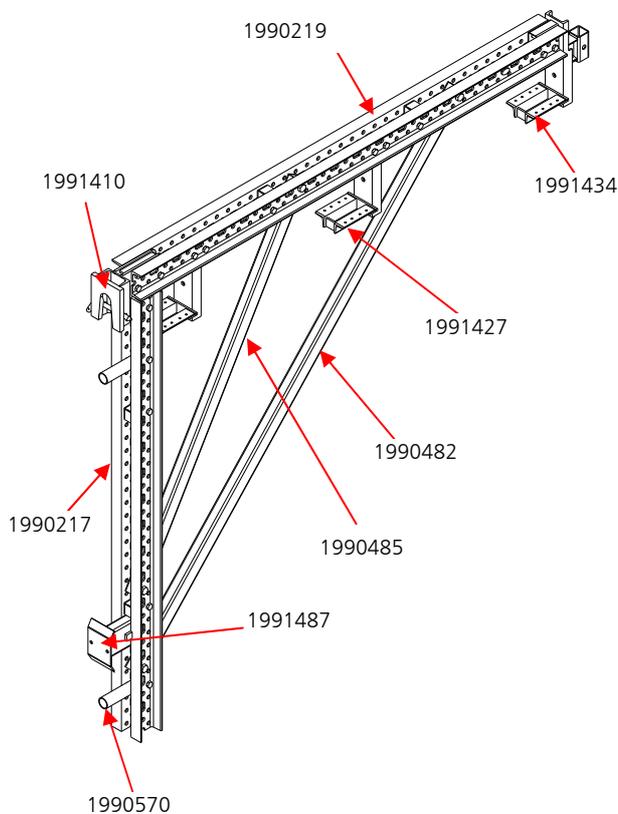
The frame consists of standard walers MK-120 with different MK accessories bolted and pinned to them.

The following walers are used as:

- Horizontal beam: MK-120/ 2.375-1990219
- Vertical beam: MK-120/ 2.125-1990217

All accessories except for the diagonals are fastened to the walers MK with Bolts M16x90 (0241690) and Locknuts M16 (0241608). The diagonals are fastened with the following Bolts M20x100 (0242010) and Locknuts M20 (0242008).

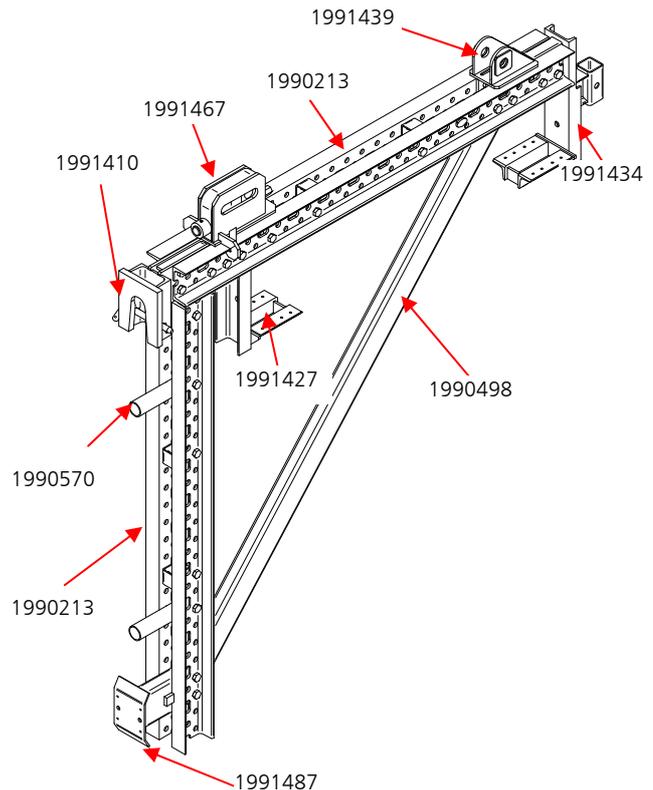
The system offers high flexibility as the accessories can be easily relocated to different positions along the waler MK and even different accessories of the MK system can be bolted to the climbing bracket.



### 2.2.4. Climbing bracket BMK-170 (1991417)

This bracket can get equipped only with the fixed stripping configuration.

The waler MK-120/1.625 is used as horizontal as well as vertical beam. It moreover consists of the Tilt-Back MK-120 (199467) and Push-Pull Prop Head MK-120 (1991439).



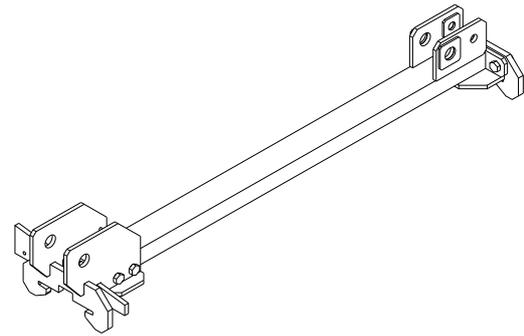
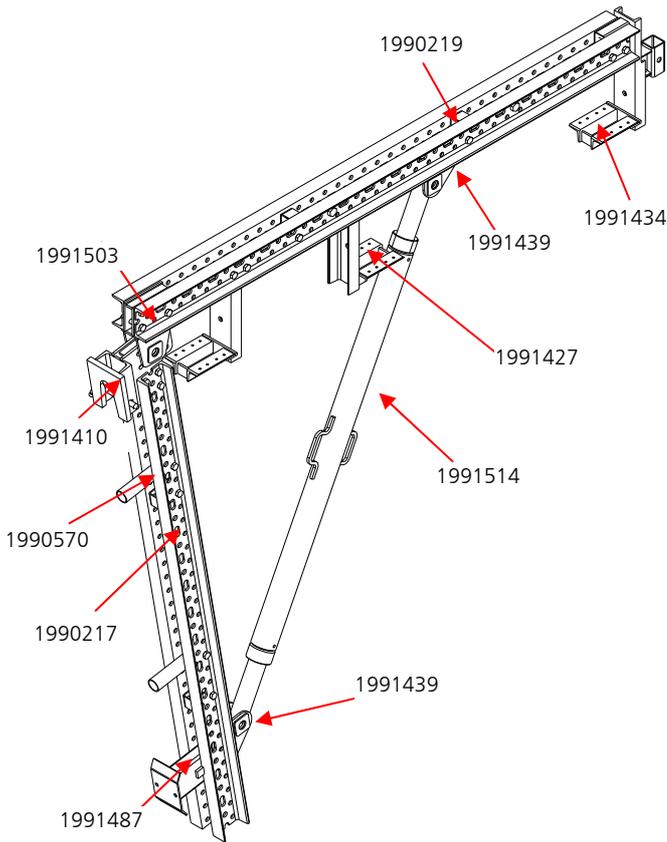
### 2.2.5. Hinged BMK-240 Bracket (1991465)

It consists of standard walers MK-120 with different accessories bolted and pinned to it.

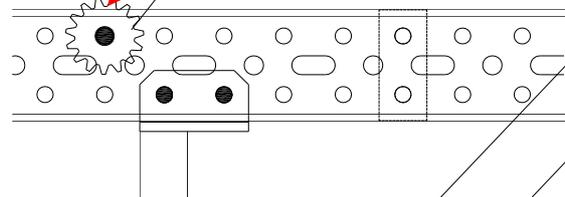
The walers used are:

- Horizontal beam: MK-120/ 2.375-1990219
- Vertical beam: MK-120/ 2.125-1990217

All accessories except for the push-pull prop are fastened to the walers MK with Bolts M16x90 (0241690) and Locknuts M16 (0241608). The push-pull prop is joined to the Push-Pull Prop Head MK-120 (1991439) with Pins 32x150 (0253215) and Cotter Pins R/5 (0250000).

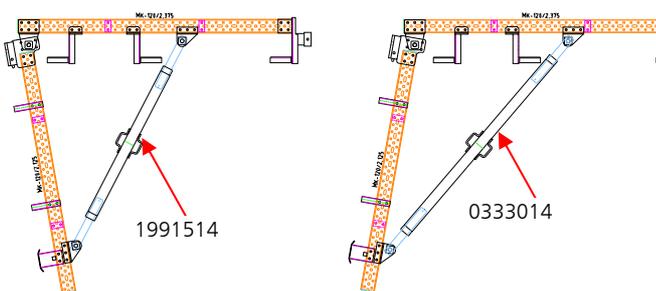


- 1 Gear MK (1991456)
- 1 Gear Shaft MK (1991457)
- 1 Spring Pin Ø5x30 DIN-1481

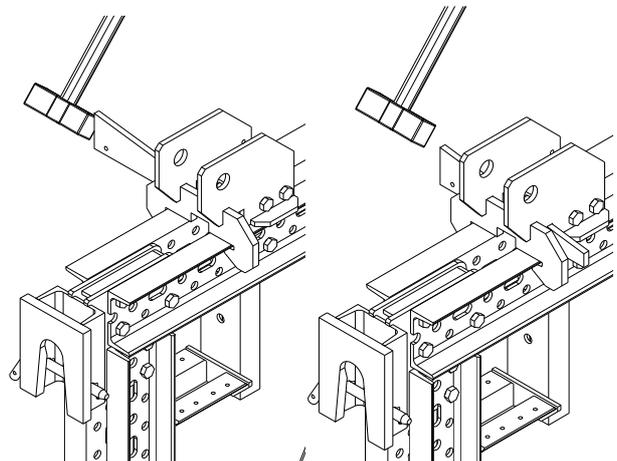


 To ensure the correct working of the Roll-Back Carriage, the Gear MK must be positioned at the place indicated in the assembly drawings of the Climbing Brackets.

For the cases that the angle is greater than 90°, the Push-Pull Prop TR63x6 2.04-2.72 (0333014) is used instead of Push-Pull Prop TR63x6 1.52-2.2 (1991514).



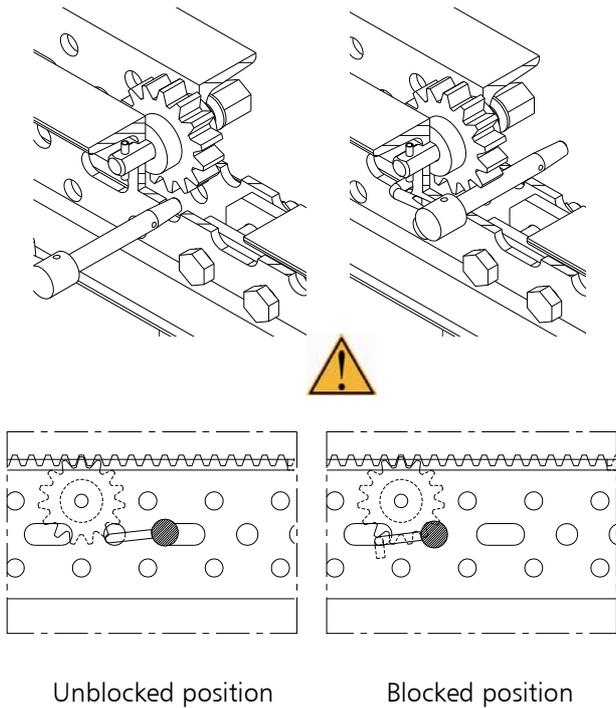
Before working on the climbing bracket, the carriage must get blocked with the incorporated wedge.



### 2.2.6. Roll-Back Carriage MK (1991444)

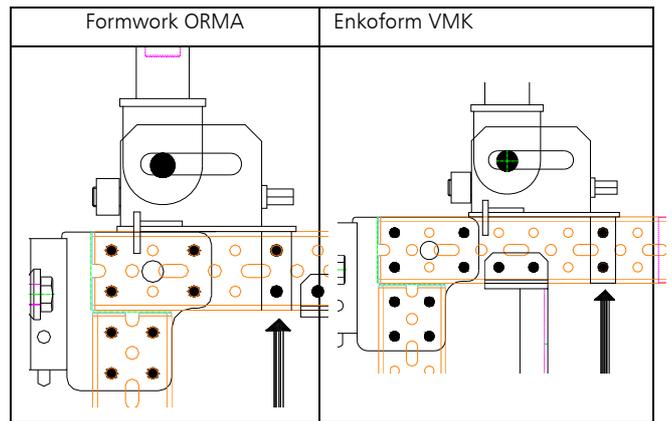
This item slides along the horizontal beam of the climbing bracket. Connected to the formwork panel, it moves the panel back for stripping.

For out-of-service cases and whenever moving the climbing bracket with crane, the carriage must be fixed with the safety item Gear Locker MK (1991510).



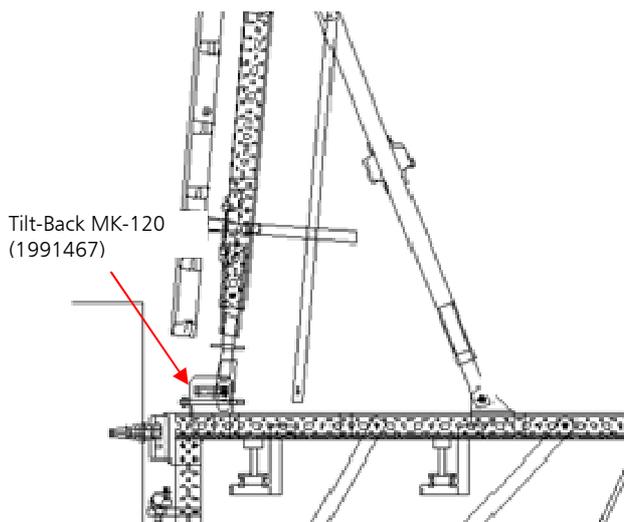
The Tilt-Back MK-120 (1991467) is fastened to the bracket frame with Bolts M16x90 (0241690) and Locknuts M16 (0241608).

Depending on the formwork type used, the Tilt-Back MK-120 is placed at different positions, the standard one is the position of the ENKOFORM VMK.



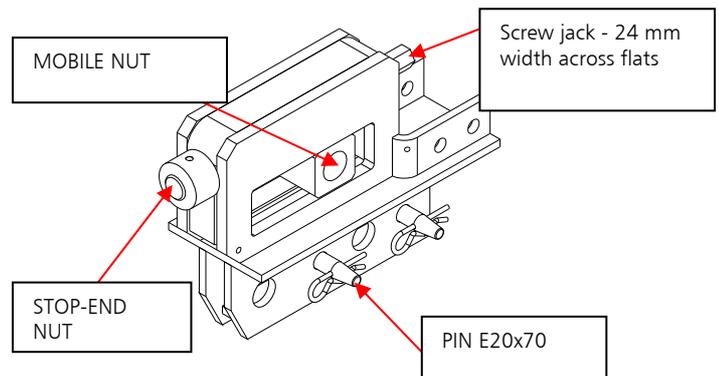
**2.2.7. Tilt-Back MK-120 (1991467)**

Whenever there is no necessity for a stripping distance as wide as the one provided by the Roll-Back Carriage, the Tilt-Back MK-120 system is used. This item separates the formwork from the wall by approximately 5 cm and subsequently tilts it.



**2.2.8. Inclined Tilt-Back MK-120 (1991463)**

It is used with the Hinged BMK-240 Bracket (1991465) in cases where the inclination of the wall is above 5° (at the side of the inclined formwork).



It enables the detachment of the formwork from the wall by 5 cm. It is joined on one side to the vertical waler with Pin w/Head D34x135 and on the other to the climbing bracket frame.

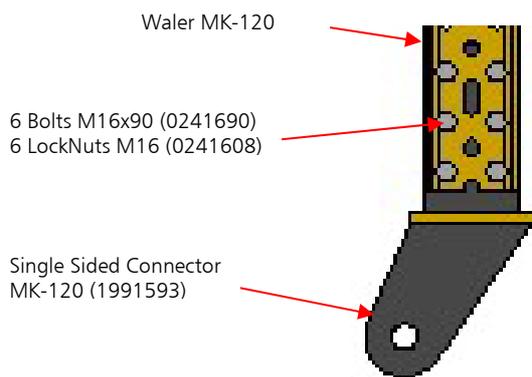
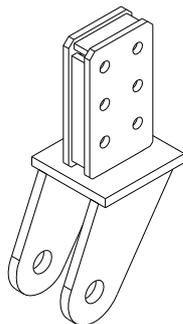
By adjusting the screw jack for stripping, the mobile nut is caused to slide along the slot. The Pin D34 inserted into the mobile nut and connected to the

vertical waler drags the vertical waler with the attached formwork away from the wall.

The position of the inclined tilt-back differs with respect to the formwork type and wall geometry (changes in sections, etc.). Therefore, the positioning of the pins along the horizontal beam of the climbing bracket must be studied individually for each project.

**2.2.9. Single Sided Connector MK-120 (1991593)**

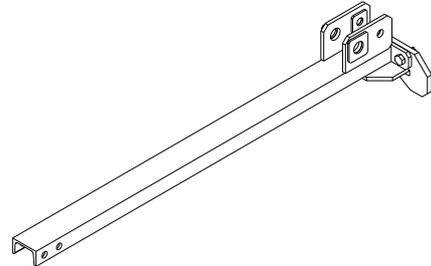
This part is bolted to the waler MK-120 at one end and pinned to the Inclined Tilt-Back MK-120 at the other with a Pin w/Head D34x135.



One feature of this item is that it can be assembled in both directions depending on the formwork used.

**2.2.10. Rack Assembly MK-120 (1991450)**

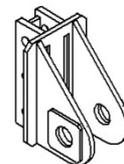
It is a sub-assembly of the Roll-Back Carriage MK-120 (1991444) and is used in combination with the Tilt-Back MK-120 (1991463) for inclined wall solutions.



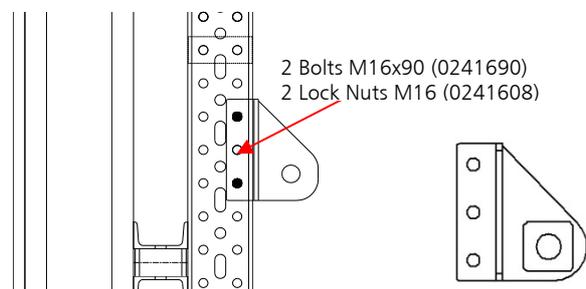
The joint with the Tilt-Back MK-120 is fastened with 2 Bolts M16x140 DIN 931-8.8 (0241690), 2 Nuts M16 DIN-934-8.8 (0241600) and 2 Washers A16 DIN-125 (0241601).

**2.2.11. Push Pull Prop Head MK-120 (1991439)**

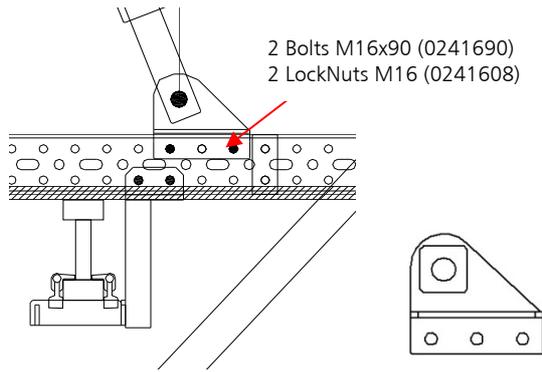
This part is used to connect the push-pull prop with the waler MK-120.



It is usually fastened to the vertical waler as well as on the horizontal beam in the case of the climbing bracket BMK-170 and the Tilt-Back MK-120 with BMK-240 and BMK-220 Frames.



Head on vertical waler

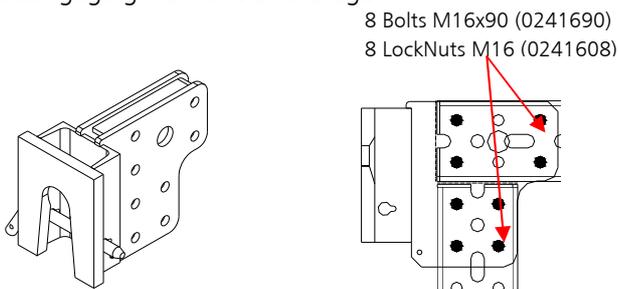


Head on horizontal beam of BMK-170

It is also used for inclined wall solutions.

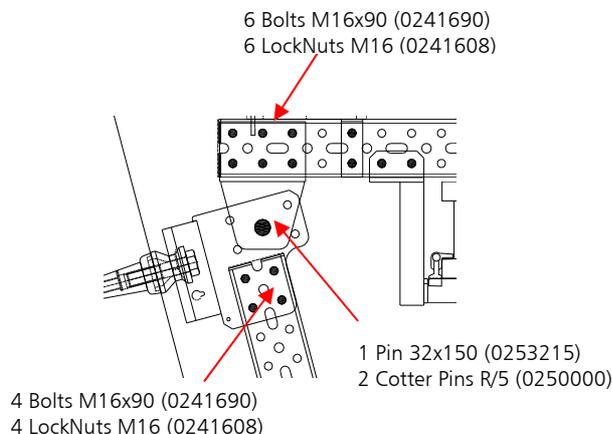
**2.2.12. Right Angle Head (1991410)**

Head to support the climbing bracket on the wall anchorages. The included safety pin prevents it from disengaging from the anchorage.



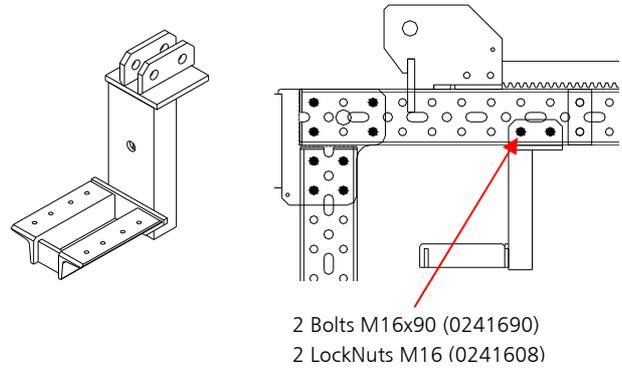
**2.2.13. MK Hinged Head (1991503)**

This head does the same for inclined wall applications, until walls with a maximum slop of  $\pm 15^\circ$ .



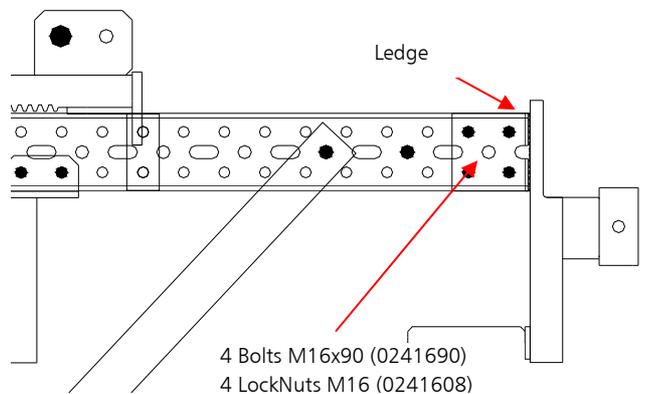
**2.2.14. Platform Support MK-120 (1991427)**

Item to which the beams or walers are assembled to form the platform. It is fastened to the waler with bolts M16.



**2.2.15. Platform Back Support MK-120 (1991434)**

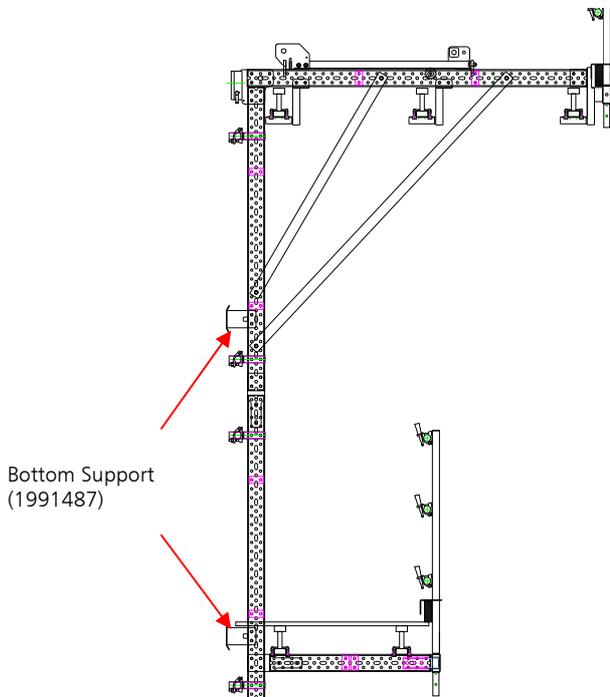
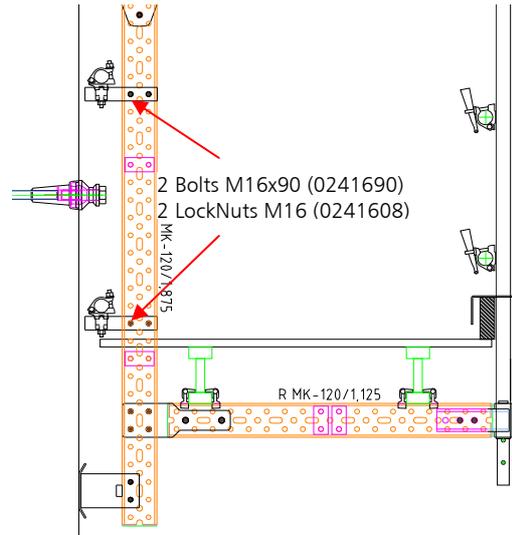
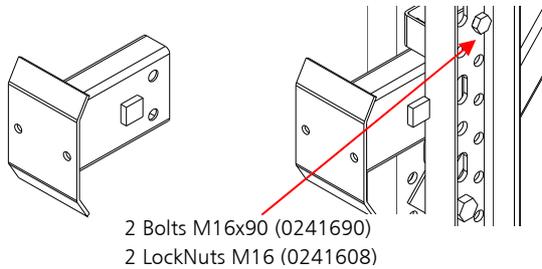
Item placed at the back part of the climbing bracket to assemble the platform. It is fastened to the waler with bolts M16.



The Platform Back Support MK-120 has a ledge incorporated to prevent the carriage from disengaging from the horizontal waler.

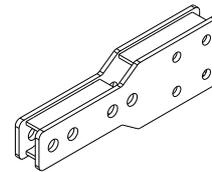
**2.2.16. Bottom Support (1991487)**

This accessory is placed on the vertical waler of the main platform and on the waler MK used for the cone recovery platform.

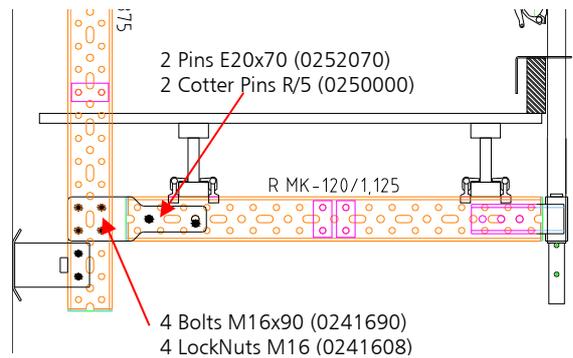


**2.2.18. Axial node M2-D20 MK (1991458)**

This part is a joint used for the creation of the platforms (pouring/ intermediate/ cone recovery).

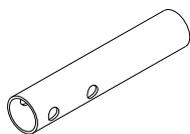


The Axial Node M2-D20 MK is bolted to the waler MK according to the pouring height.

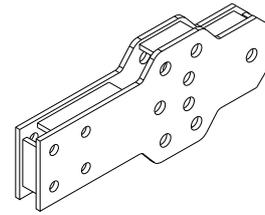
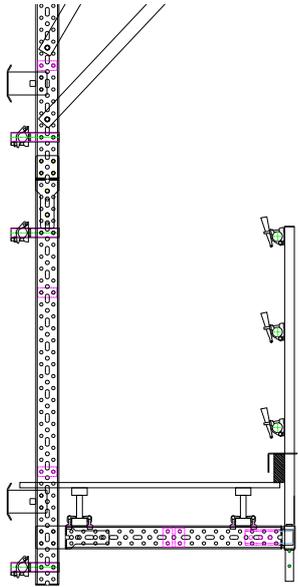


**2.2.17. Handrail Head MK (1990570)**

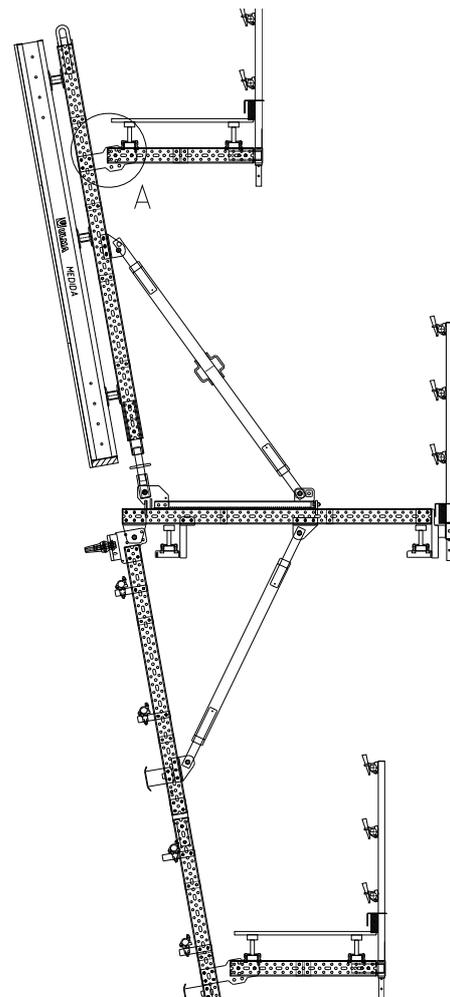
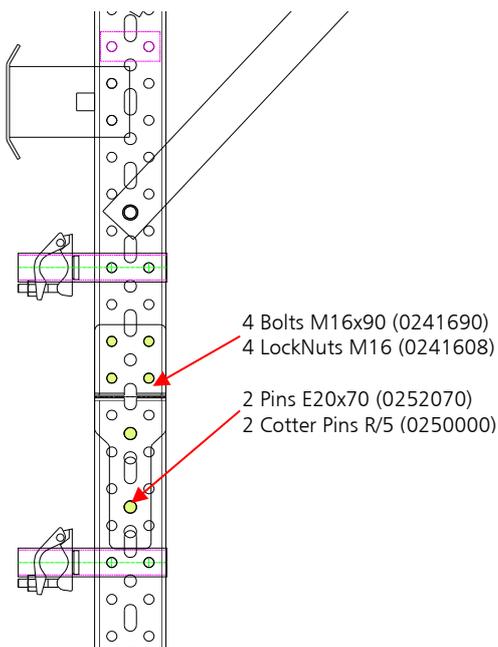
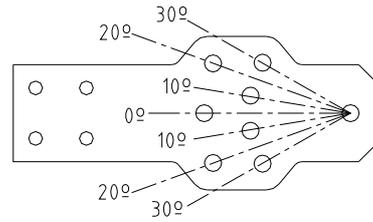
Tube which serves as support for the couplers of the climbing bracket bracing and for the walers of the cone recovery platform.



It is also used to connect the main platform to the cone recovery platform.

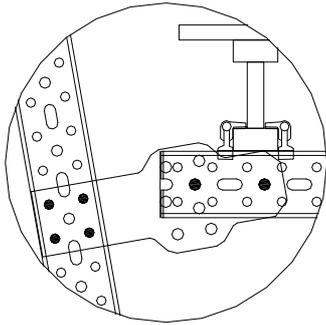


Covers inclinations of  $\pm 10^\circ - 20^\circ - 30^\circ$

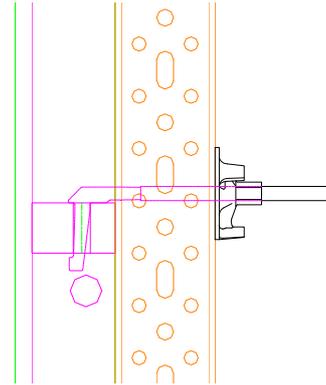


**2.2.19. Walkway Hinged Connector (1991476)**

This part is a joint used for the creation of the platforms for inclined wall solutions. With this connector, the platforms are kept in horizontal plane.

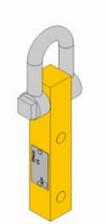


detalle A

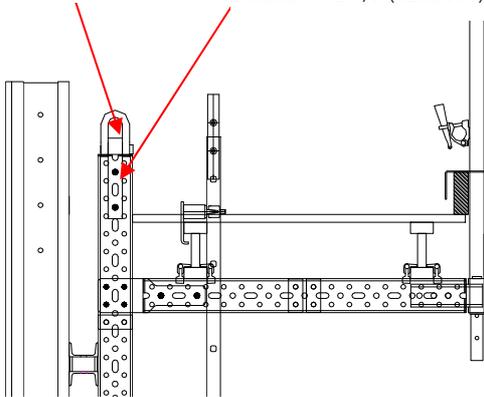


**2.2.20. Lifting Hook MK (1991360)**

Item used to lift the structure. It is joined to the top part of the vertical waler (waler MK) fastened with 2 Pins E20x70.



- 1 Lifting Hook MK (1991360)
- 2 Pins E20x70 (0252070)
- 2 Cotter Pins R/5 (0250000)

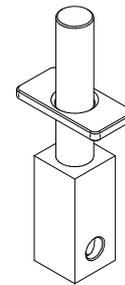


**2.2.21. Waler Hook (1900448)**

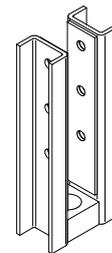
Connection part between vertical walers and ORMA formwork panels.

**2.2.22. Waler Screw TR53x6 (0302020)**

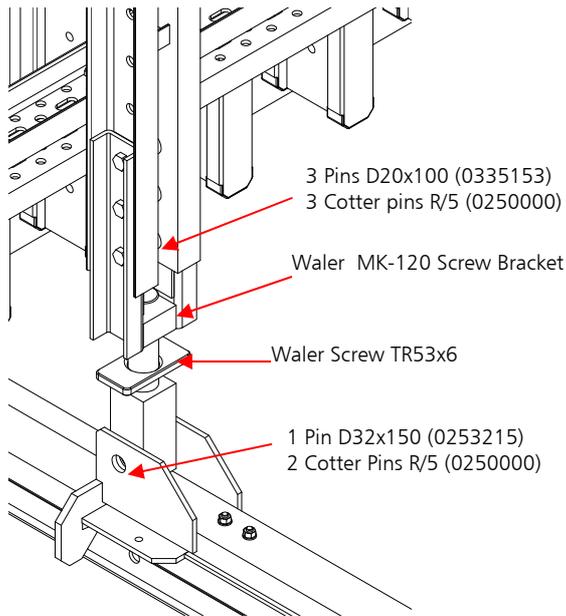
This part joins the vertical waler with the Roll-Back Carriage and enables height adjustments.



The following parts are required for the joint.

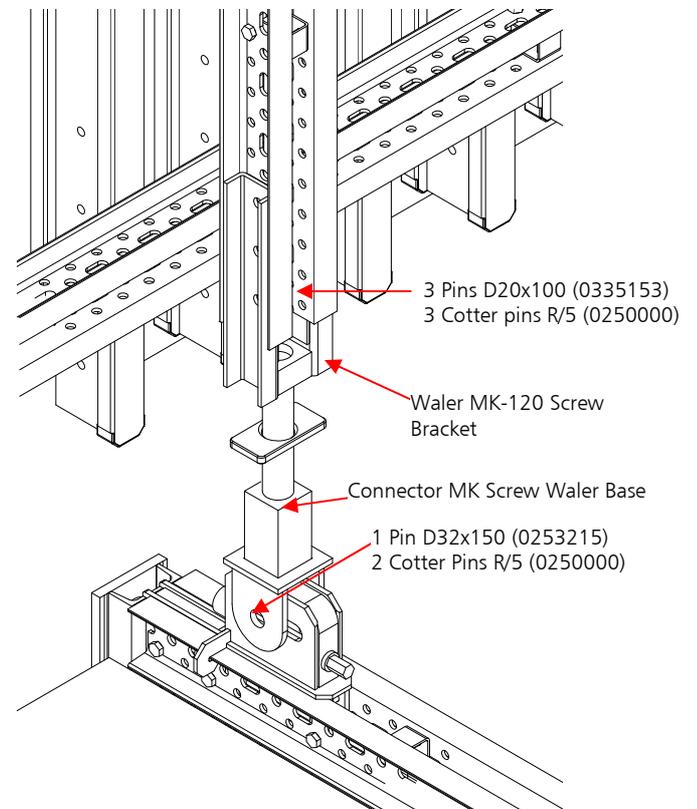
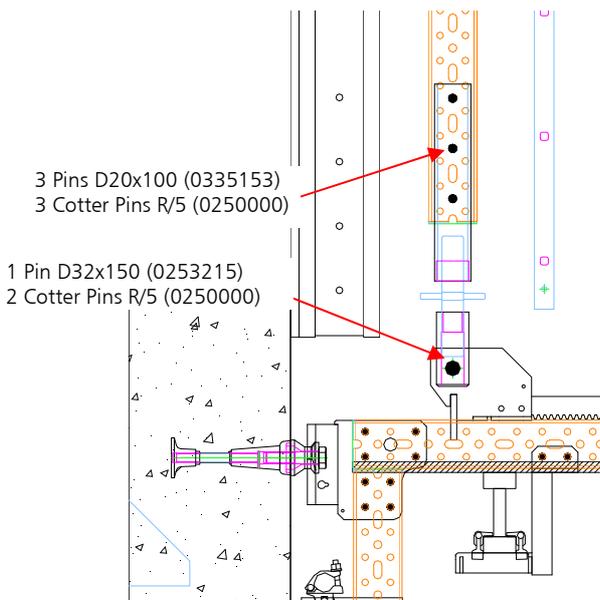
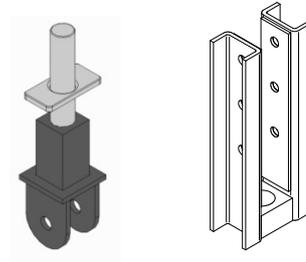


- 1991570 – Waler MK-120 Screw Bracket : This item connects the screw jack with the vertical waler.



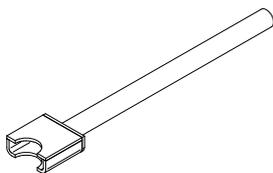
**2.2.23. Connector MK Screw Waler Base (1991517)**

This part connects the vertical waler with the Tilt-Back MK-120 (1991467). This way the panel height is adjusted with the screw jack.



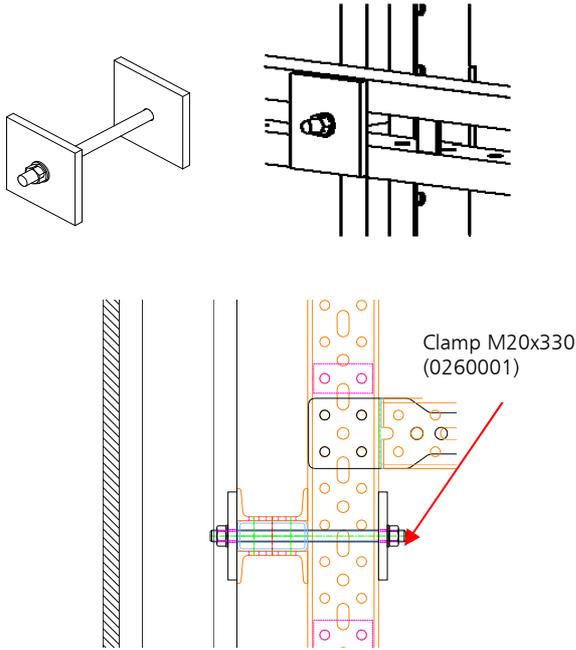
To operate the screw:

- 0331013- Handle screw TR53. This item introduced into the plates makes easier to move it.

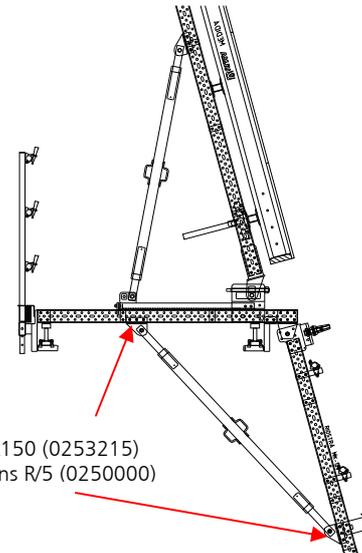


**2.2.24. Clamp M20x330 (0260001)**

It is used to join two walers, primarily the vertical waler to the horizontal waler of ENKOFORM formwork.

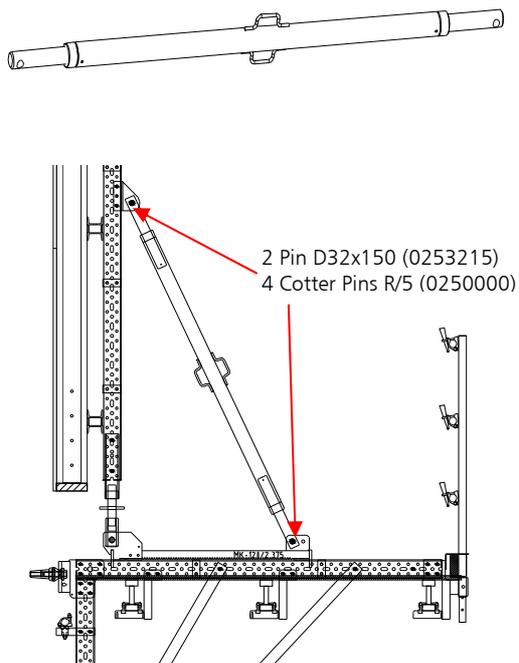


It is also used as diagonal for the hinged climbing bracket.



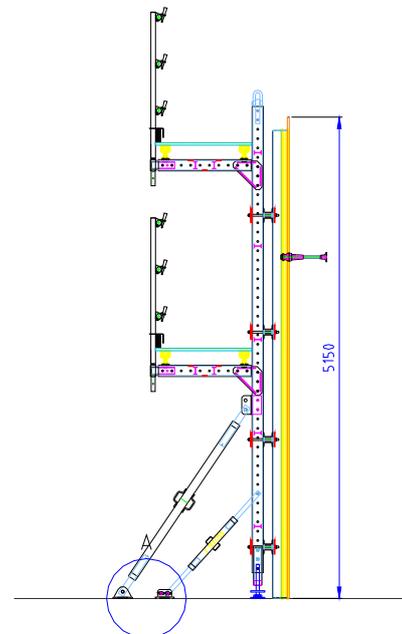
**2.2.25. Push-Pull Prop TR63x6 2.04-2.72 (0333014)--Push-Pull Prop TR63x6 1.52-2.2 (1991514)**

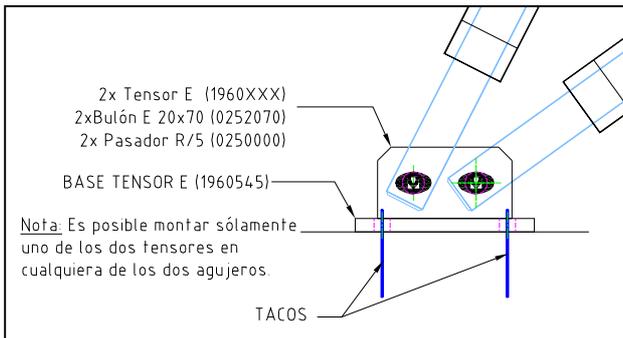
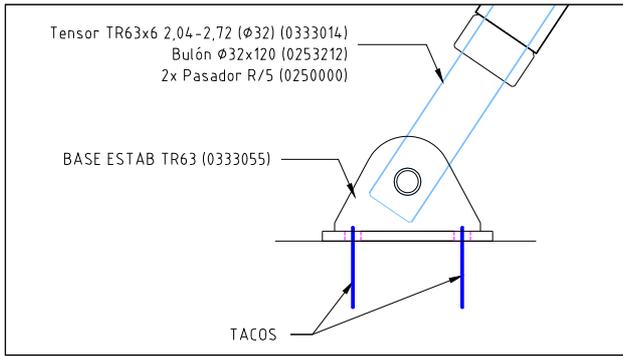
These props are used to plumb and strip the panels by connecting the vertical walers with the climbing bracket.



**2.2.26. Push-Pull Prop Shoe TR63 (0333055) and Push-Pull Prop E Shoe 2 D20x48 (1960545)**

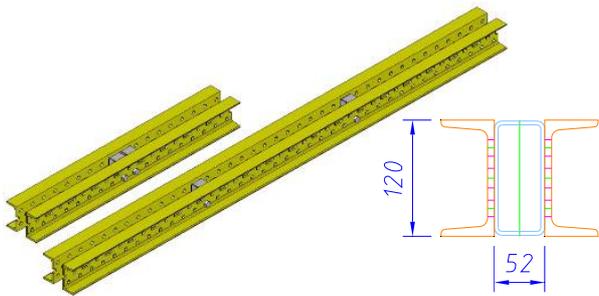
These shoes are used to stabilise the panel of the vertical formwork at the first pouring stage on the ground.





To validate the use of these shoes, see the User's Guide Push-Pull Prop Shoes.

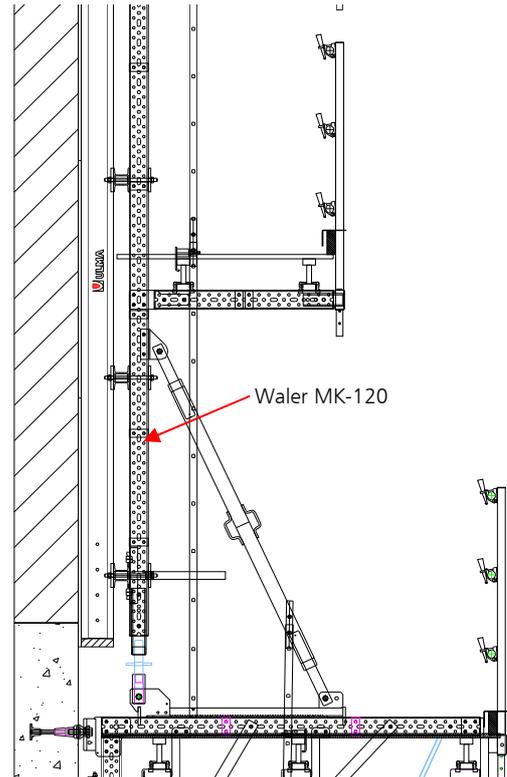
### 2.2.27. Walers MK-120



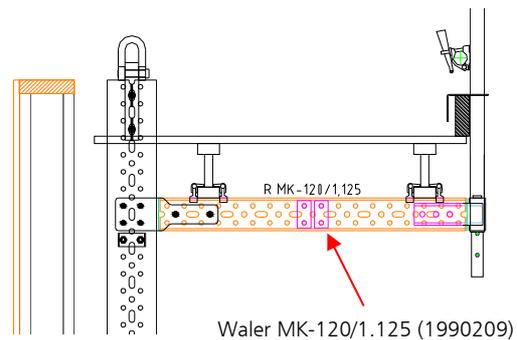
The main applications of the Waler MK-120 are the following:

- As vertical waler: vertical connection beams between the formwork and the climbing bracket BMK.

The lengths used depend on the formwork height.

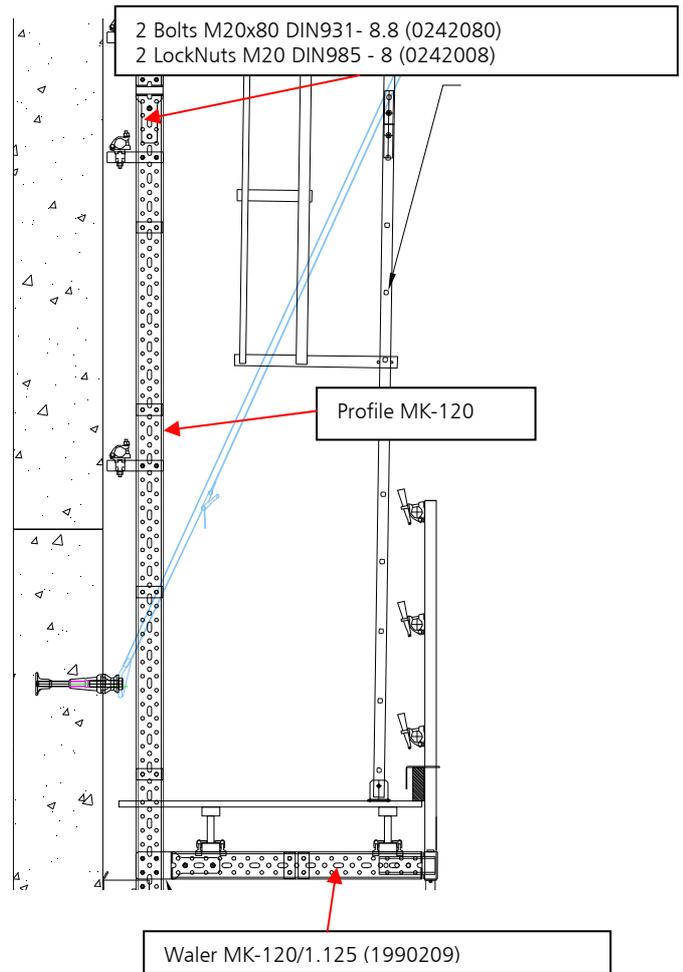
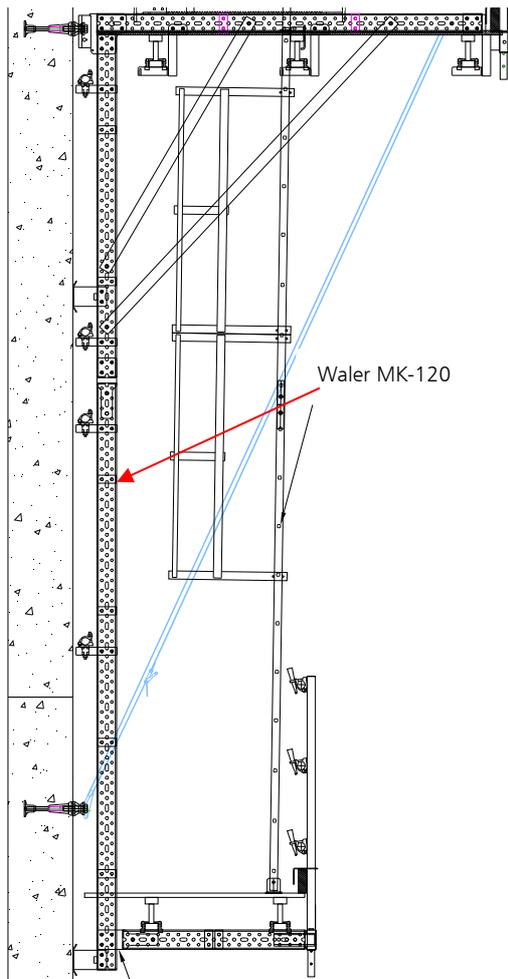


- As part of concrete pouring, vertical waler and cone recovery platform: transversal beams on which the timber beams VM20 are placed parallel to the wall. The most commonly used waler length is the Waler MK-120/1.125 (1990209). It is fastened with the Axial Node M 2-D20 MK (1991458).



- As part of the cone recovery platform: longitudinal beams, fastened to the climbing bracket with Pins E20x70.

The lengths used depend on the pouring height.



### 2.2.28. Profiles MK-120

The range of Profiles MK-120 can be used to replace the Walers MK-120 as vertical beam of the cone recovery platform.

With the same accessories, the profile is placed on the side of them and is fastened with bolts and nuts.

### 2.2.29. Timber Beams VM20

Timber beams are used to deck all working platforms.

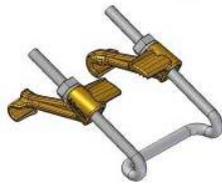


These are the item numbers and available lengths:

Item no.	Length	Item no.	Length
1940172	1.90m	1940146	3.60m
1950129	2.45m	1950112	3.90m
1940144	2.90m	1950113	4.90m
1950130	3.30m	1940149	5.90m

**2.2.30. Waler-VM20 Clamp 2T (1960375)**

Part to tie the timber beams VM20 to the walers.



**2.2.31. Platform board**

The beams VM20 of the platforms are commonly covered with planks or 3-layer board.

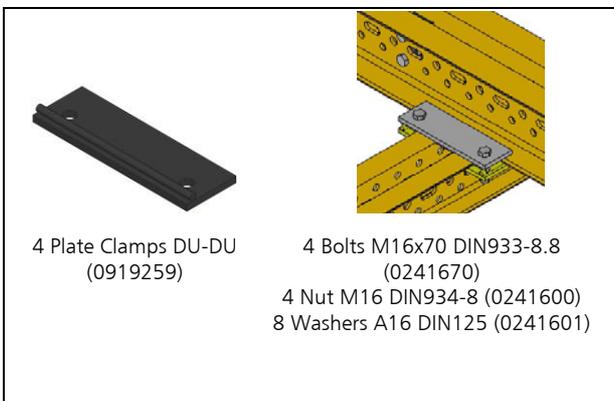
These are the main sizes of the 3-layer-board used:

- 3-Layer Board of 2000x503x27 (7251132)
- 3-Layer Board of 2500x500x27 (7251136)

The board is fixed to the timber beams with Screws 6x60 DIN-7505-A (0249911).

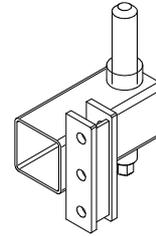
**2.2.32. Plate Clamp DU-DU**

It is used to join two walers MK-120 at 90°.

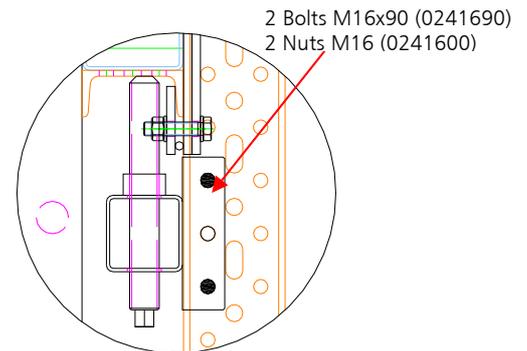


**2.2.33. Adjustment Jack MK-120 (1991567)**

It is used to prevent any possible vertical movement of the formwork.



It is fastened to the vertical walers (MK-120) with 2 bolts placed the way that the horizontal walers support on the jacks.

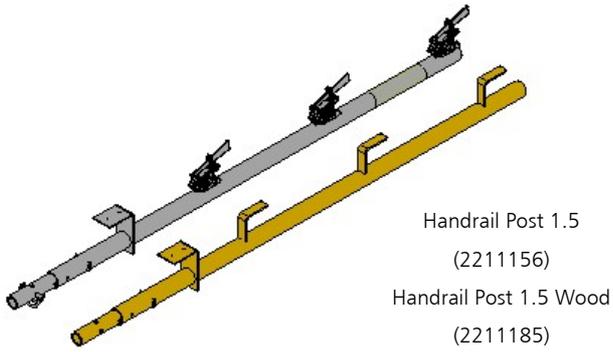


**2.2.34. Handrail Post 1.5 (2211156) and Handrail Post 1.5 Wood (2211185)**

They form part of the handrail system of the climbing brackets. Posts to which tubes or planks are connected thus providing a handhold.

The Handrail Post 1.5 has wedges to ease the assembly of the tubes.

It is inserted into the respective handrail support. The toeboard is hold by the mobile toeboard bracket.

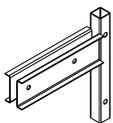
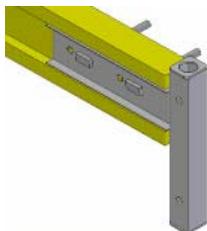


They following handrail post supports are available:

- 2211165 - VM Handrail Support Long
- 0121004 - Handrail Socket D50

**2.2.35. VM Handrail Support Long (2211165)**

Support type used to place handrails onto beams VM of which the platforms consist. It is tied to the beams with two Panel Bolts and two Hexagonal Nuts 15.



VM Handrail Support Long (2211165)



Panel Bolt (1861122)

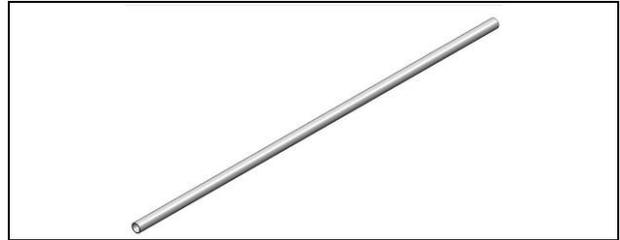


Hexagonal Nut 15 (7238001)

Also it is possible to tie with Bolt M16x90 (0241690) + Nut M16 DIN934 (0241600) + Washer A16 (0241601).

**2.2.36. Tube Ø48**

Tube serving as handhold for the handrail system of the different platforms.



These are the item numbers and available lengths:

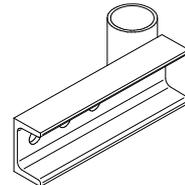
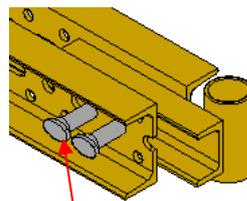
Item no.	Length	Item no.	Length
2125288	0.50m	2125249	3.10m
2125289	1.10m	2125648	3.60m
2125290	1.60m	2125250	4.10m
2125291	2.10m	2125251	5.00m
2125647	2.60m	0200600	6.00m

The tubes are connected to the wedges incorporated in the handrail posts.

They are also used as bracing during the initial assembly stage of the climbing bracket.

**2.2.37. Handrail Socket D50 (0121004)**

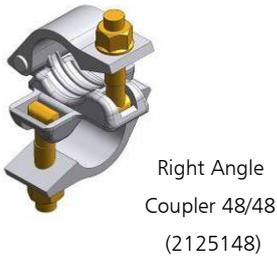
Support type used to place handrails onto walers MK-120 of which the platforms consist. The socket is placed inside the waler and fastened with two pins.



2 Pins E20x70 (0252070)  
2 Cotter Pins R/5 (0250000)

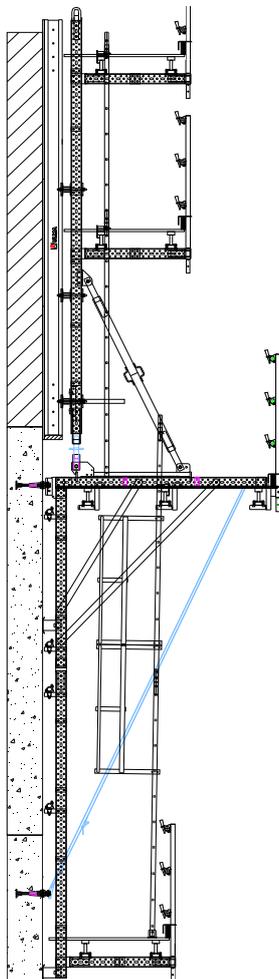
**2.2.38. Couplers 48/48**

Couplers are used to join two D48 tubes. The right angle coupler is used to join two tubes perpendicularly. The swivel coupler is used to join two tubes at different angles.



**2.2.39. Access Ladders between platforms**

Ladders provide access to the different working platforms. This is an example for access ladders:

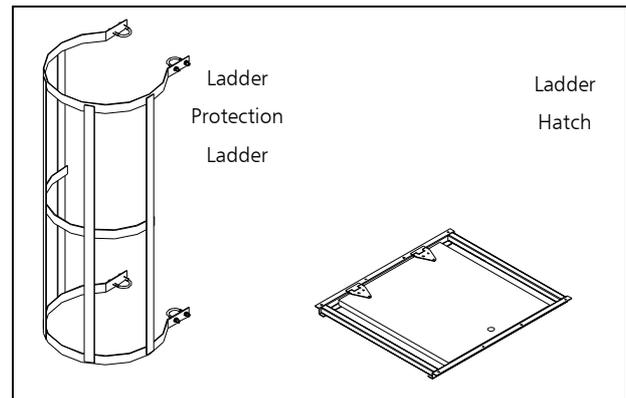


The ladder C2.1 and the ladder C3 can be used interconnected or separately depending on the pouring height.

**2.2.40. Ladder Protection (0333012) and Ladder Hatch (0333013)**

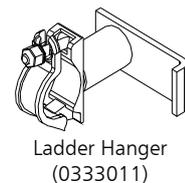
When the height is above 2.5 m, Ladder Protection is placed.

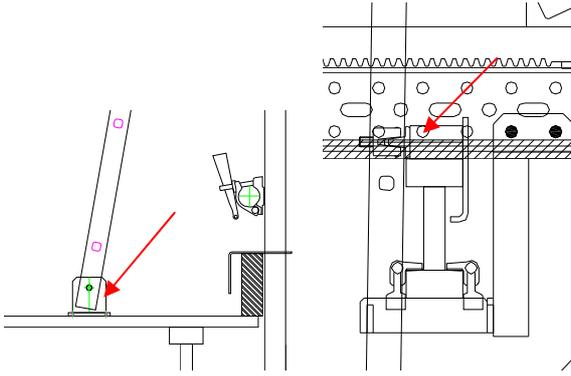
The Ladder Hatch is nailed to the wood of the working platforms. It eases the access to the platforms.



**2.2.41. Ladder Fixer (0333010) and Ladder Hanger (0333011)**

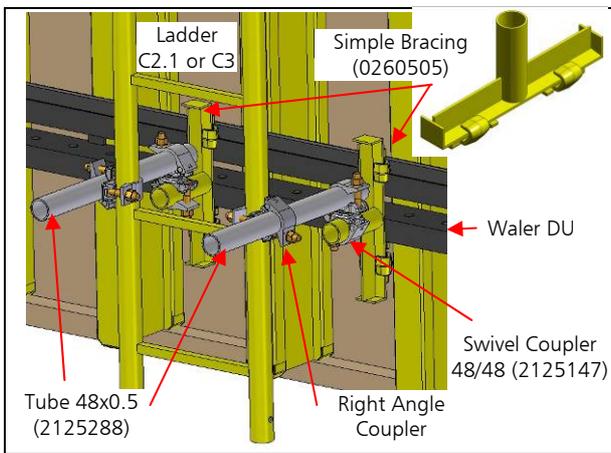
The Ladder Fixer and the Ladder Hanger are used to fix the ladder to the working platforms.





**2.2.42. Simple Bracing (0260505)**

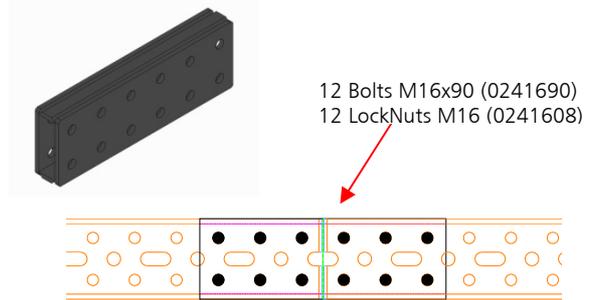
It is used on the main platform to fix the ladder to the formwork panel tied to the lower horizontal waler of the ENKOFORM panel (for an ORMA panel, another horizontal waler DU-100 must be placed held with panel bolts). A tube 48x0.5 connects the Simple Bracing (with swivel coupler) with the vertical pipe of the ladder (with right angle coupler).



**2.2.43. Orthogonal Joint MK (1990395)**

In certain situations, the main platform is decked with Walers MK-120 instead of Timber Beams VM20. For those cases, it may also become required to connect walers lengthwise in order to cover longer distances. This is obtained with the Orthogonal Joint

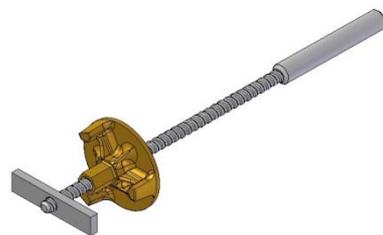
MK placed between two walers and fastened with bolts M16.



**2.2.44. Cone-Waler Tie 90 (1901250)**

This part consists of a threaded bar M24 at one end and Dywidag thread along the rest of the bar. A plate nut runs on the Dywidag thread secured from disengaging by a stop-end plate.

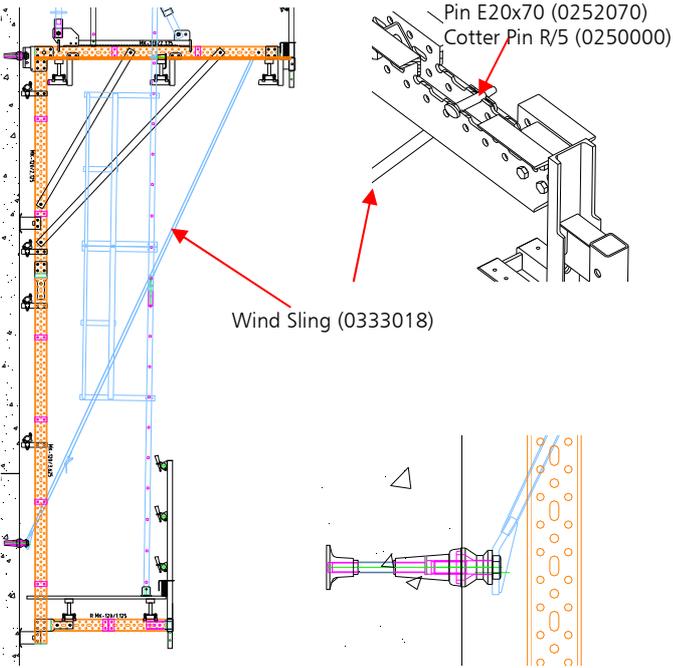
It is used to hold the anchor components onto ORMA panels. The ties are inserted into the tie holes of the panels and into additional holes drilled into the panel if required.



**2.2.45. Wind Sling (0333018) and Wind Sling Fixer M30 (0333016) or M24 (1901804)**

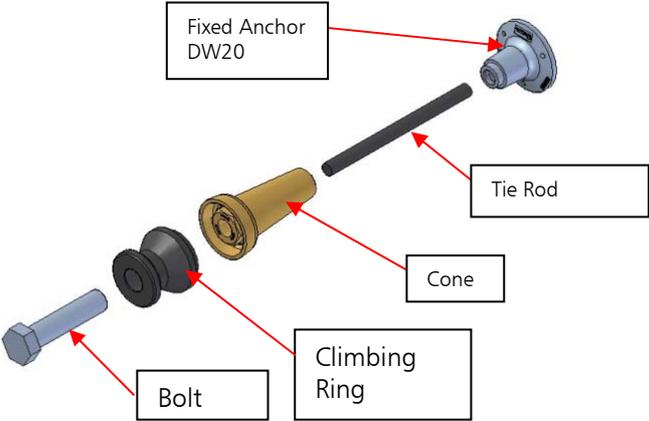
It prevents the overturning of the entire system under windy conditions. The climbing bracket BMK is fixed to the wall with the sling.

This sling is tied to the Pin E20X70 of the climbing bracket BMK and to the anchor cones of the previous pouring stage.



2.2.46. Anchorages

The anchoring system for the climbing brackets consists of:



Anchorage types DW15 as well as DW20 can be used with the system. Each case must be studied in terms of formwork type and area possible to be used.

Note: The reactions of the anchor cone must always be compared with the anchorage strength and concrete strength.

 See working load tables of the anchorages DW15 and DW20.

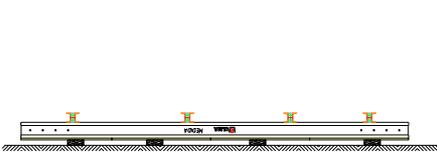
### 3. ASSEMBLY, USE AND DISMANTLING

Allow for an adequately sized and level working area to ease the correct assembly of the climbing system.

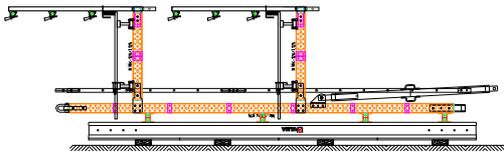
Subsequently, general guidelines for the assembly, use and dismantling of the system are described in detail.

#### 3.1. Instructions for the Climbing Bracket BMK system: First pouring stage on the ground

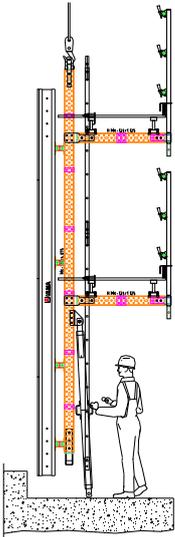
1. Assemble the formwork panels according to the instructions given below.
2. Fix the vertical walers to the formwork making sure that the distance between the walers is the same as the one between the cones. Bolt the walkway bracket onto the vertical walers to complete the platforms. The position of the platforms on the vertical waler depends on the pouring height.
3. Lift the structure and position it in the indicated location.
4. Place Base Plates and Push-Pull Props to plumb the formwork panel. Fasten the Base Plates. Do not let go of the panel with the crane until having anchored the formwork properly to the ground. Position the anchor cones to support the climbing system during the next pouring stage according to the indications in the assembly drawings.
5. Apply release agent and place the steel reinforcement.
6. Position the rest of the formwork panels.
7. Place tie rods along the rows of walers and pour the concrete according to the project.
8. Remove the tie rods and proceed with stripping by adjusting the push-pull props. Before actually removing the panels, place the climbing rings onto the cones from the concrete pouring platform. Remove the panels.



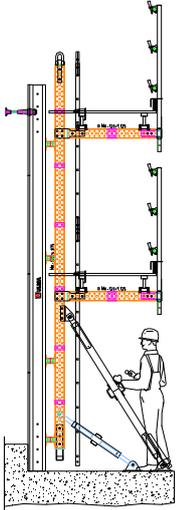
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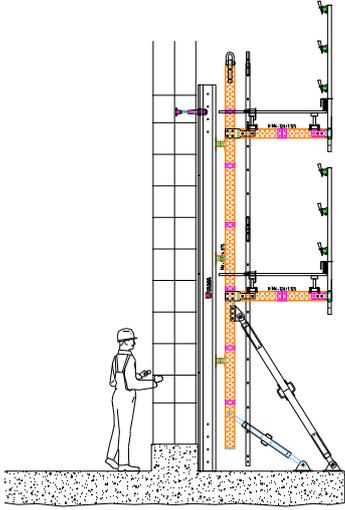
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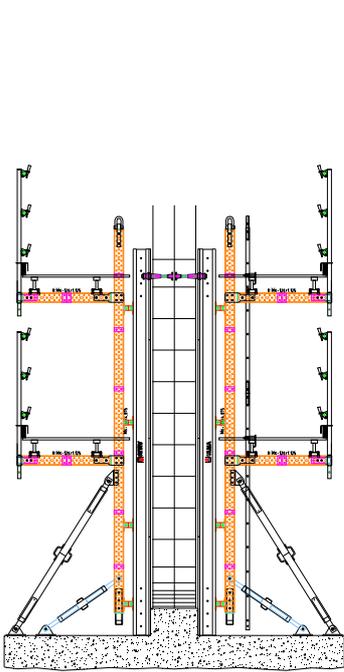
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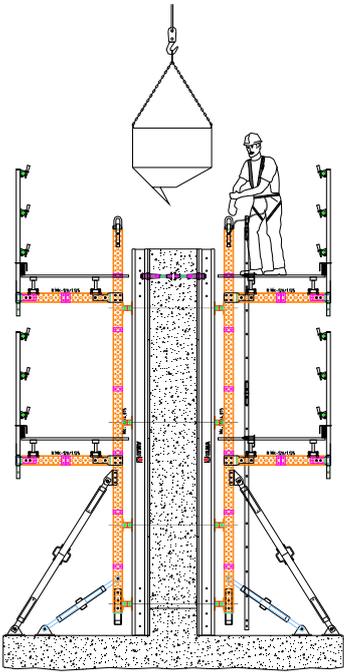
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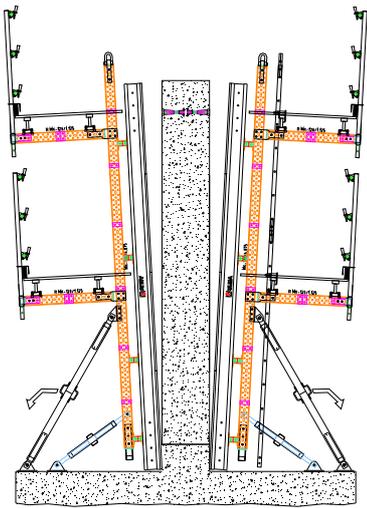
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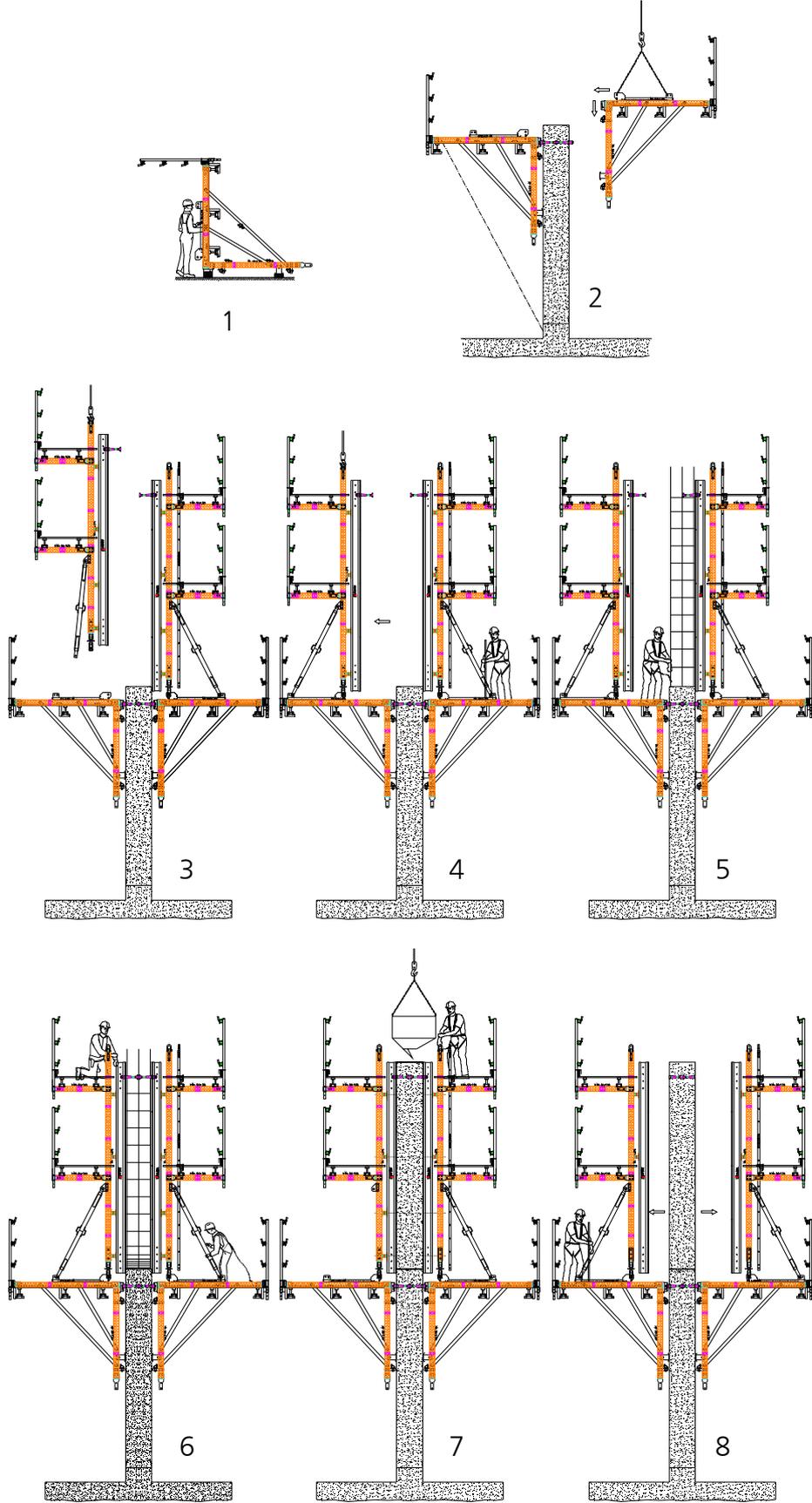
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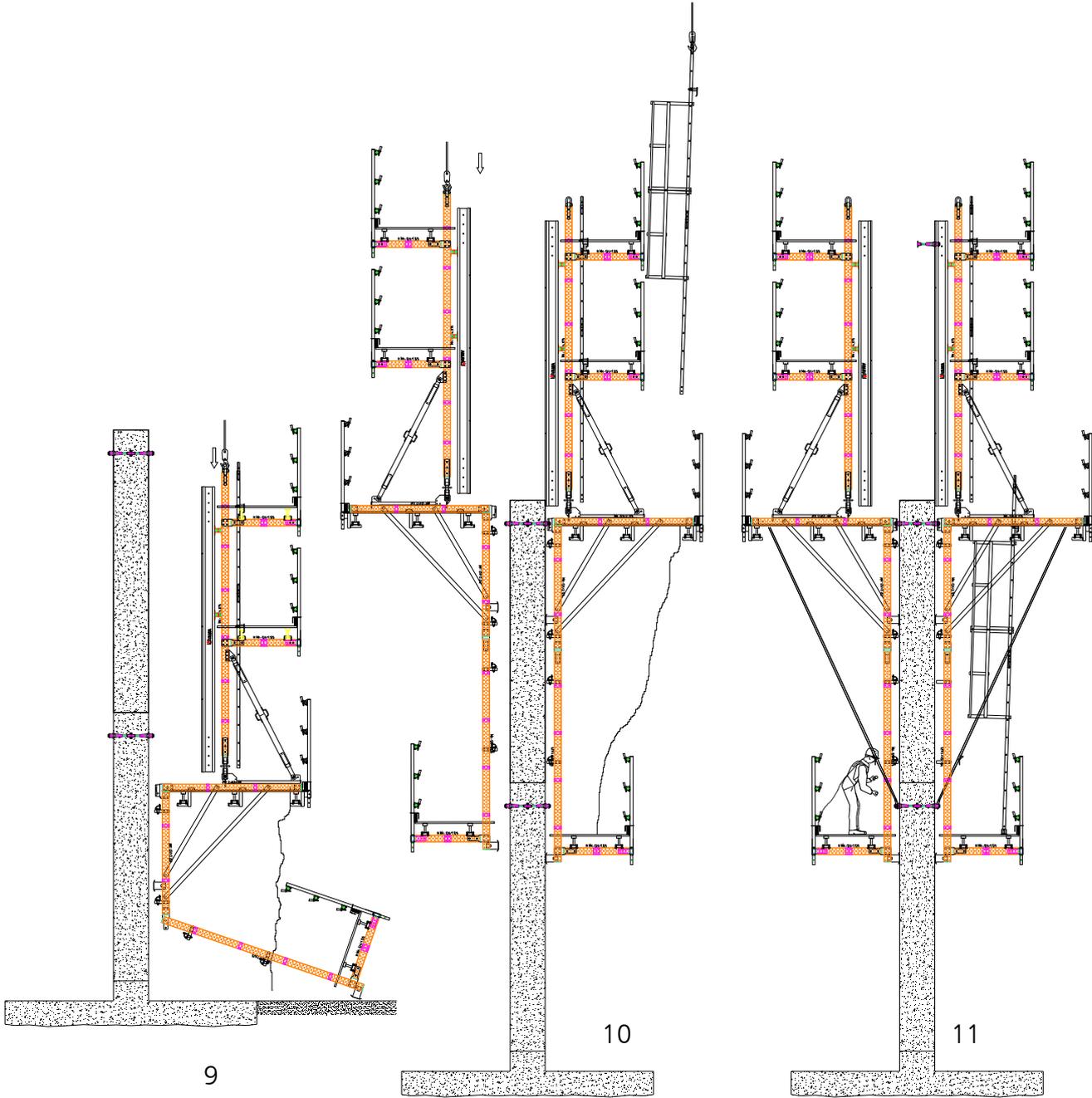
### 3.2. Instructions for the Climbing Bracket BMK system: Second pouring stage - first climbing stage

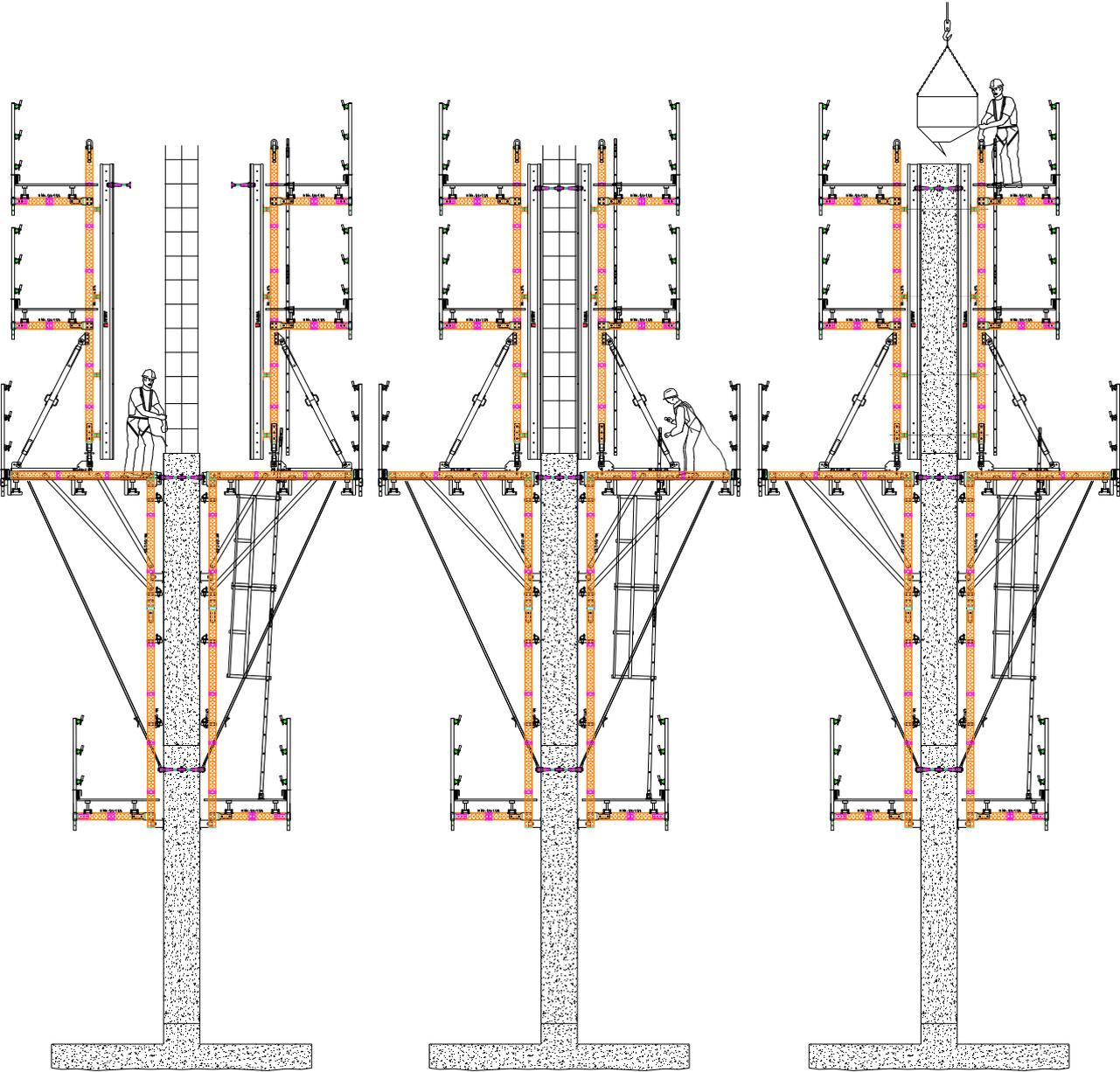
1. Hook the climbing bracket frames to a crane by positioning them vertically and parallel to each other at the distances indicated in the assembly drawings. Brace them with tubes  $\varnothing 48 \times 3$  and couplers. Assemble the working platform and place the Handrail Post onto the climbing bracket.
2. Lift the climbing bracket pair up and support them on the cones which have been previously placed.
3. Lift the panels one by one up onto the main platforms and pin the push-pull props to the main platform (through the Roll-Back Carriage).
4. Keep the panels from the wall at a distance which allows to work in between them.
5. Clean the panels, apply release agent and place steel reinforcement.
6. Move the panels closer to the concrete wall and plumb them with the push-pull prop. Check the cone positions by using topography techniques and level the formwork with the Waler Screw TR53X6.
7. Place tie rods and proceed with concrete pouring.
8. Strip the wall by keeping the panels separated from it at an approximate distance of 30 cm to be able to assemble the climbing rings to the cones from the concrete pouring platform.
9. Hook panel by panel to the crane and lower them to the ground to fasten the cone recovery platform to them with pins.
10. Formwork panel climbing:
11. Fix the wind bracing cable to the cones of the previous pouring stage and place the cones for the next climbing stage on the panel. Keep the panels separated from the wall.
12. Clean the panels, apply release agent and place steel reinforcement.
13. Check the cone positions by using topography techniques and level the formwork with the Waler Screw TR53X6. Move the panels to the wall into concrete pouring position and hit the wedge to block the roll-back carriage. Place tie rods between the panels.
14. Proceed with concrete pouring.



No workers are allowed on the working platforms during lifting operations.







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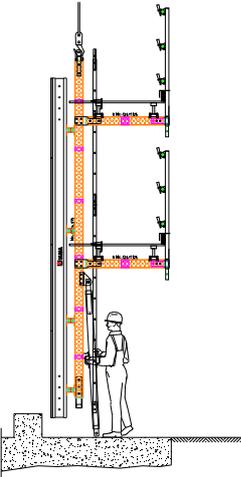
### 3.3. Instructions for the Climbing Bracket BMK system for the construction of hollow piers

1. Lift the structure and position it in the indicated location.
2. Place the Base Plates and Push-Pull Props to plumb the formwork panel. Do not let go of the panel with the crane until having anchored the formwork properly to the ground.  
  
Position the anchor cones to support the climbing system in the next pouring stage according to the indications in the assembly drawings.
3. Apply release agent and place steel reinforcement.
4. Position the inside formwork without platform and finish placing steel reinforcement. Before though, place the anchor brackets into the panel for the support of the inside platform. Place the rest of the outside panels.
5. Place tie rods and proceed with concrete pouring.
6. Separate the panels from the wall by adjusting the push-pull props at a distance which allows assembling the climbing rings to the cones from the concrete pouring platform. Remove the formwork and lower it to the ground.
7. Set the platform into the pier shaft the way the gravity pawls snap into the box-outs. Lift the climbing brackets and support them on the cones embedded in the concrete.
8. Assemble the outside panels onto the climbing brackets and the inside formwork onto the platform fixing it with chains and levelling it.
9. Separate the outside panels from the wall to get sufficient working area to place the cones and anchor brackets onto the inside formwork panel.
10. Clean the panels, apply release agent and place steel reinforcement.
11. Move the panels to the wall, plumb and level them. Check the cone positions by using topography techniques.
12. Place tie rods and proceed with concrete pouring.
13. Strip the wall by keeping the panels separated from it at an approximate distance of 30 cm to be able to assemble the climbing rings to the cones from the concrete pouring platform.
14. Connect the cone recovery platform to the outside panels and move them up to the next climbing stage, starting with the one with ladders. Once having reached the next climbing stage, tie the wind bracing cable.

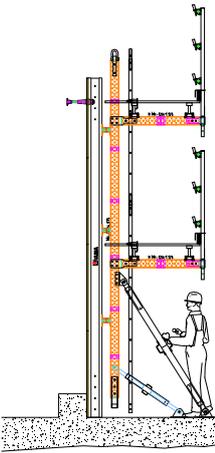
15. Move the formwork and the inside platform up together to the next climbing stage by letting the gravity pawls snap into the box-outs.
16. Place cones and anchor brackets on the inside and outside formwork. Attach the ladder to the cone recovery platform.
17. Clean the panels, apply release agent and place steel reinforcement.
18. Move the formwork into concrete pouring position, pass the tie rods through the panels.
19. Proceed with concrete pouring.



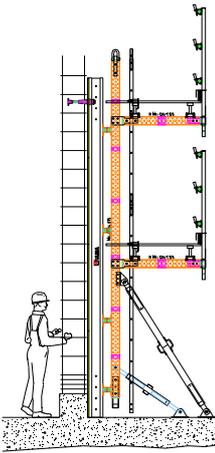
No workers are allowed on the working platforms during lifting operations.



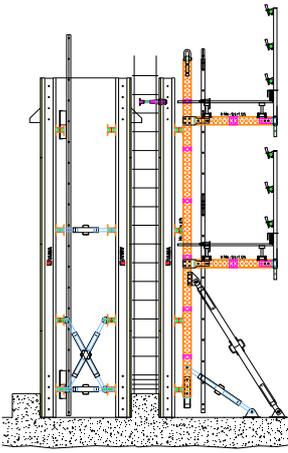
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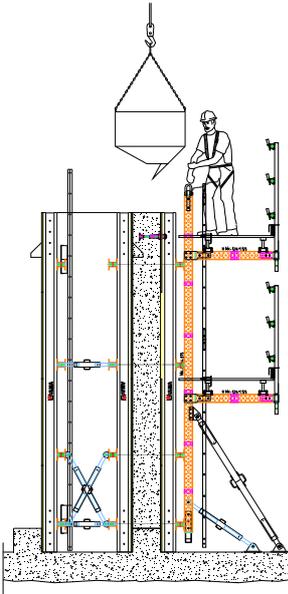
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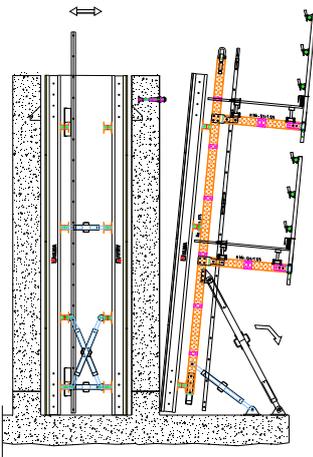
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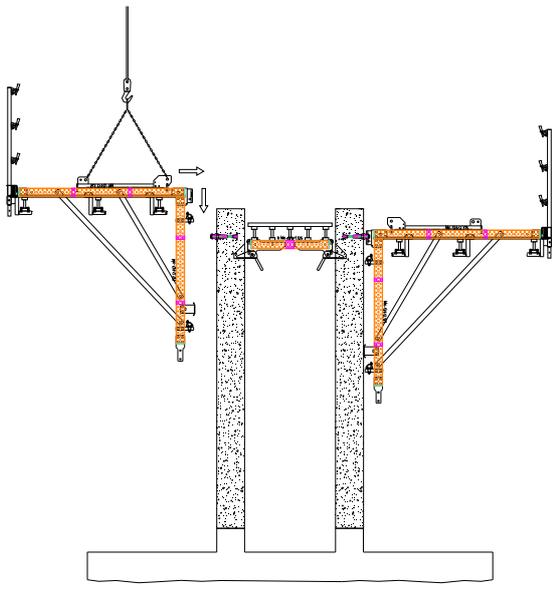
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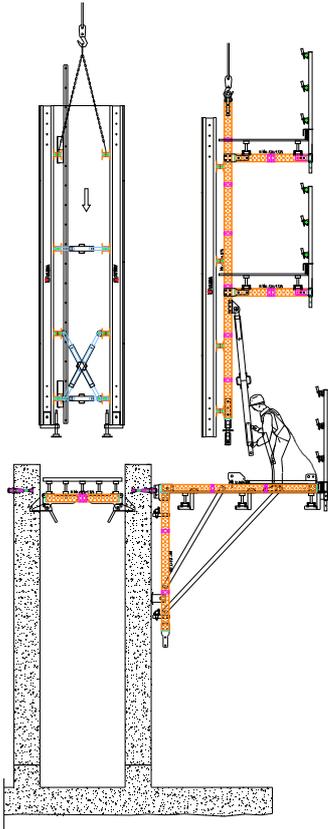
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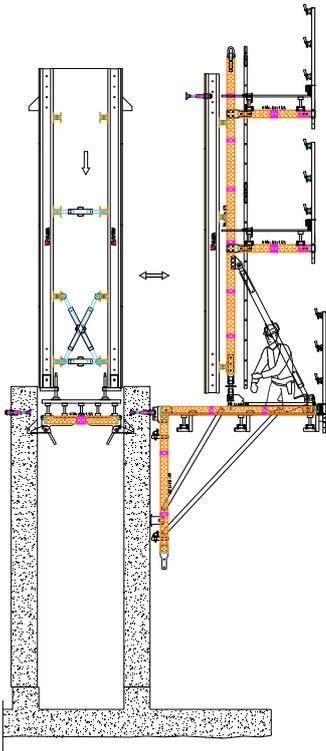
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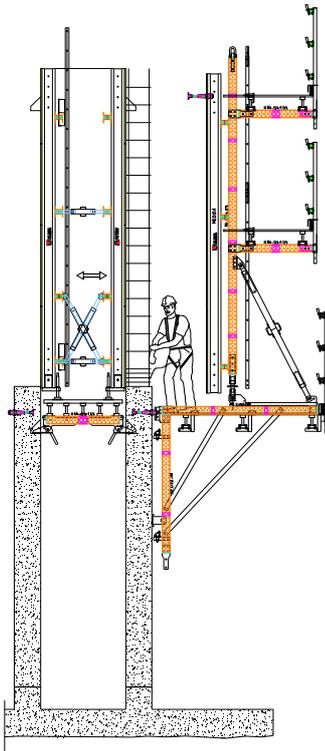
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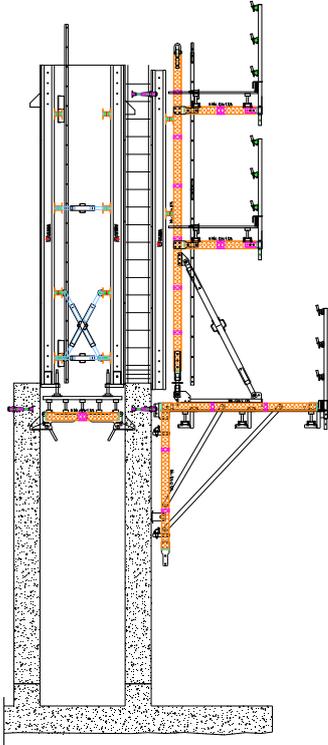
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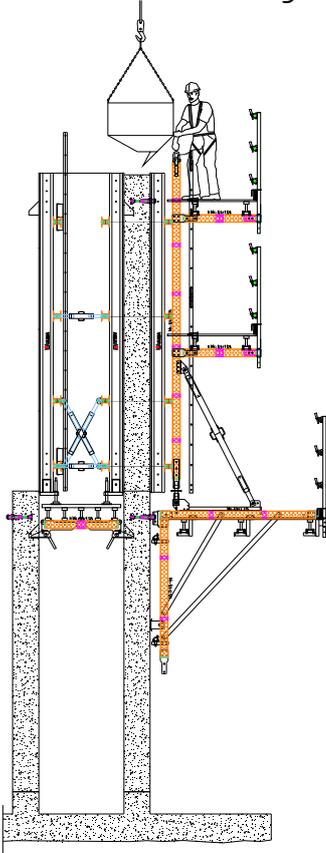
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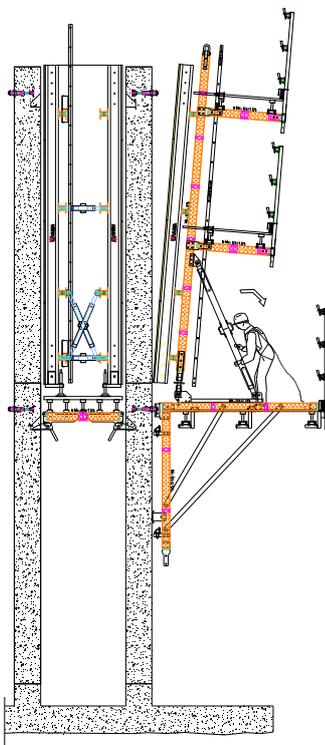
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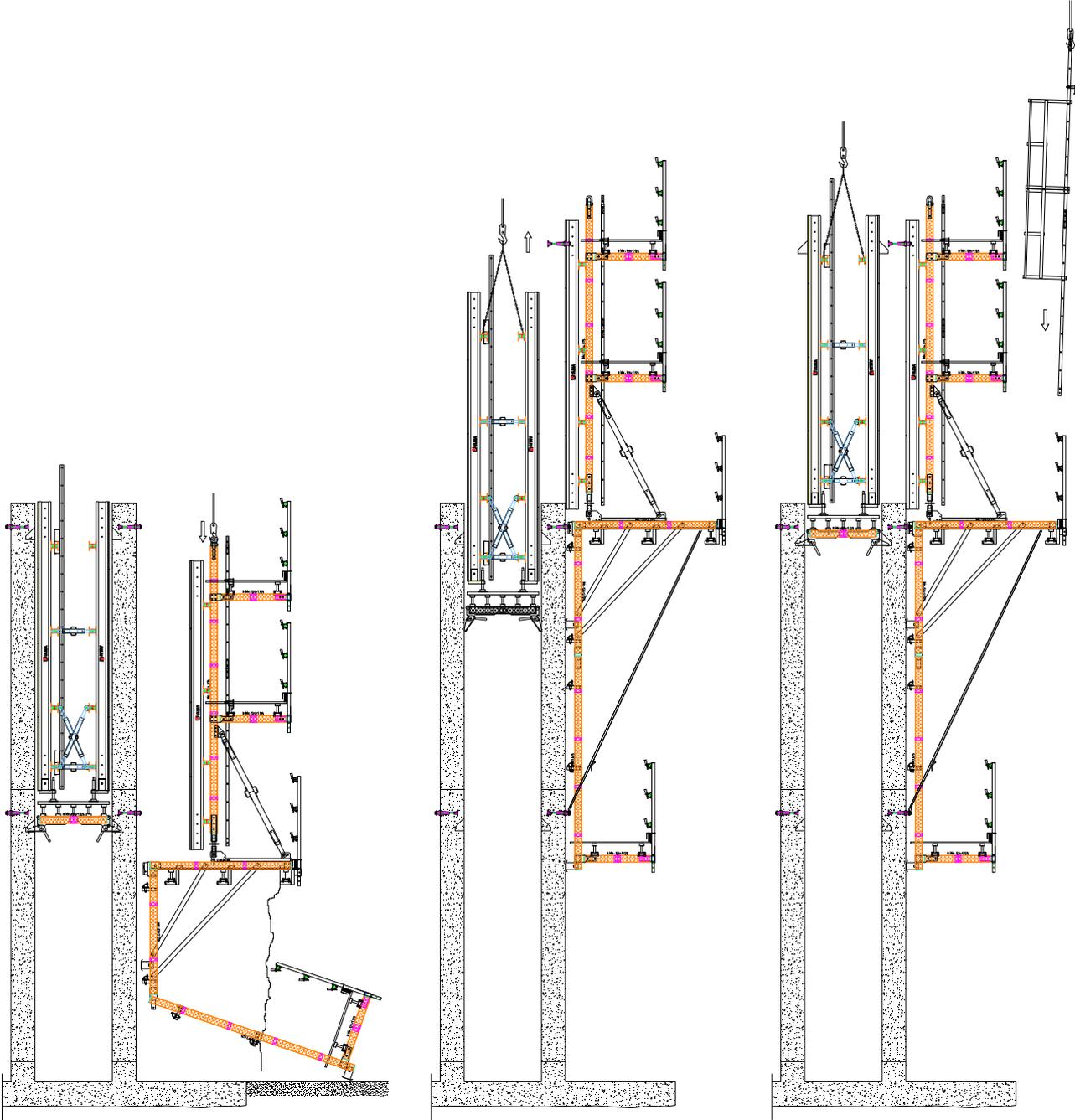
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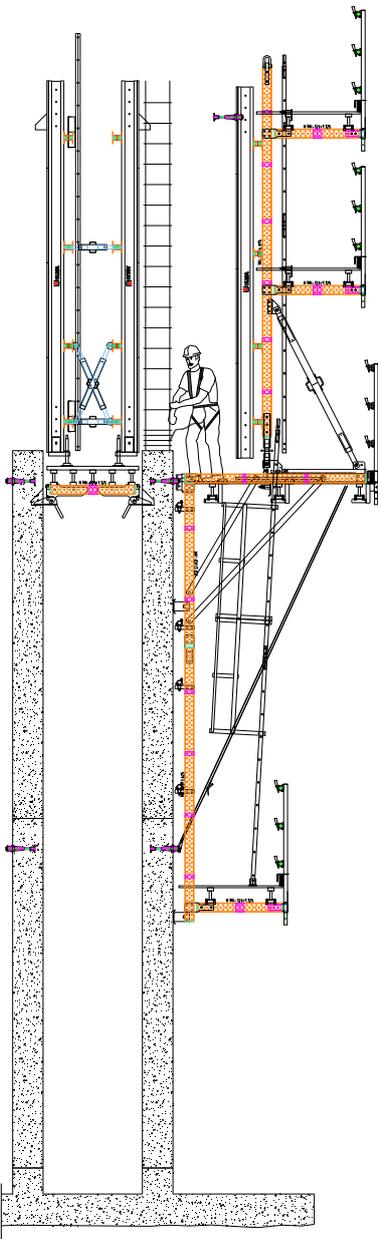
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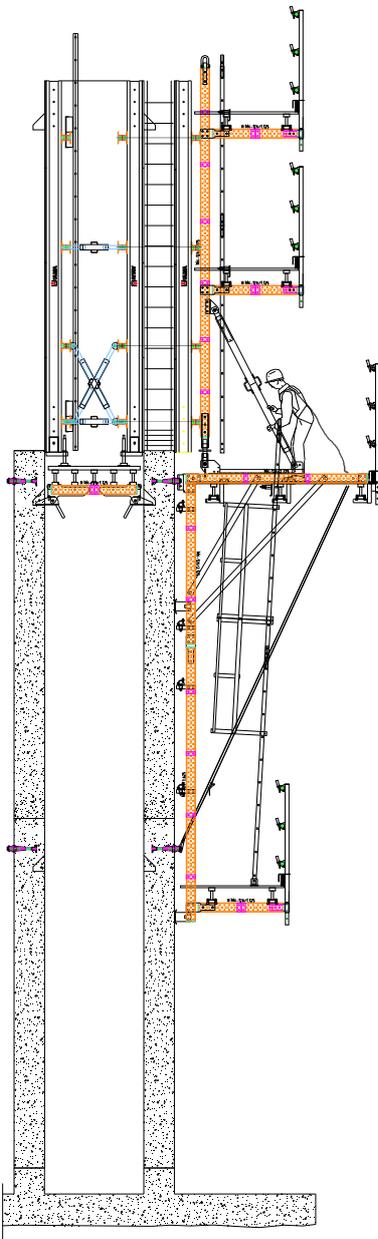
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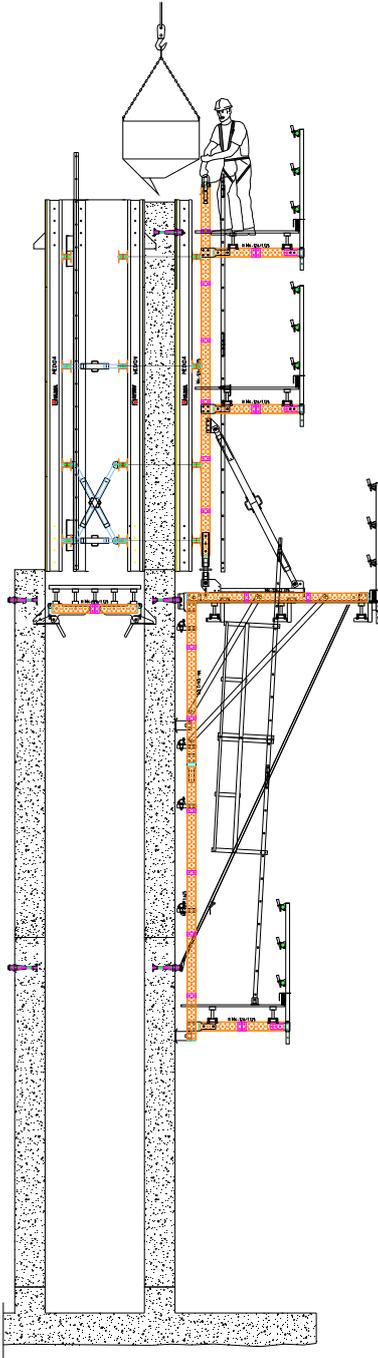
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### 3.4. PLATFORMS ASSEMBLY

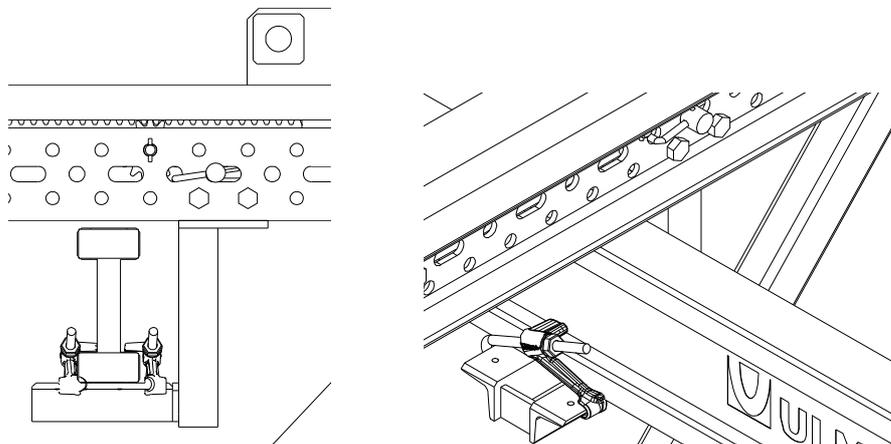
As mentioned in the first section "Product description", the climbing brackets BMK allow of the installation of 4 working platforms: main, concrete pouring, vertical waler and cone recovery platform.

#### 3.4.1. Main platform

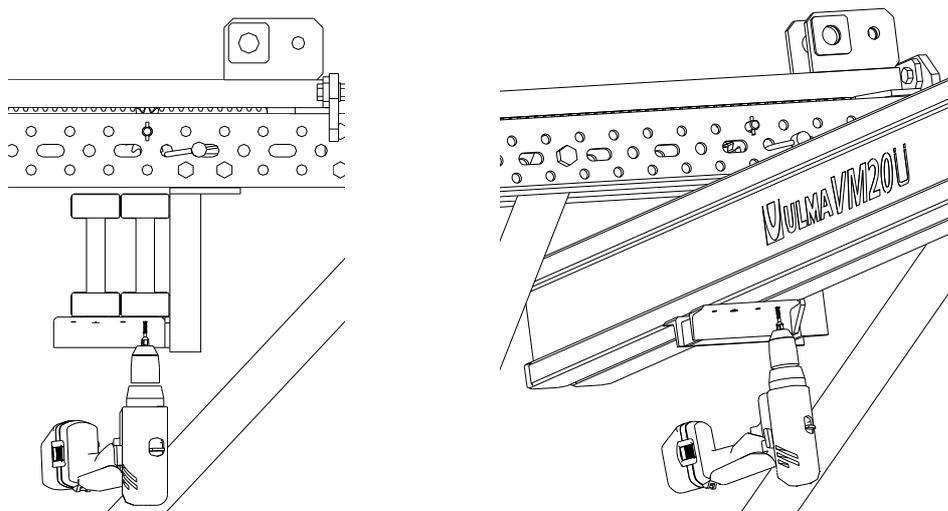
Subsequently, some main platform assembly variations are shown:

- **Timber Beams VM20**

One or two timber beams per each support can be placed on the climbing brackets depending on the platform strength required to be obtained.



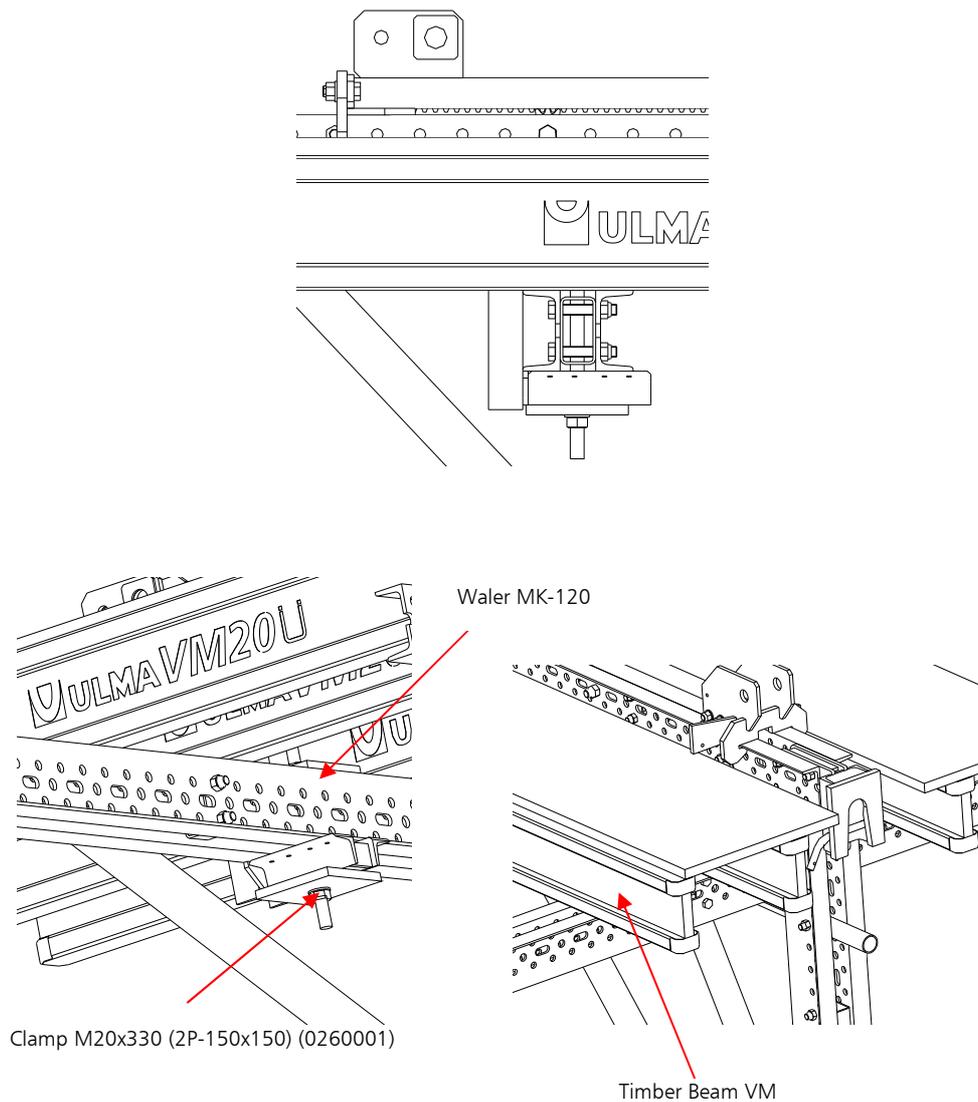
1 Beam VM20 fastened with Waler-VM20 Clamp 2T



2 Beams VM20 fastened with Screws 6x50 DIN7505-A (9371434)

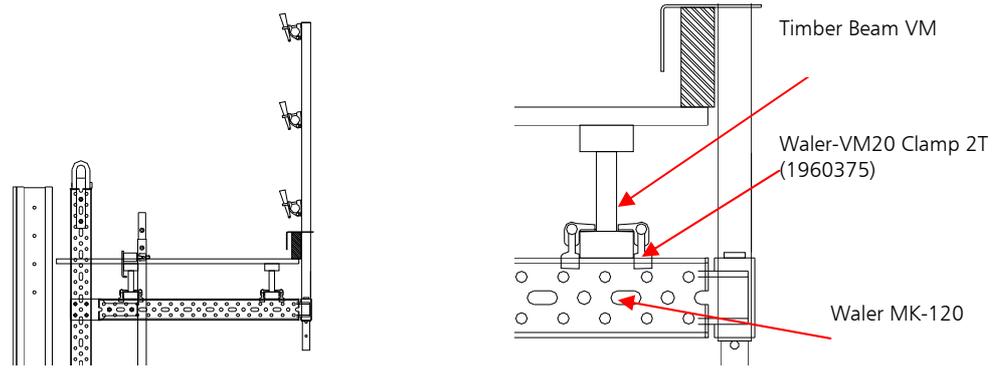
- **Walers MK-120 (it is also possible to use DU-120 and DU-100):**

The corresponding walers are placed lengthwise and the timber beams VM20 perpendicular to them: this solution for climbing brackets BMK is adopted in cases in which the beams VM20, due to the size of the platform, are not strong enough to bear the acting loads, mainly in long cantilevers.



### 3.4.2. Concrete pouring, vertical waler and cone recovery platform

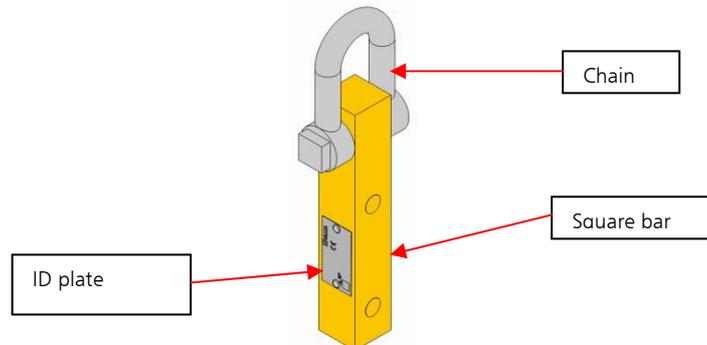
To create these platforms, the timber beams are directly joined to the walers MK.



The spacing between the Handrail Posts 1.5 of all platforms is according to standard EN 13374 Temporary edge protection systems.

### 3.5. LIFTING HOOK MK

Item used to lift the structure. It is connected to the top part of the vertical waler (waler MK), that is, each vertical waler has its own lifting hook attached to it. Each lifting hook is designed to bear a maximum load of 31 kN in direction of the pull of the sling or 27 kN in vertical pulling direction (moreover the maximum weight of the structure which is possible to lift is 54 kN or 5400 kg respectively). The static test coefficient used is 1.5.

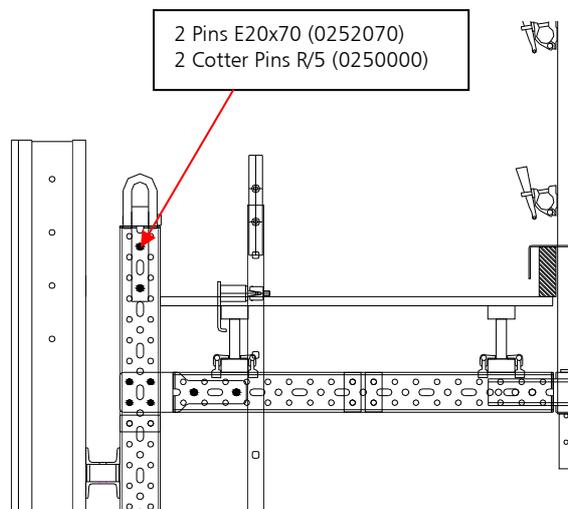


ID PLATE:

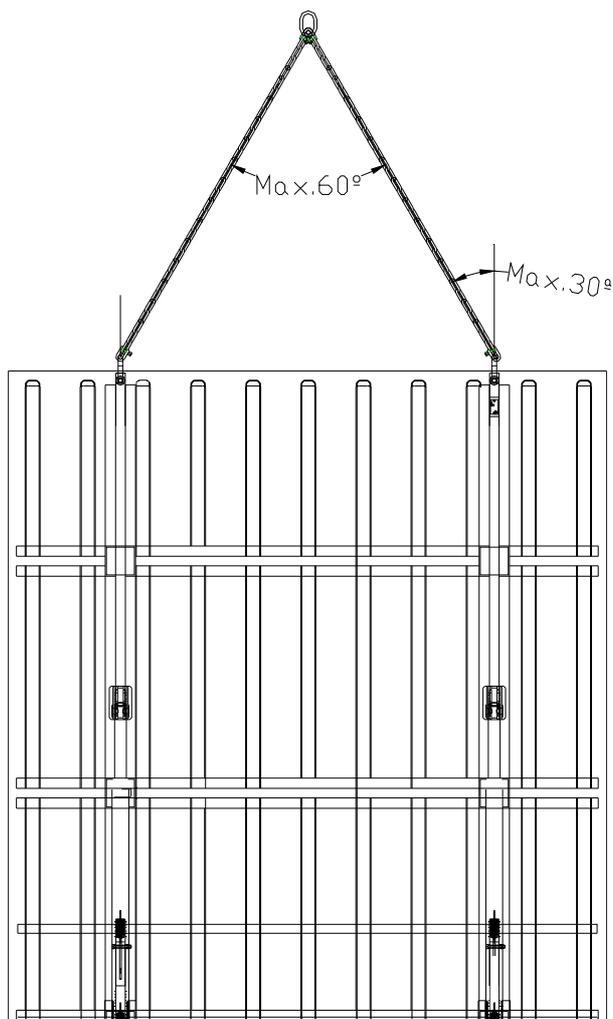
<p>CARGA MAX. DE USO MAX. WORKING LOAD MAX. TRAGFÄHIGKEIT</p> <p><b>3100 kg (6800 lbs)</b></p>	<p><b>ULMA</b> ULMA C y E.S.Coop.</p> <p><b>CE</b> Otadui,3 - Apdo.13 20560 OÑATI (SPAIN)</p>
<p><b>30°</b></p> <p>ANGULO MAX. DE ESLINGAS MAX. CHAIN ANGLE MAX. NEIGUNGS-WINKEL</p>	<p><b>RIOSTRA MK</b></p> <p>GRILLETE IZADO MK 1991360 LIFTING HOOK MK FAHRRIEGELKRANÖSE MK</p>

Each lifting hook is fastened to the waler with two pins E20x70.

The crane sling is connected directly to the chain shackle of the hook.



The slings attached to the lifting hook should not exceed the maximum angle of maximum 60° between them.

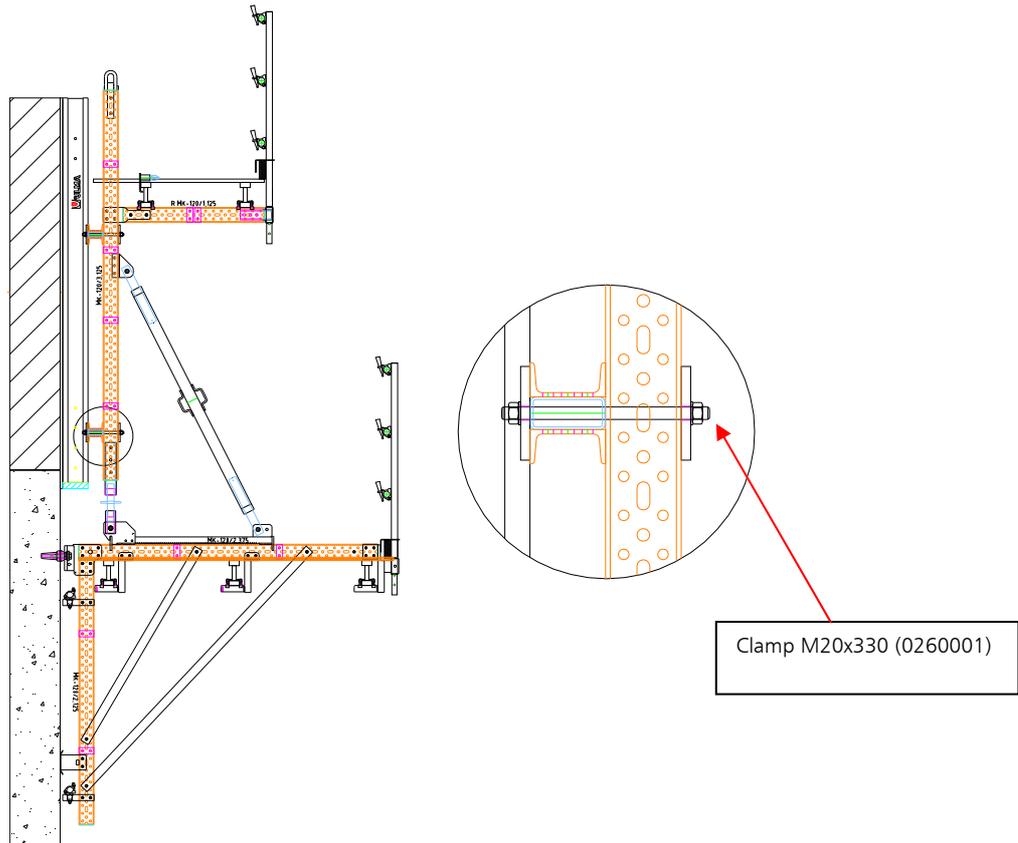


### 3.6. FORMWORK PANEL CONNECTION TO CLIMBING STRUCTURE

The climbing brackets BMK also offer flexibility with regard to the use of different formwork products. The following panel types can be used.

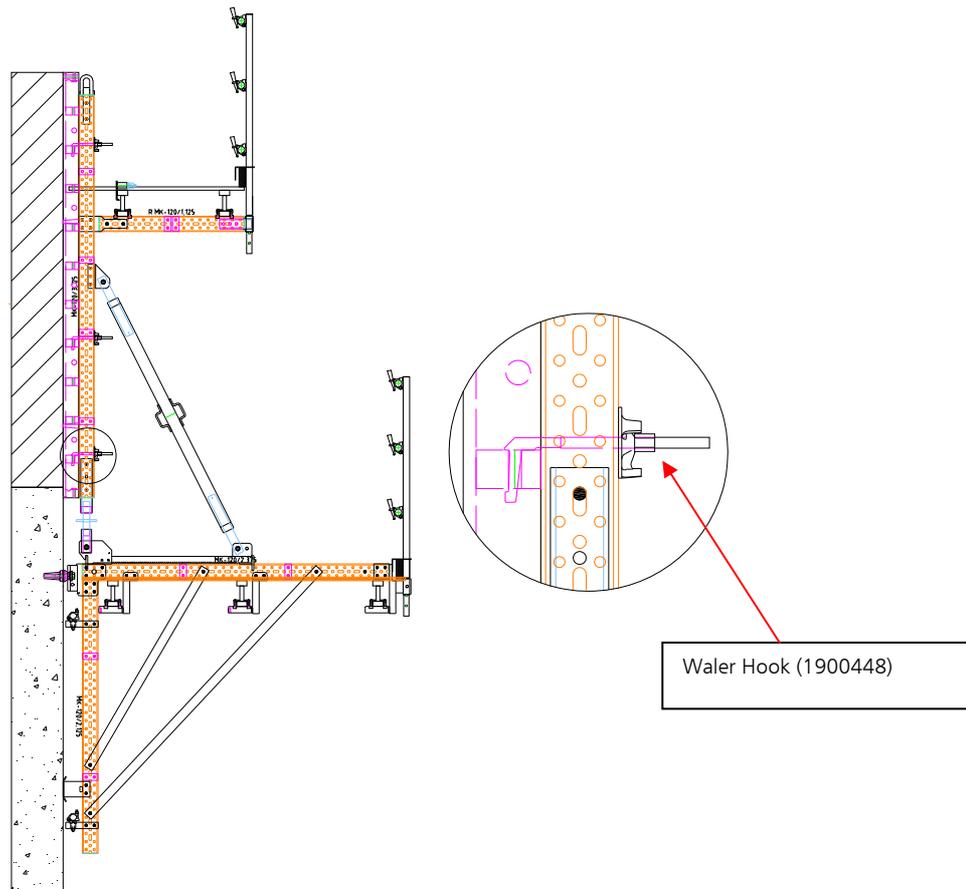
#### 3.6.1. ENKOFORM V-100 and ENKOFORM VMK panels

The connection between the panel and the vertical walers is obtained with the Clamp M20x330 (2P-150x150) (0260001).



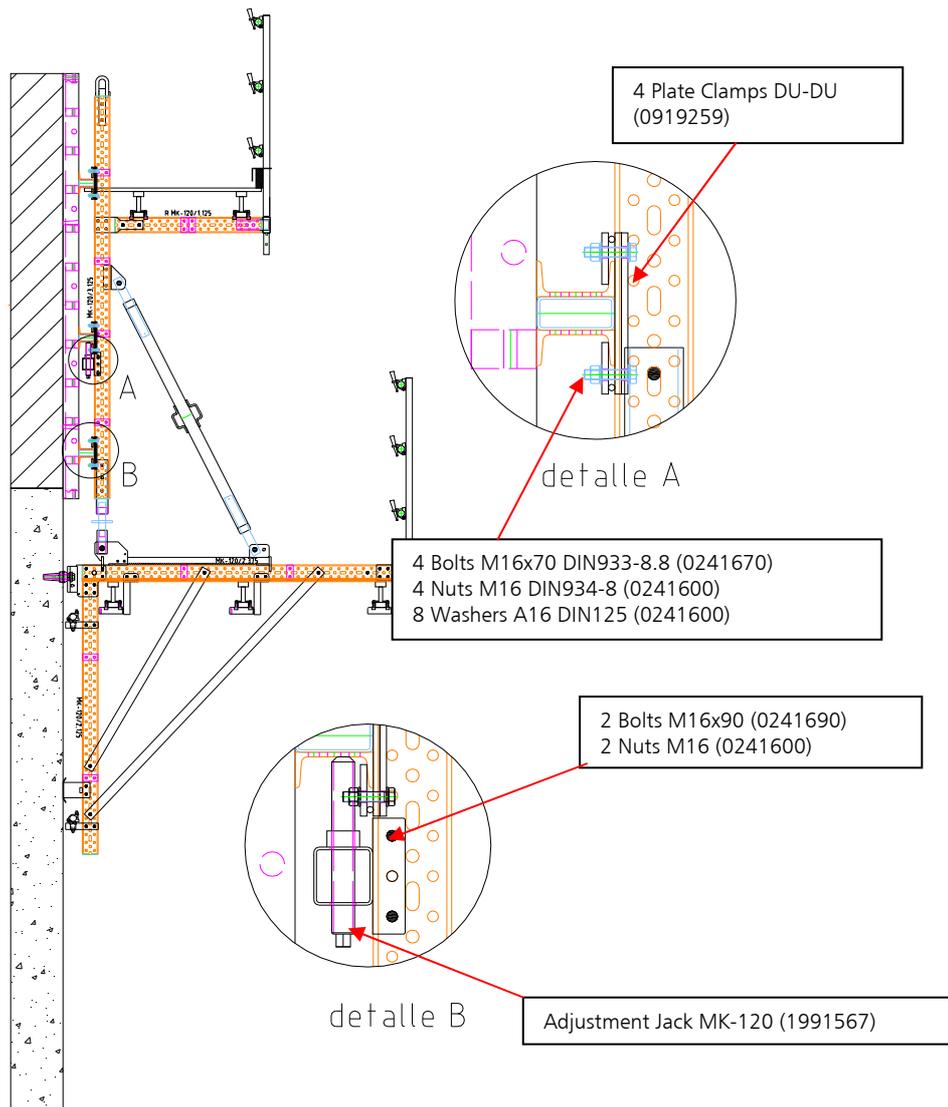
#### 3.6.2. ORMA panel

When the vertical walers are in direct contact with the panel, the Waler Hook is used attached to the holes of the panel ribs.

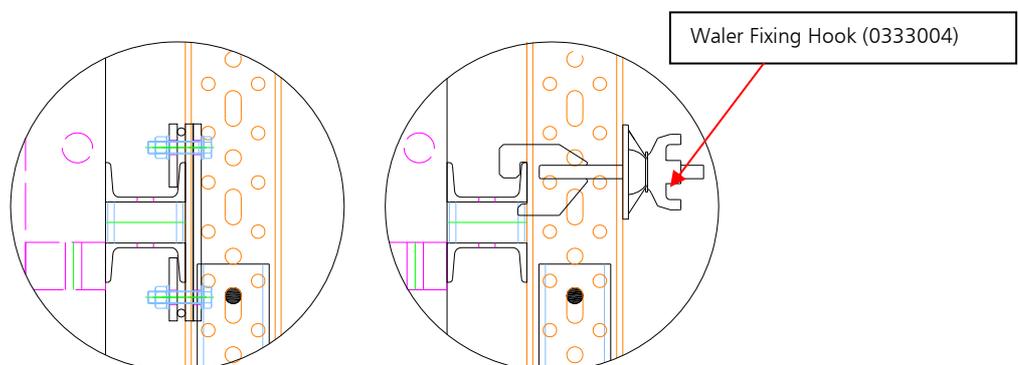


### 3.6.3. ORMA panel + horizontal waler (MK-120, DU-100 DU-120)

In the case that horizontal walers are placed between the ORMA panel and the climbing structure, the connection with the vertical walers is obtained with Plate Clamps DU-DU (4 per each connection) fastened with bolts between each other and Adjustment Jacks MK-120.



If a waler DU-100 is used as horizontal waler, the Waler Fixing Hook (0333004) can also be used for the connection between the vertical and the horizontal waler.

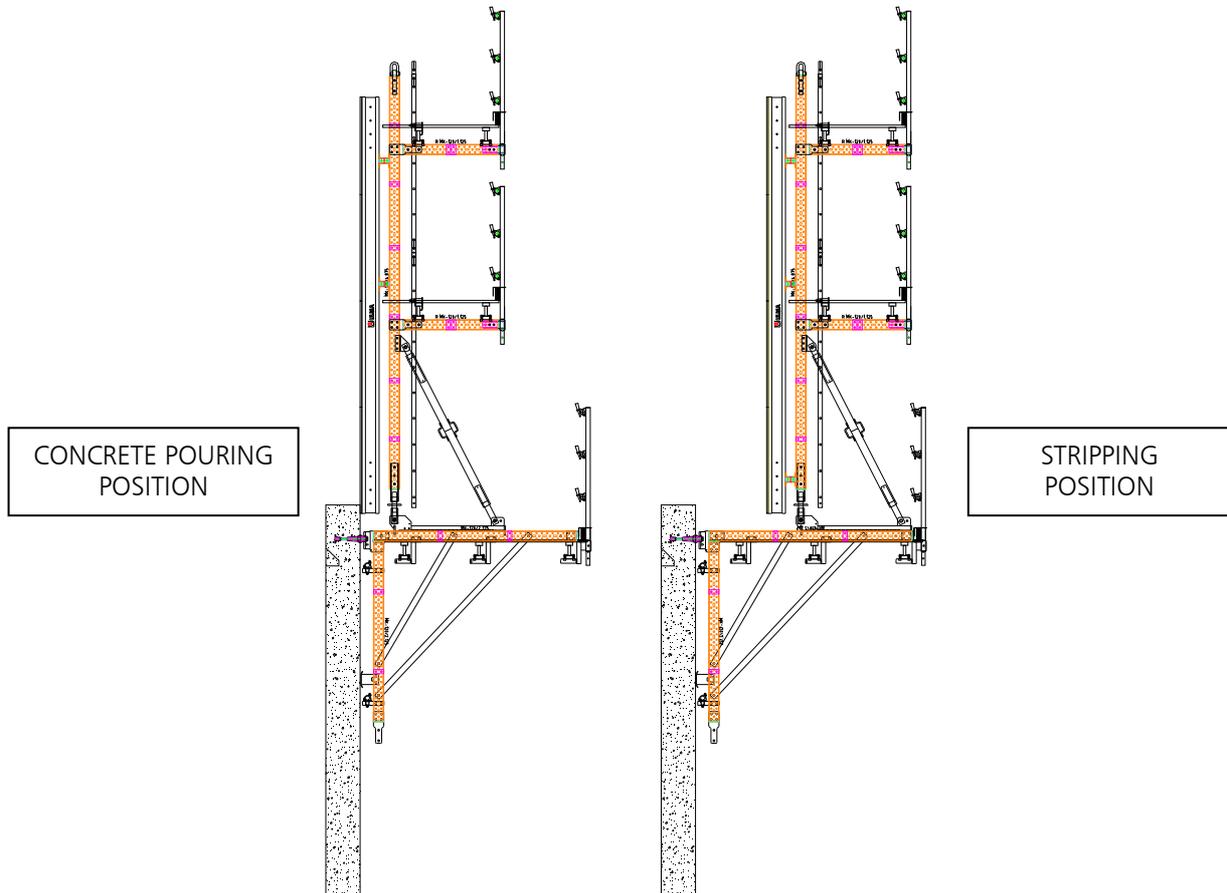


 The Waler Fixing Hook can ONLY be used with the horizontal waler DU-100, NOT with the DU-120 or MK-120.

### 3.7. STRIPPING SYSTEM

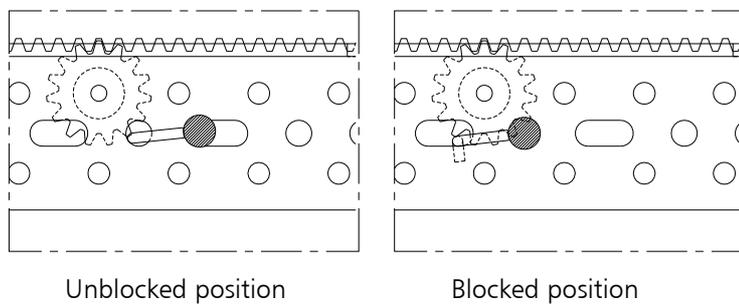
#### 3.7.1. Roll-Back Carriage

If a working area is required between the wall and the formwork, the Climbing Brackets BMK-240 (1991424)



The stripping process comprises the following steps:

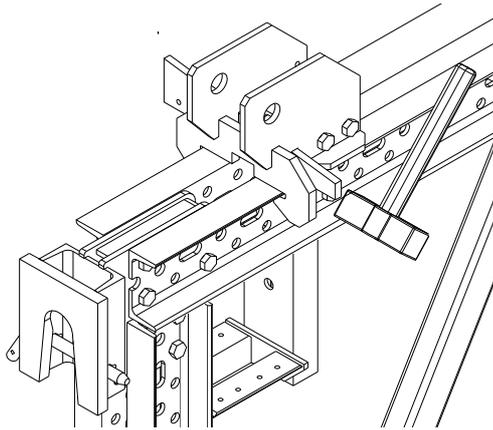
1. Place the Gear Locker MK (1991510) in unblocked position in case it is set to blocked.



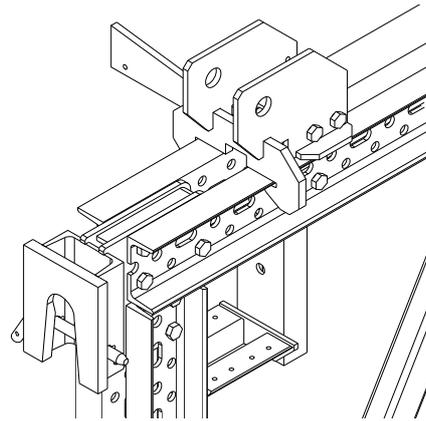


For out-of-service cases and whenever moving the climbing bracket with crane, always set the Gear Locker MK to the blocked position.

- Hit the wedge with a hammer to unblock the Roll-Back Carriage.

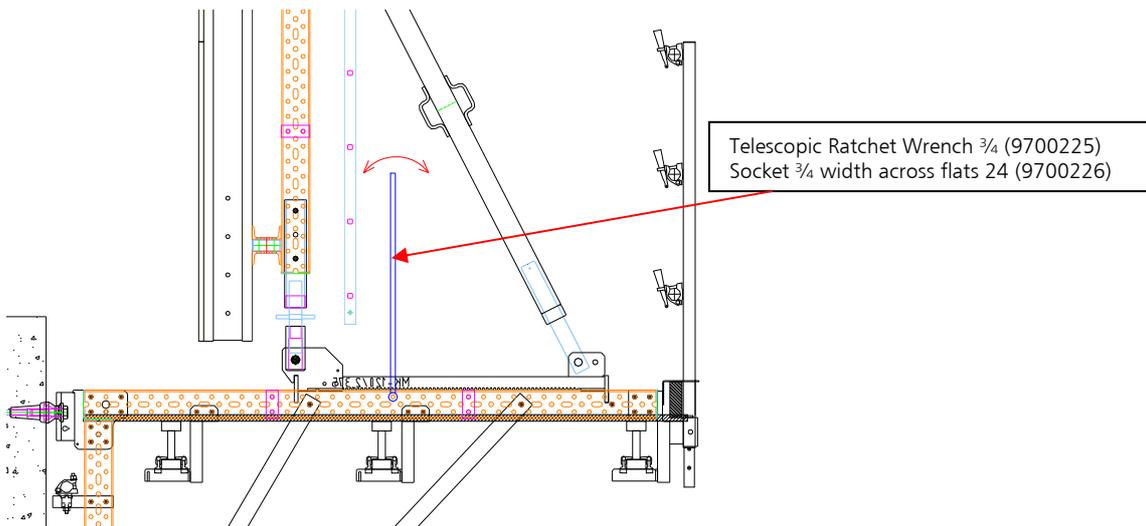


Blocked Roll-Back Carriage

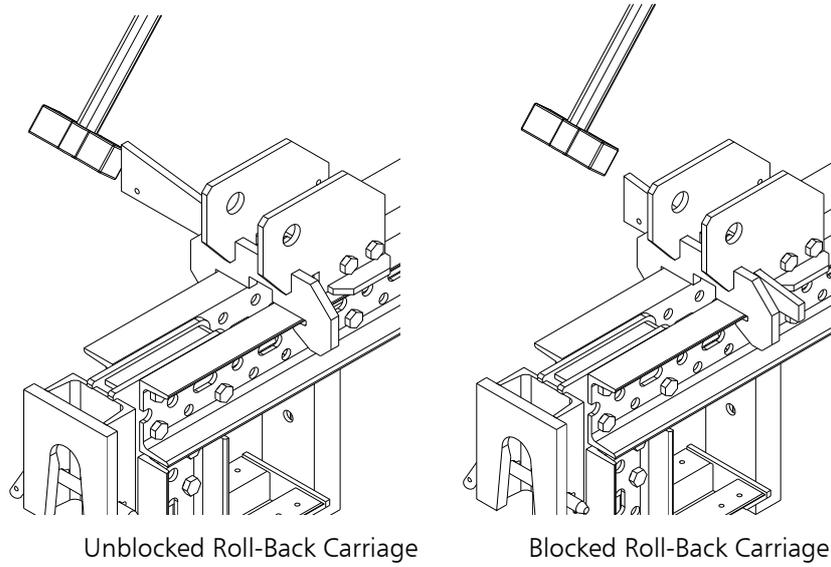


Unblocked Roll-Back Carriage

- Use a ratchet wrench  $\frac{3}{4}$  to turn the head of the axis thus moving the carriage to its subsequent position.

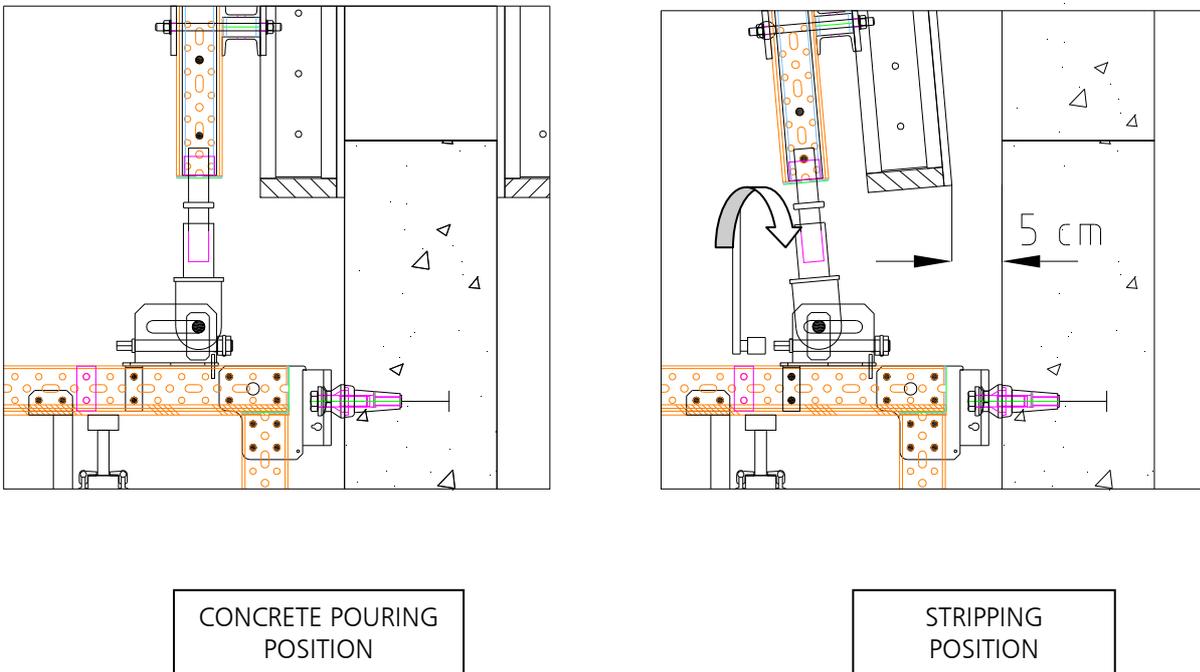


4. Hit the wedge with a hammer to block the Roll-Back Carriage.



**3.7.2. Tilt-Back MK-120**

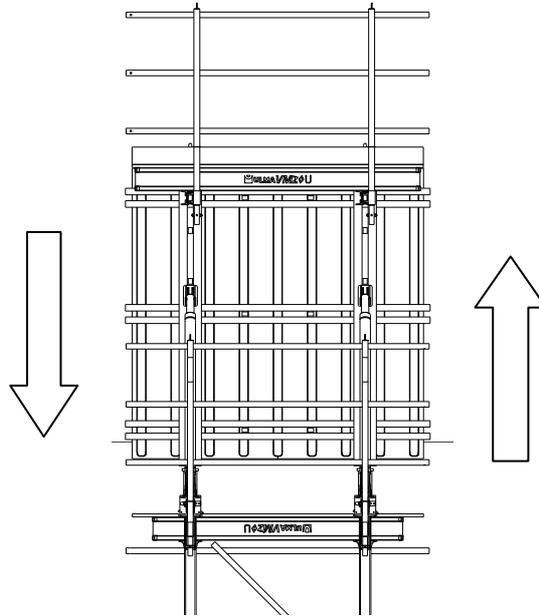
The formwork is joined to the main platform through the Tilt-Back MK-120(1991467). The panels can be separated from the poured concrete wall to a distance of about 5 cm.



For stripping the screw jack (24 mm width across flats) is adjusted which causes the mobile nut to slide along the slot. The Pin D32 inserted into the mobile nut and connected to the vertical waler drags the vertical waler with the attached formwork away from the wall.

### 3.8. HEIGHT ADJUSTMENT

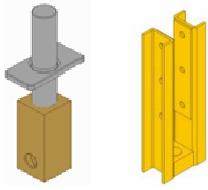
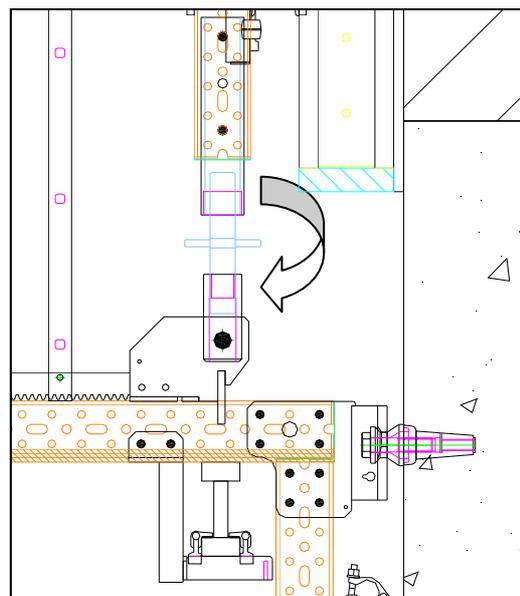
It is often required to adjust the formwork height to correctly overlap the panel with the previous pouring stage. For such adjustment the Waler Screw TR53x6 (0302020) is used.



#### 3.8.1. Roll-Back Carriage MK

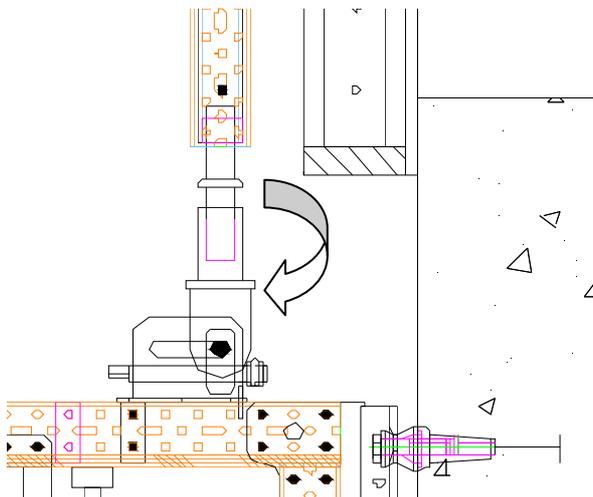
The height adjustment is obtained by turning the waler screw in one or the other direction. The adjustment range is approximately about some 100 mm.

0302020	10.8	WALER SCREW TR53X6
1991570	13,5	WALER MK-120 SCREW BRACKET

### 3.8.2. Tilt-Back MK-120

The height adjustment is obtained by turning the waler screw in one or the other direction. The adjustment range is approximately about some 120 mm.



1991517	15,7	CONNECTOR MK SCREW WALER BASE
1991570	13,5	WALER MK-120 SCREW BRACKET

## 4. SOLUTIONS

Subsequently, the most common solutions with the climbing brackets BMK are described.

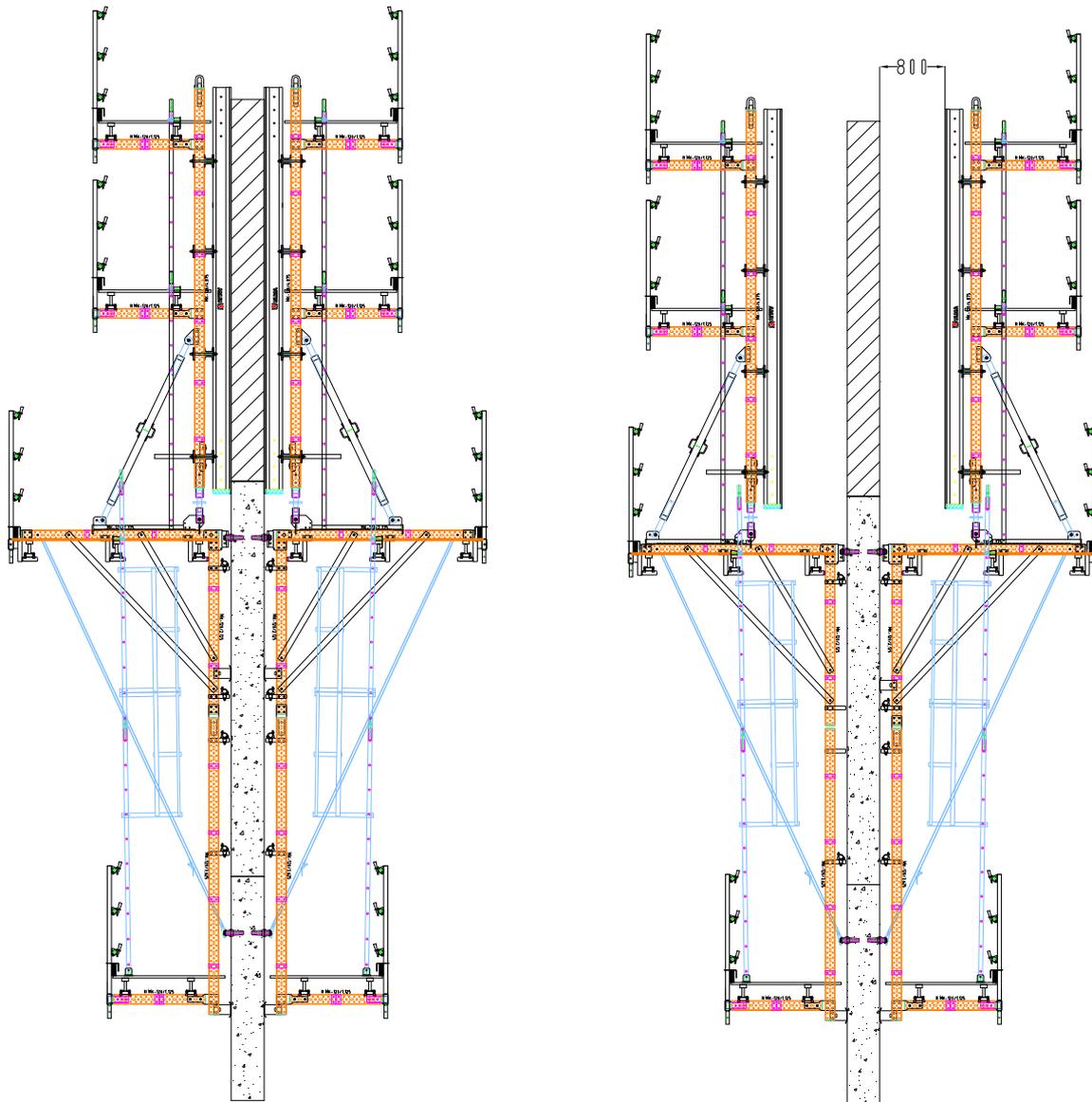
### 4.1. STRAIGHT WALLS

#### 4.1.1. Straight walls with Roll-Back Carriage at both sides of the wall

In this configuration, the formwork of both wall sides is moved back to the maximum distance to ease steel reinforcement works.

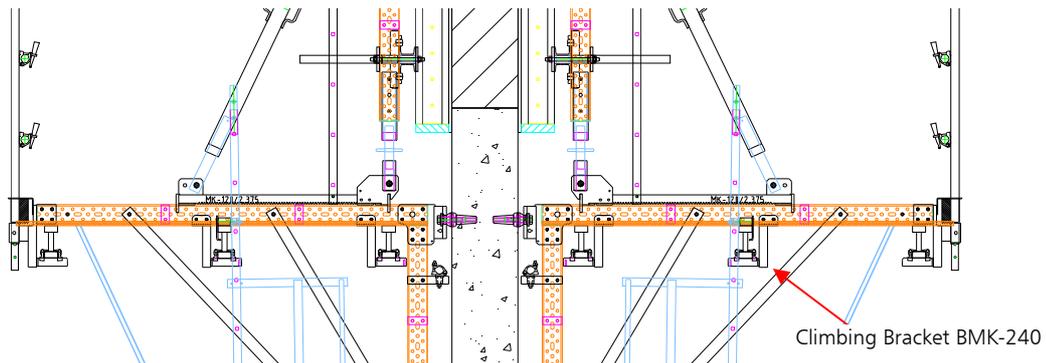
##### CLIMBING BRACKET BMK-240 AT BOTH SIDES

The distance between wall and formwork is approximately **80 cm** but the exact distance depends on the formwork type used (see section 2.2.1).



CONCRETE POURING POSITION

STRIPPING POSITION

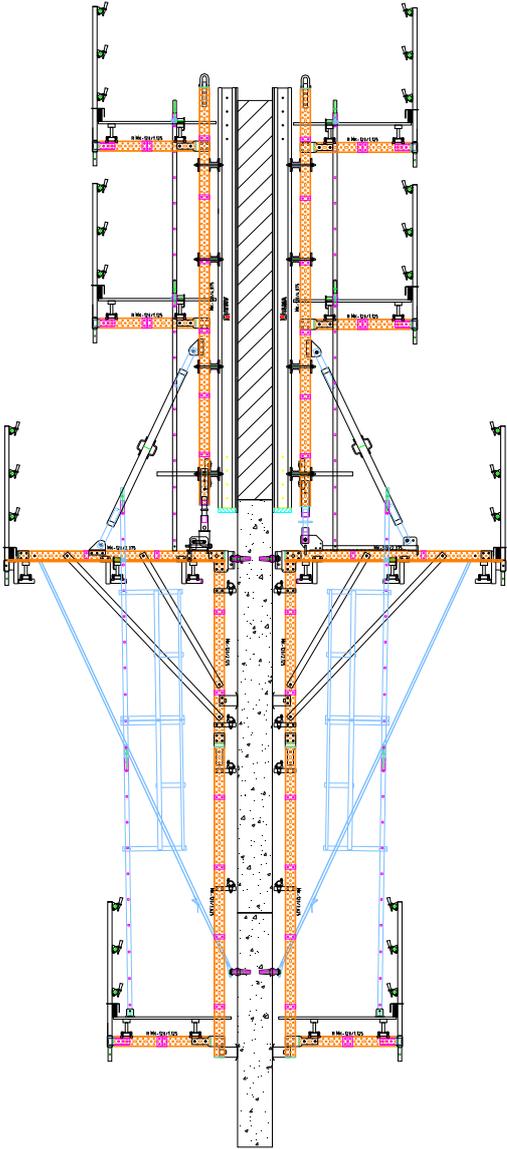


#### 4.1.2. Straight walls with Roll-Back Carriage at one side and Tilt\_Back system at the other side of the wall

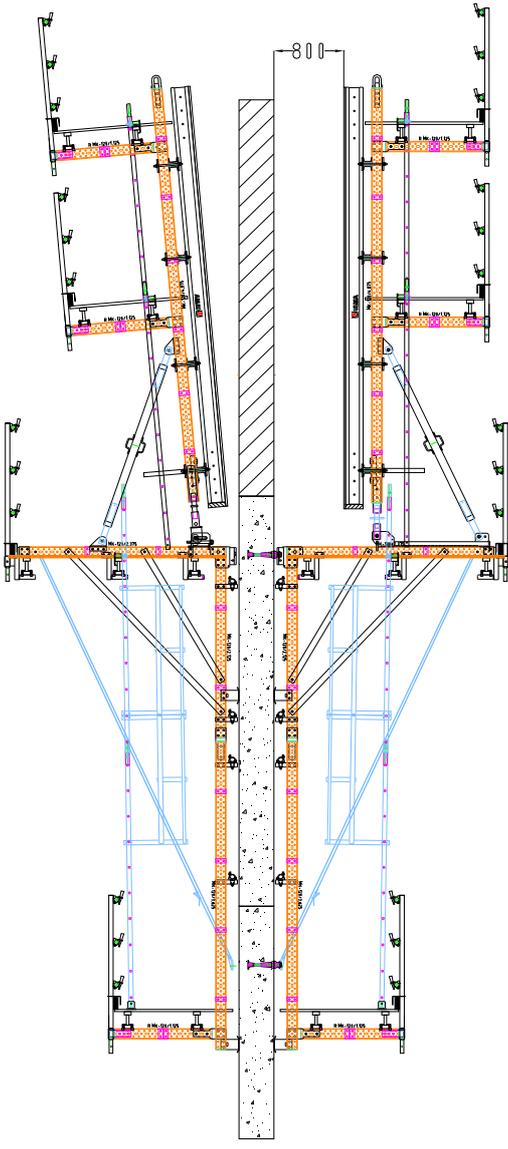
In these configurations only the formwork of one side of the wall is stripped with roll-back carriages because the steel reinforcement works can be done from this side. It is an easier and cost-saving alternative. At the side of the tilt-back system, the formwork can be separated from the wall by approximately 5 cm and tilted by means of the push-pull prop.

#### CLIMBING BRACKET BMK-240 and BMK-240 FRAME with Tilt-Back system

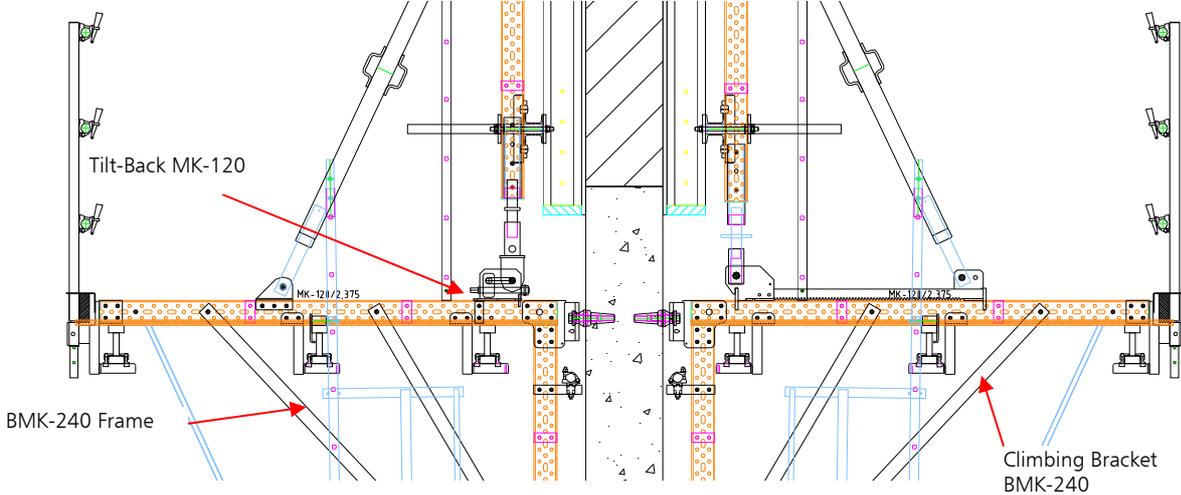
In this configuration, the same BMK-240 Frames are used but at one side the frame is equipped with roll-back carriages and at the other it is equipped with the tilt-back system.



CONCRETE POURING POSITION

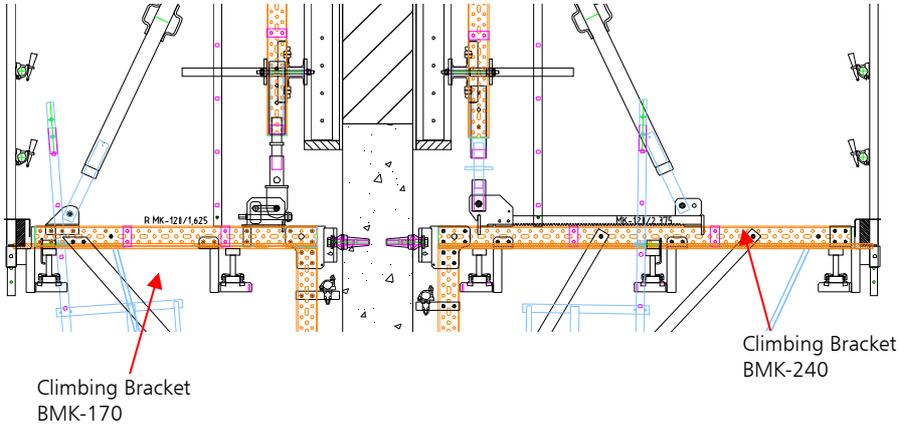
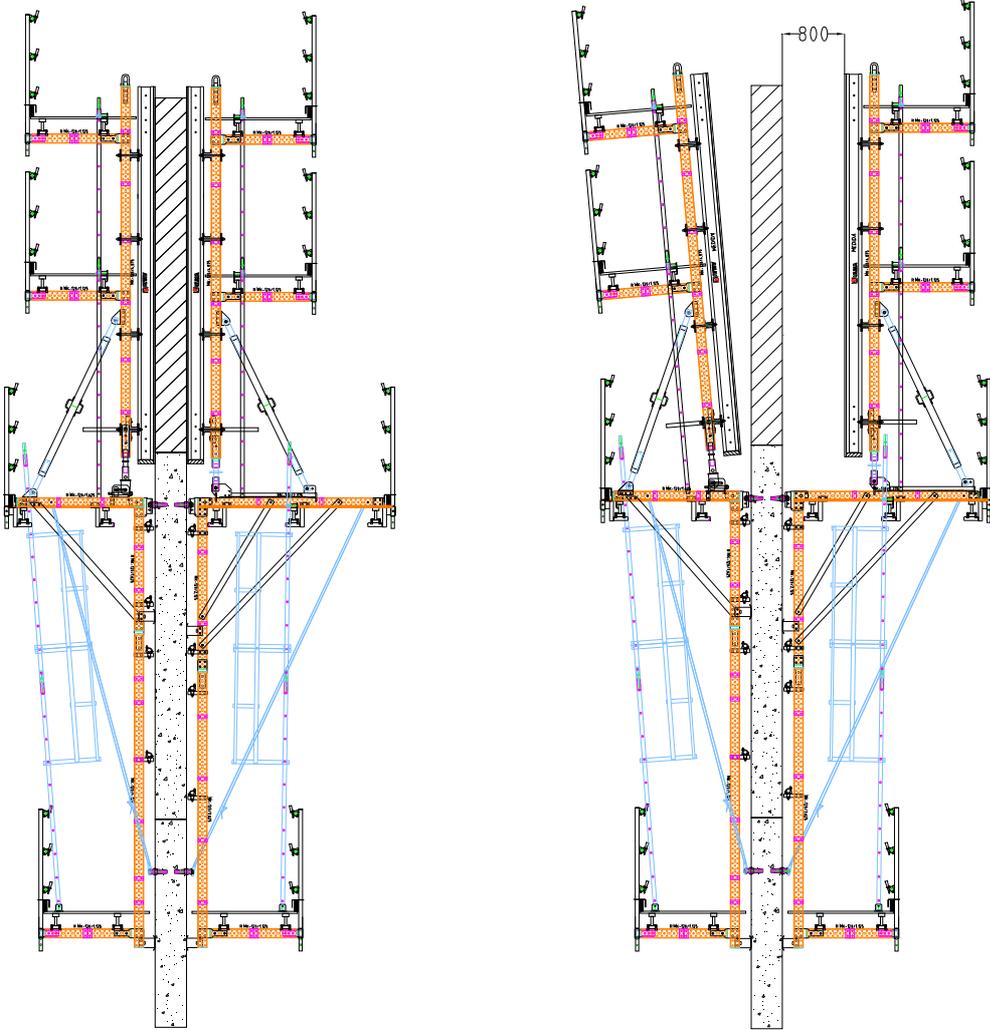


STRIPPING POSITION



**CLIMBING BRACKET BMK-240 and CLIMBING BRACKET BMK-170**

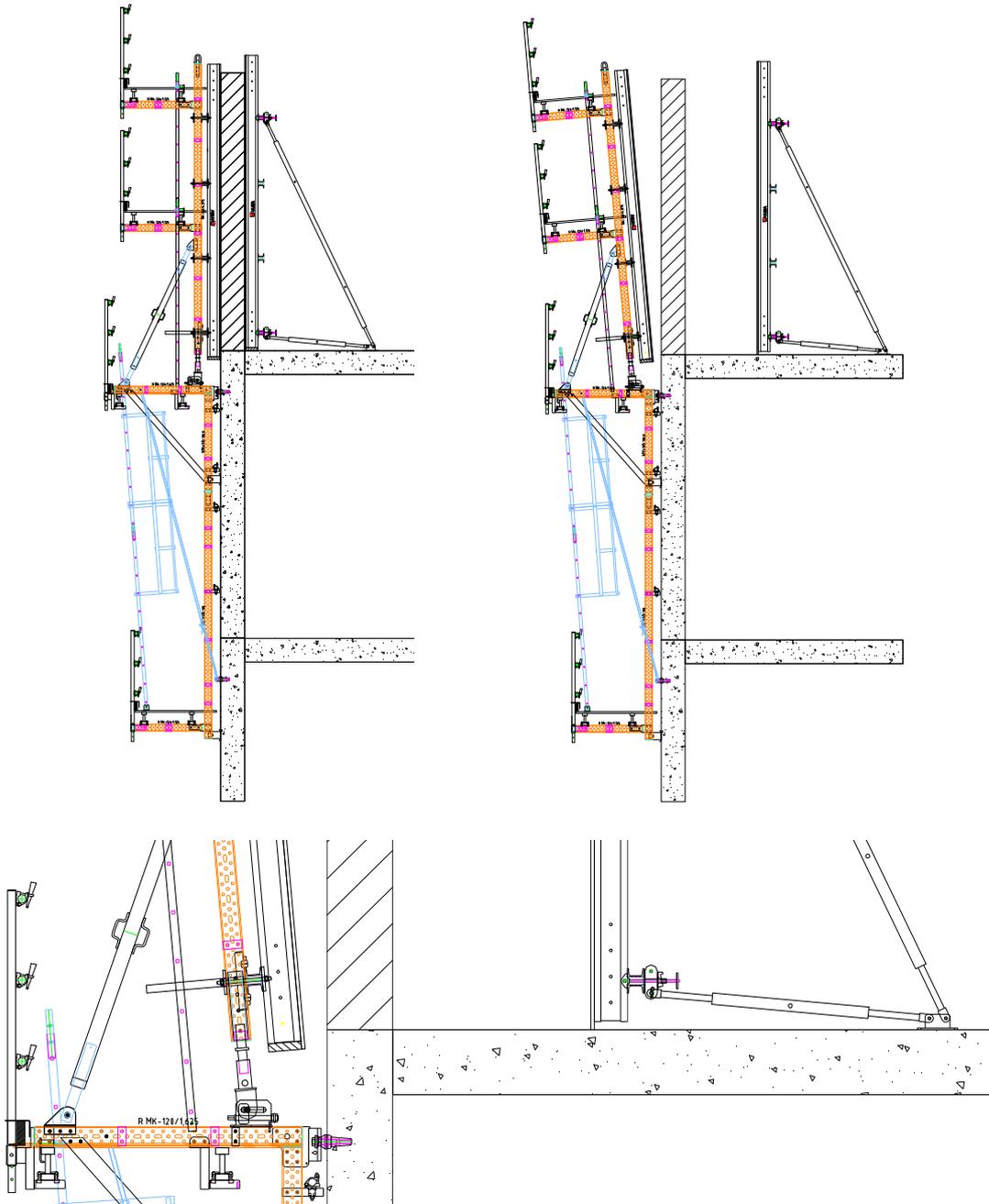
In this case, additionally to the installation of the tilt-back system at one side, also the size of the working platform of this side is reduced by using the Climbing Bracket BMK-170. This configuration is even simpler and cheaper than the previous ones.



**Straight perimeter walls with inside slab**

In this configuration, the climbing bracket is only used at the outside of the wall because the inside formwork supports directly on the slab already built. Therefore, a working area between wall and outside formwork is not necessary. Instead the inside formwork is removed and the steel reinforcement works are carried out from the inside. For these cases, the adequate configuration is with the Climbing Bracket BMK-170.

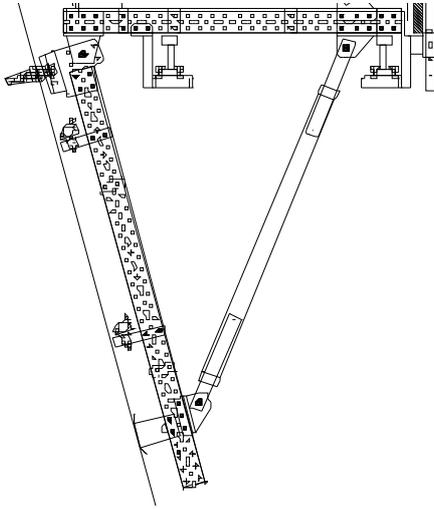
CLIMBING BRACKET BMK-170



## 4.2. INCLINED WALLS

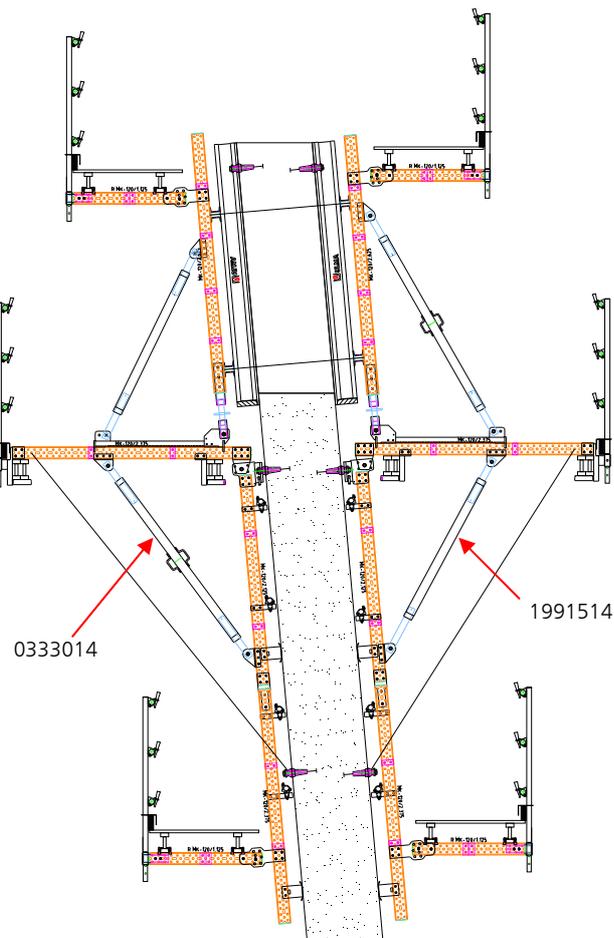
For  $\pm 15^\circ$  inclined wall solutions, the Hinged BMK-240 Bracket (1991465) is used.

In these cases should be used beam formworks "ENKOFORM".

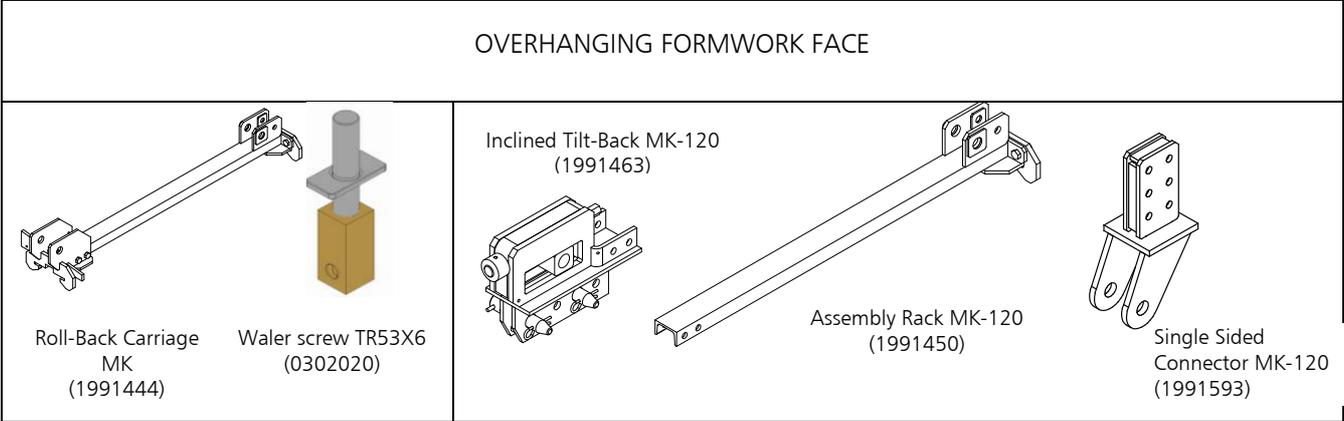


Máximum angle on vertical  $\pm 15^\circ$

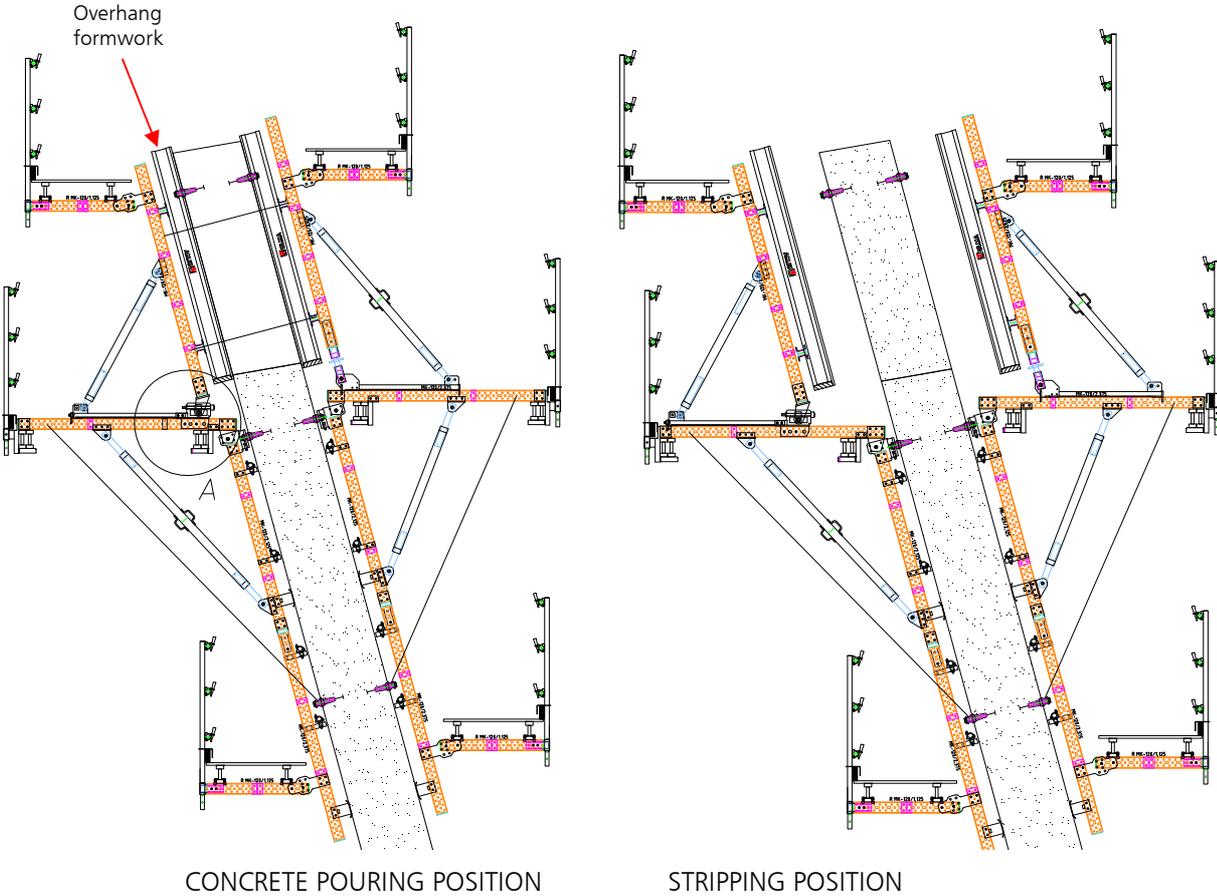
For the cases that the angle between the horizontal and vertical beam is greater than  $90^\circ$ , the Push-Pull Prop TR63x6 2.04-2.2 (0333014) is used instead of Push-Pull Prop TR63x6 1.52-2.2 (1991514).

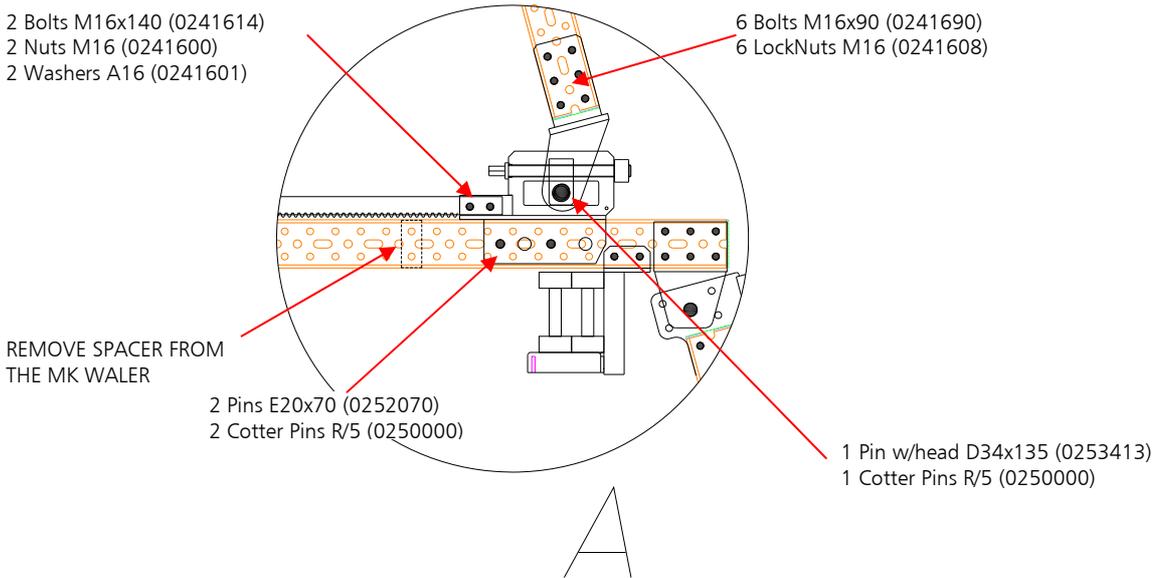


At the side of the overhang and slopes bigger than 5° the Roll Back Carriage BMK (1991444) and the Waler screw TR53x6 (0302020) should be replaced by the Inclined Tilt-Back MK-120 (1991463) the Assembly Rack MK-120 (1991450) and the Single Side Connector MK-120 (1991593).

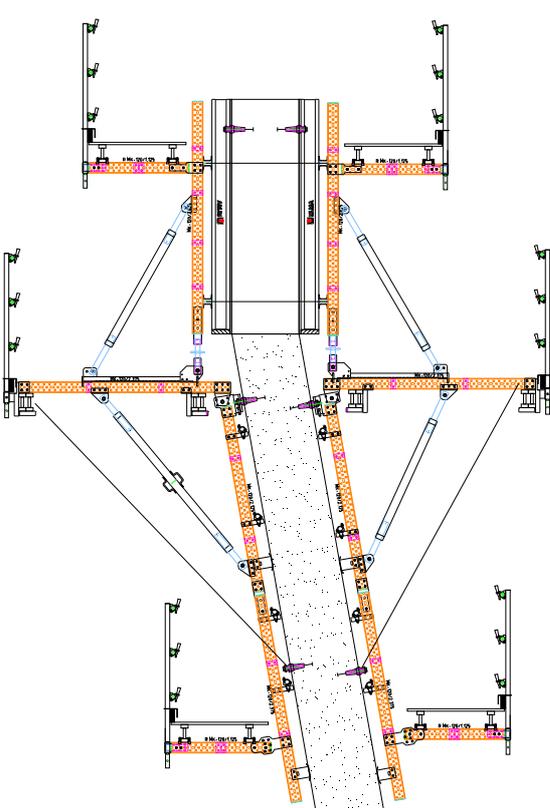


 For inclined wall solutions, specific calculations must be made for each application.

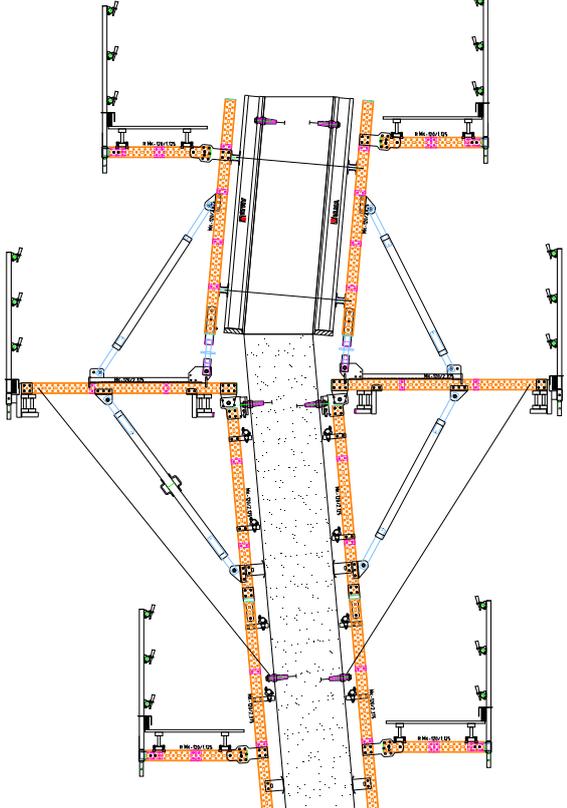




The system also offers solutions for the following geometries:



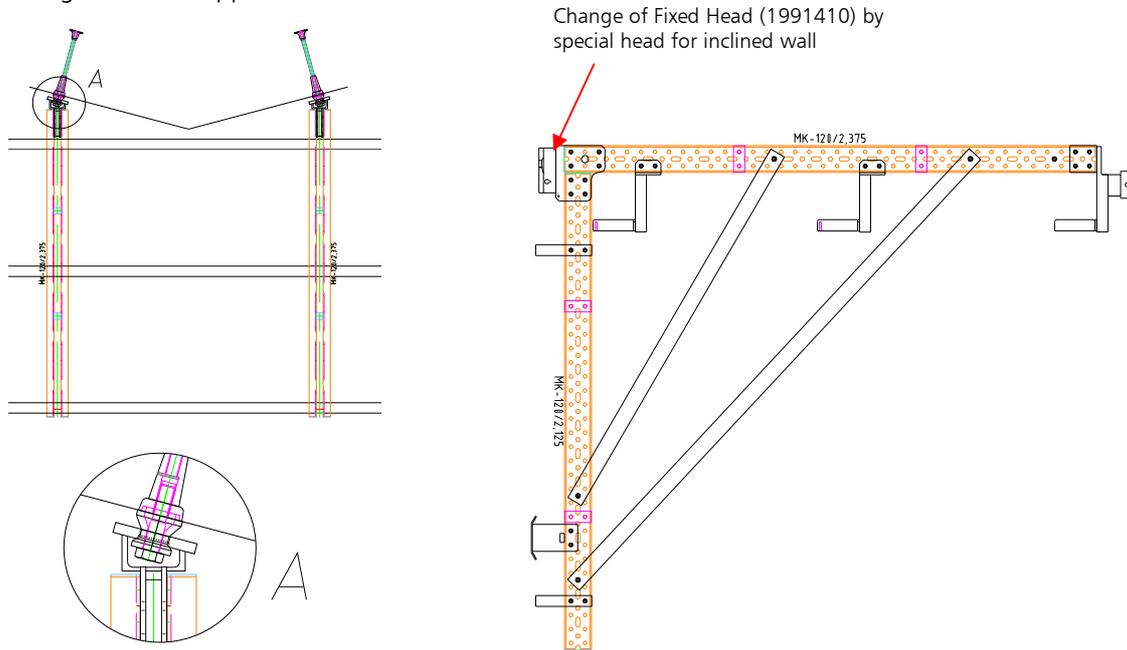
Walls with transitions from inclined to straight



Walls with changing inclination direction

### 4.3. CURVED AND POLYGONAL WALLS

For solutions of curved and polygonal walls, the Fixed Head (1991410) is replaced by a special head with a particular angle for each application.



### 4.4. ANCHORAGE SOLUTIONS

The anchors are the tie members of the climbing bracket to the wall.

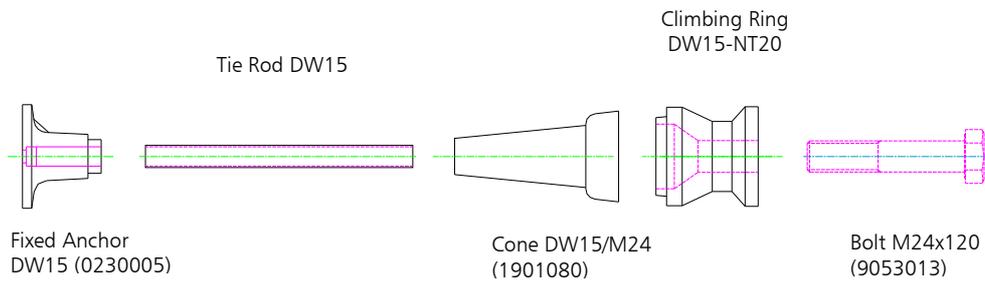
It is of utmost importance to embed the anchors into the concrete as indicated in the assembly drawings in order to correctly transmit the loads from the structure to the concrete. The correct transmission of the anchor reactions to the concrete is responsibility of the customer. Only genuine components of ULMA may be used.

Depending on the reactions in the anchors, DW20 or DW15 anchorages are used.

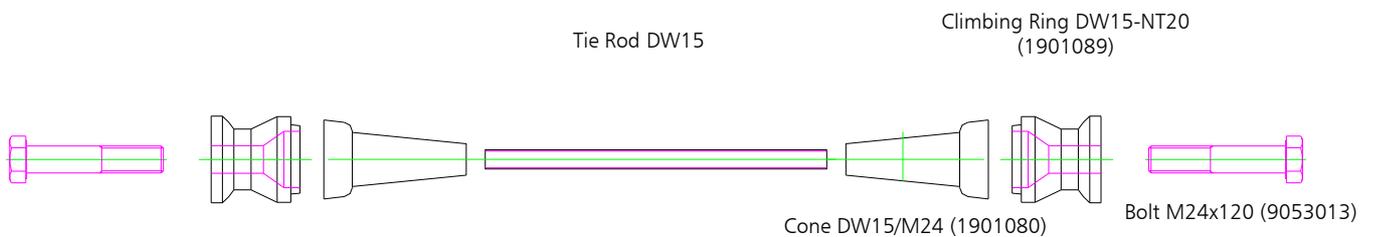


Do not weld anchorage components because of the risk of fractures.

• Anchorage DW 15



The set assembled of fixed anchor, tie rod DW15 and cone DW15/M24 remains embedded in the concrete and the climbing ring DW15-NT20 is fastened to the set with the bolt M24x120. There is also the possibility to place two cones face-to-face without the requirement of the fixed anchor.

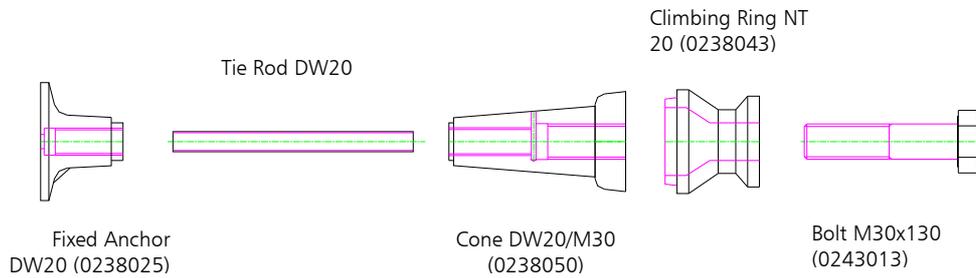


To position the cone on the formwork panel (without using a bolt), the Cone Positioner M24 is used, and the Positioner Spanner for its removal.

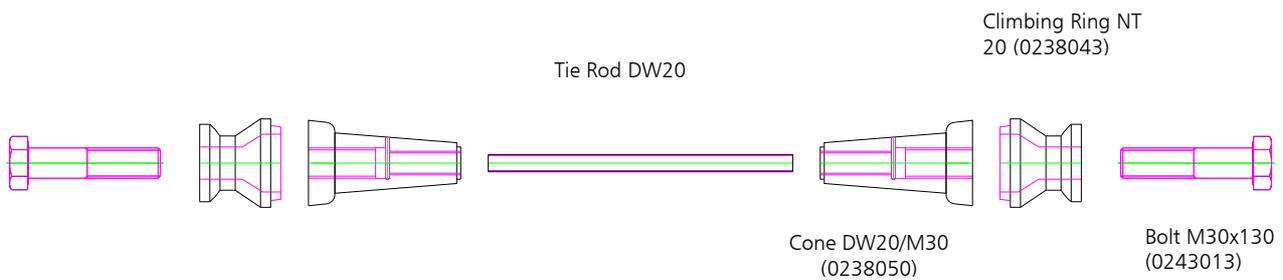


Special care has to be taken when tightening the bolts M24x120 as well as the tie rods DW15 and the fixed anchors to ensure the effective transmission of loads from the structure to the concrete.

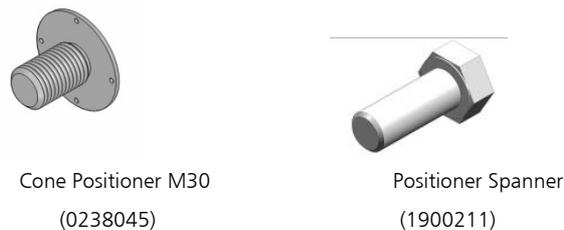
• Anchorage DW 20



The set assembled of fixed anchor, tie rod DW20 and cone DW20/M30 remains embedded in the concrete and the climbing ring NT20 is fastened to the set with the bolt M30x130. There is also the possibility to place two cones face-to-face without the requirement of the fixed anchor.



To position the cone on the formwork panel (without using a bolt), the Cone Positioner M30 is used, and the Positioner Spanner for its removal.

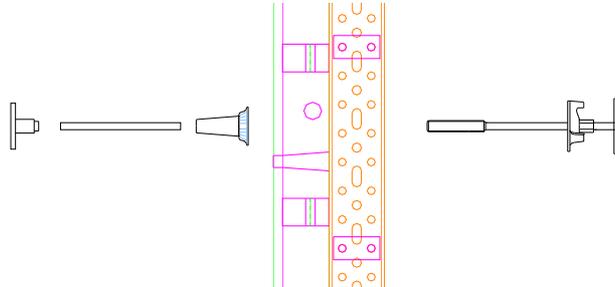


Special care has to be taken when tightening the bolts M30x130 as well as the tie rods DW20 and the fixed anchors to ensure the effective transmission of loads from the structure to the concrete.

The positioning of the cones on the panels can be done in different ways:

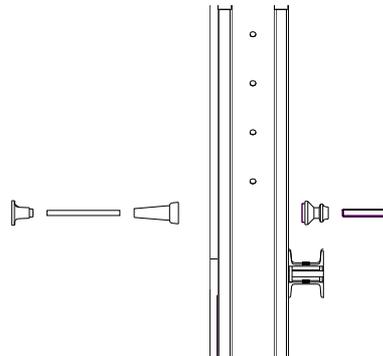
#### 4.4.1. Drilling ORMA panel board

The shuttering face is drilled at the required position and dimension,  $d = 25$  mm. Cone DW15/M24, tie rod DW15 and fixed anchor are placed on the shuttering face and fastened with the Cone-Waler Tie 90. The Tie passes through the gap between the vertical waler profiles MK-120 and is fastened with the plate nut of the tie.



#### 4.4.2. Drilling ENKOFORM panel board

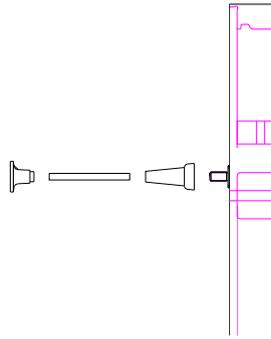
The shuttering face is drilled at the required position and dimension. The corresponding cone DW, tie rod and fixed anchor are assembled to each other, placed on the shuttering face and fastened with the climbing ring and the bolt from the other side of the board.



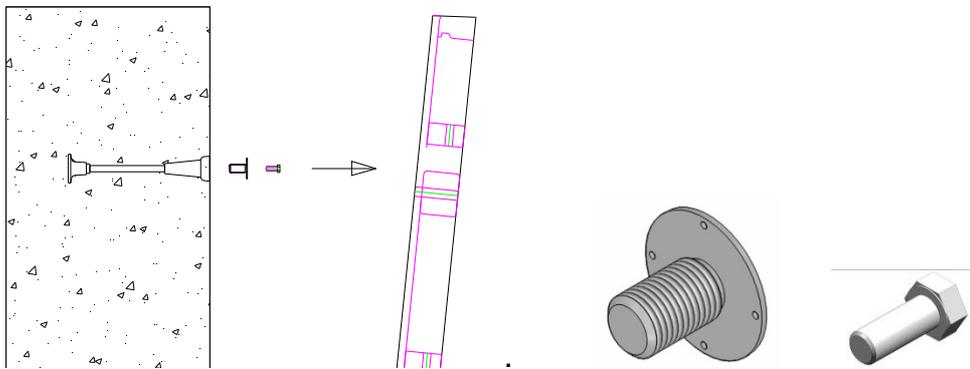
#### 4.4.3. Without drilling the board

If drilling holes into the shuttering face shall be avoided, this is the way to proceed:

- The cone positioner is nailed to the board. Then the cone, the tie rod and the fixed anchor are assembled to each other.



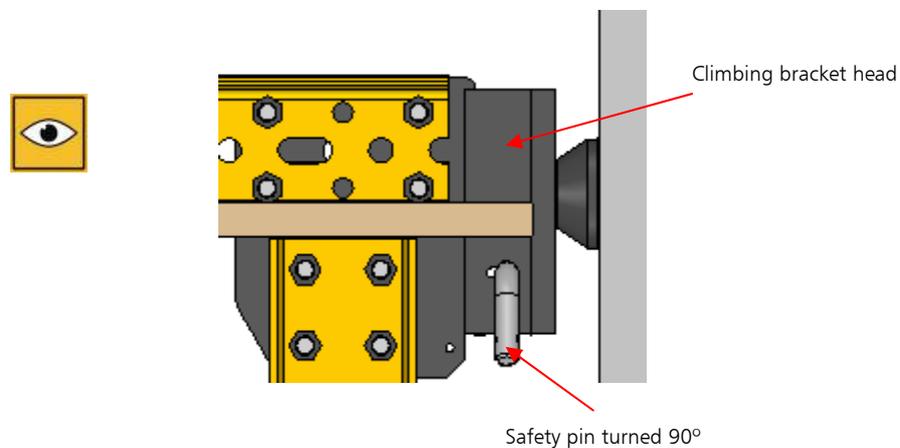
- The formwork is removed from the concrete by reclining the panel. With the positioner spanner, the cone positioner is removed from the cone



Special care has to be taken when tightening the bolts as well as the tie rods and the fixed anchors to ensure the effective transmission of loads from the structure to the concrete.

#### 4.4.4. Installation and securing of climbing brackets

Once the last anchorage is fastened to the wall, the climbing structure is supported on the anchors. After having inserted the head into the climbing ring, the safety pin is placed and turned 90° thus clamping the climbing bracket against any accidental uplifting.

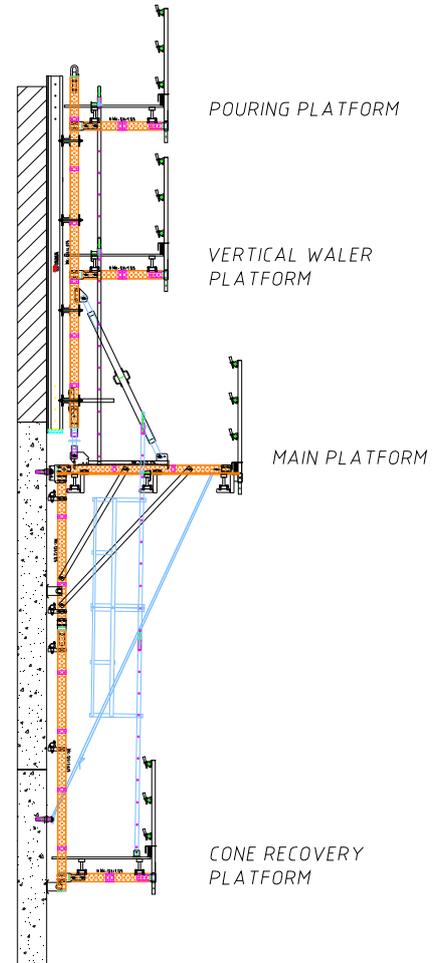


## 5. SYSTEM PROPERTIES

### 5.1. MAXIMUM SIZE OF FORMWORK PANEL

The system is designed to work under the following conditions:

	Working (kN/m <sup>2</sup> )	Out-of-service (kN/m <sup>2</sup> )
Concrete Pouring Platform	1.5	0.75
Vertical Waler Platform	0.75	0
Main platform	3.0	1.5
Cone Recovery Platform	0.75	0
Wind Load	0.2	1.1



Notes:

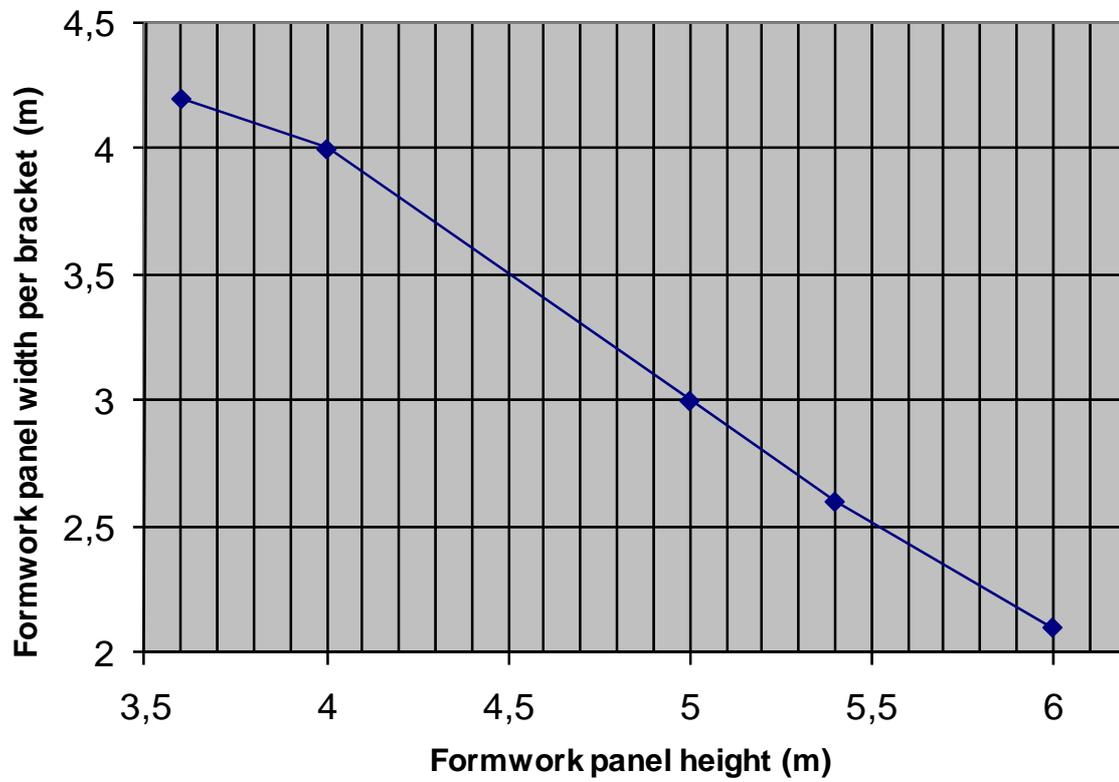
- The maximum wind load is 0.2 kN/m<sup>2</sup> which corresponds to a wind speed of 64 km/h.
- For wind speeds above 64 km/h, all activities on the climbing structure are abandoned and the workers leave the platforms. Moreover, it is necessary to move the formwork towards the wall and block the roll-back carriage with the Gear Locker MK (1991510) (see for details on page 16).

One limit of the climbing bracket BMK structure is relates to the maximum size of the formwork panel.

In the below chart, the relation between panel height and width of the climbing bracket BMK-240 is shown. It is assumed that the length of the working platforms and the formwork panel width is the same.

This chart is valid only for a working height below 100m.

## HEIGHT-WIDTH LIMITS OF FORMWORK PANEL FOR THE CLIMBING BRACKET BMK-240



## 5.2. LIMITS OF ANCHORAGES

For each application, the loads to be borne by the anchors must be analysed individually. These depend on the self-weight, the live loads and the wind loads.

The anchor strength depends on the following factors:

- Concrete strength
- Cone DW20/M30 or DW15/M24 strength
- Tie rod DW20 or DW15 strength
- Bolt M30 DIN-931-10.9 or M24 DIN-931-10.9 strength
- Through anchor or with Fixed Anchor DW20
- Embedded anchor depth
- Edge effects

Therefore, the limit of the anchorage varies for each anchorage configuration, so each anchorage in particular must be studied.

## 6. TERMS AND CONDITIONS OF USE



The general terms and conditions of use can vary. Therefore, those are defined for each application in particular and included in the documentation for each project.

Herein, serving as example only, the general terms and conditions of use are outlined.

### 6.1. LOAD CASES

The following load cases are identified for the climbing brackets BMK:

- **Working case:** when carrying out works such as concrete pouring, placing steel reinforcement, preparation and stripping. These works are restricted to a permissible wind speed of 64 km/h (0.2 kN/m<sup>2</sup>).
- **Out-of-service case (OS):** when wind speeds are above the maximum permissible wind speed of 64 km/h (0.2 kN/m<sup>2</sup>).



When facing an out-of-service situation, the following preventive measures must be taken to ensure the safety of workers on the building site:

- Evacuate all employees working on the climbing bracket structure. Works must not continue on the climbing formwork.
- Tie any loose object of the climbing platforms.
- In an out-of-service situation, the formwork panels are moved against the wall and the stripping systems blocked.

### 6.2. MAXIMUM WORKING LOADS

According to the load case, some maximum load conditions are specified to which the system can be submitted.

In each load case, permanent loads equal for all load cases and variable loads differing according to the load case are considered.

Subsequently, the loads to consider are specified:

- Permanent loads:
  - Self-weight of the structure
  - Self-weight of the formwork panels
  - Self-weight of the working platforms
- Variable loads:
  - Live loads on working platforms
  - Wind loads (according to Eurocode 1)



The final values are specified in the documentation of each application.

Serving as example, these are the loads to consider.

LIVE LOAD (kN/m <sup>2</sup> )	A WORKING	C OS
Pouring Platform	1.5	0.75
Vertical Waler Plat.	0.75	0
Main Platform	3	1.5
Cone Recovery Plat.	0.75	0
<b>WIND (km/h)</b>	64	According to EC-1 (parts 1-4).



The customer is responsible to check the wind speed and the live loads on the platforms at all times.

### 6.3. ANCHORAGE STRENGTH

For each application, the loads acting on each anchor as well as the minimum strength which the concrete must have to hold the elevating structure are specified.

### 6.4. SAFE HANDLING GUIDELINES

#### 6.4.1. BASIC SAFETY GUIDELINES ON SITE

- Appropriate certified personal protective equipment must be used to ensure the safety of workers.

Always use:

- Safety helmet
- Gloves
- Safety boots



Where applicable and whenever necessary with regard to the type of works carried out, use:

- Goggles or safety screens
- Hearing protection
- Breathing mask
- Safety harness



- Adequate collective protection equipment (nets, handrails, etc.) must be installed to ensure safe working at height.
- Observe an adequate tidiness and cleanliness of formwork and climbing and formwork systems to ensure their safe handling. The working platforms are kept clean and tidy at all times, without tools, bolts and any other parts in danger of falling from them, and striking persons below.
- Toeboards are placed at the outside face of the

platforms to prevent objects from falling to a lower level. Moreover, safety nets can be installed at the outside face of the platforms to prevent objects from falling to a lower level. At the inside of the platforms cover gaps with rubber or similar material to prevent objects from falling to a lower level. Avoid working below platforms where work is carried out which might entail the hazard of falling objects.

- Access to and between platforms is ensured exclusively by ladders installed for this purpose. After having accessed a platform, the ladder hatch must be closed. All ladders should project 1 m above the platform to which they provide access.
- Spread sawdust or sand on any slippery surface caused by spilling (release agent, etc.).

#### 6.4.2. System-specific safety instructions

- All persons responsible for the operation of the climbing system must be qualified and trained and must have read the User's Guide before handling the system. The User's Guide should be constantly accessible for reference.
- In the case of doubt or lack of information, please contact the Technical Department of ULMA.
- Travel sequences of the climbing system are carried out under the supervision of the person in-charge of the installation. This person must be trained for the handling of climbing systems.
- The employed crane must be of sufficient capacity for the handling and assembly of the climbing system parts.
- Check and verify all cables and slings. The maximum angles between the slings during lifting may not exceed 60°.
- Strictly avoid the Lifting Hook MK suffering strong blows and crushing from handling, storage and transport, and above all, from the handling of the formwork with it.

- The Lifting Hook MK must be visually checked before each use and removed from service, if not working properly.
- If the Lifting Hook MK experiences any sort of deterioration during handling, it must be immediately removed from service.
- Before starting to lift the climbing brackets or platforms, make arrangements to close the sides of the platform to avoid falls from height.
- No workers are allowed on the working platforms during their lifting.
- Ensure a steady and smooth travel of the climbing structure. Avoid any sudden jerky movements.
- Step back when lifting starts. Slightly lift the item and check that the load is balanced and secured correctly.
- If not, lower the load again to the ground and revise deficiencies.
- Stand clear of suspended load. Do not guide suspended load with your hands. To guide suspended load, auxiliary means such as ropes previously tied to the load are used.
- Under the circumstances that the crane operator has no visual control of the entire trajectory of the load, the crane operations are guided by a banksman who is in constant communication with the crane operator by means of a previously agreed sign code.
- To prevent collision between platforms or brackets during elevation, special attention must be paid to the interferences between platforms and to any object which could interfere in the elevation movement of the system.
- The entire structure with its components must get assembled according to the instructions and assembly drawings provided by ULMA. All bolts, connections, tie rods, pins, etc. must be assembled correctly.
- All working platforms of the climbing system are kept free from ice and snow, even when not in use.
- The maximum permissible wind speed for working on the climbing system is 64 km/h (0.2 kN/m<sup>2</sup>). The customer is responsible to check the wind speed at each lifting operation and to evacuate the platforms and to fix all platform components the way they do not fall down, when wind speed is rising.
- For correct handling of the climbing system, the customer shall ensure at all times a minimum lighting of 100 lux in working areas, and particularly in areas where the cylinder operation is supervised.
- In the out-of-service case, all employees working on the climbing bracket structure must leave the platforms. The formwork panels must be moved against the wall and the climbing brackets fixed.
- Before moving the roll-back carriages of the climbing brackets, ensure that nobody remains between wall or steel reinforcement and formwork panel.
- The moving of the formwork panel towards the wall must be carried out with special care. Moving the panels against the part of the concrete wall from the previous pouring stage, can cause a pre-stressing or overloading of the climbing system hence loading the climbing structure mainly the screw jacks but also the anchors.
- When moving the formwork panels against the wall, it is very important to strictly follow the steps indicated below:
  - Move the panel close to the wall (2-3 cm from the wall) with the roll-back carriage.
  - Plumb the formwork panel with the push-pull prop.

- Adjust the vertical position of the formwork panel with the levelling jack located at the bottom of the vertical waler.
- Adjust the final position of the formwork panel with the tie rods.
- The use of the climbing system and the presence of persons on the system is forbidden when the weather forecast reports a storm with lightening.
- If the building site is located nearby high voltage power lines, it is recommended to work without power supply. If this is not possible, the appropriate measures according to the respective reference standard should be taken.
- It is of utmost importance to embed the anchors into the concrete as indicated in the User's Guide in order to correctly transmit the loads from the structure to the concrete. The correct transmission of the reactions in the anchors to the concrete is responsibility of the customer. Only genuine components of ULMA may be used to support and anchor the climbing system. ULMA cannot be held responsible for the use of material supplied by third parties.
- The live loads and maximum values of reactions in the anchorages indicated in this guide must be respected. Likewise, the minimum concrete strengths indicated for the operation of the climbing system must be respected. The customer is responsible to control and check the concrete strength.

**6.4.3. Maintenance of the climbing system**

- Before assembling any system part, check that it is in good working condition (rust, deformation, etc.).
- Periodically check the correct arrangement and working of bolts, pins, wedges and joint components, in general.
- No alteration or change neither to the system components nor to the assembly of the climbing system is made without the approval and under the supervision of ULMA personnel.
- All welding which affects the operation of the climbing system are carried out under the supervision of personnel of ULMA.
- Proper storage of the parts is fundamental to keep them in good working condition.

**6.4.4. Inspection instructions of lifting appliances with CE marking of ULMA Construcción**

- Before each use, the condition of the lifting appliance must be checked, confirming the good working condition of the following parts:

COMPONENT TO CHECK	CORRECT WORKING CONDITION
Ring	Without deflection nor excessive wear
Square bar	Without deflection
Bolt	Without deflection
ID plate	Existing and legible

In case that the lifting appliance does not fulfil all defined requirements, it must be removed from service.

For more information, consult ULMA Construcción.

## 7. Legal references

### 7.1. LEGAL REFERENCES

- Council Directive 89/391/EEC of 12 June 1989 on the introduction of measures to encourage improvements in the safety and health of workers at work
- Council Directive 89/654/EEC of 30 November 1989 on the minimum safety and health requirements for the workplace
- Council Directive 89/656/EEC of 30 November 1989 on the minimum health and safety requirements for the use by workers of personal protective equipment at the workplace
- Council Directive 90/269/EEC of 29 May 1990 on the minimum health and safety requirements for the manual handling of loads where there is a risk particularly of back injury to workers
- Council Directive 92/57/EEC of 24 June 1992 on the implementation of minimum safety and health requirements at temporary or mobile construction sites
- Directive 92/58/EEC of 24 June 1992 on the minimum requirements for the provision of safety and/or health signs at work
- Directive 89/655/EEC of 30 November 1989 concerning the minimum safety and health requirements for the use of work equipment by workers at work. Council Directive 95/63/EC of 5 December 1995 and Directive 2001/45/EC of the European Parliament and of the Council of 27 June 2001 amending formerly mentioned Directive.
- Directive 2002/44/EC of the European Parliament and of the Council of 25 June 2002 on the minimum health and safety requirements regarding the exposure of workers to the risks arising from physical agents (vibration)
- Directive 2003/10/EC of the European Parliament and of the Council of 06 February 2003 on the minimum health and safety requirements regarding the exposure of workers to the risks arising from physical agents (noise)
- Directive 2006/42/EC of the European Parliament and of the Council of 17 May 2006 on machinery, and amending Directive 95/16/EC (recast)

## 8. APPENDICES

### 8.1. DECLARATION OF CONFORMITY: LIFTING HOOK MK

#### DECLARATION OF CONFORMITY

According to Directive 2006/42/CE concerning machines

Hereby ULMA C y E, S.Coop., located in Paseo Otadui 3, 20560 Oñati, declares that the product whose code and name are mentioned below complies with the design and manufacturing aspects concerning people's safety required by the corresponding European directive, being this the valid statement until the product suffers any modification.

Códe: **1991360**

Name: **LIFTING HOOK MK**

Oñati, 28th January 2011

Signed

Ander Olló, R&D Manager  
Responsible for compile the technical file  
Barrio Garibai nº 9, 20560 Oñati

Signed

Aitor Ayastuy, General Manager

## EUROPE

### Spain

**ULMA C y E, S. Coop.**  
www.ulma-c.es

**Canary Islands Branch**  
GÜIMAR (Tenerife)

**Centre Branch**  
AJOFRÍN (Toledo)

**East Branch**  
POLINYA (Barcelona)

**North Branch**  
LEGUTIANO (Álava)

**West Branch**  
CAMBRE (A Coruña)

**South Branch**  
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**Northwest Branch**  
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**East Branch**  
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