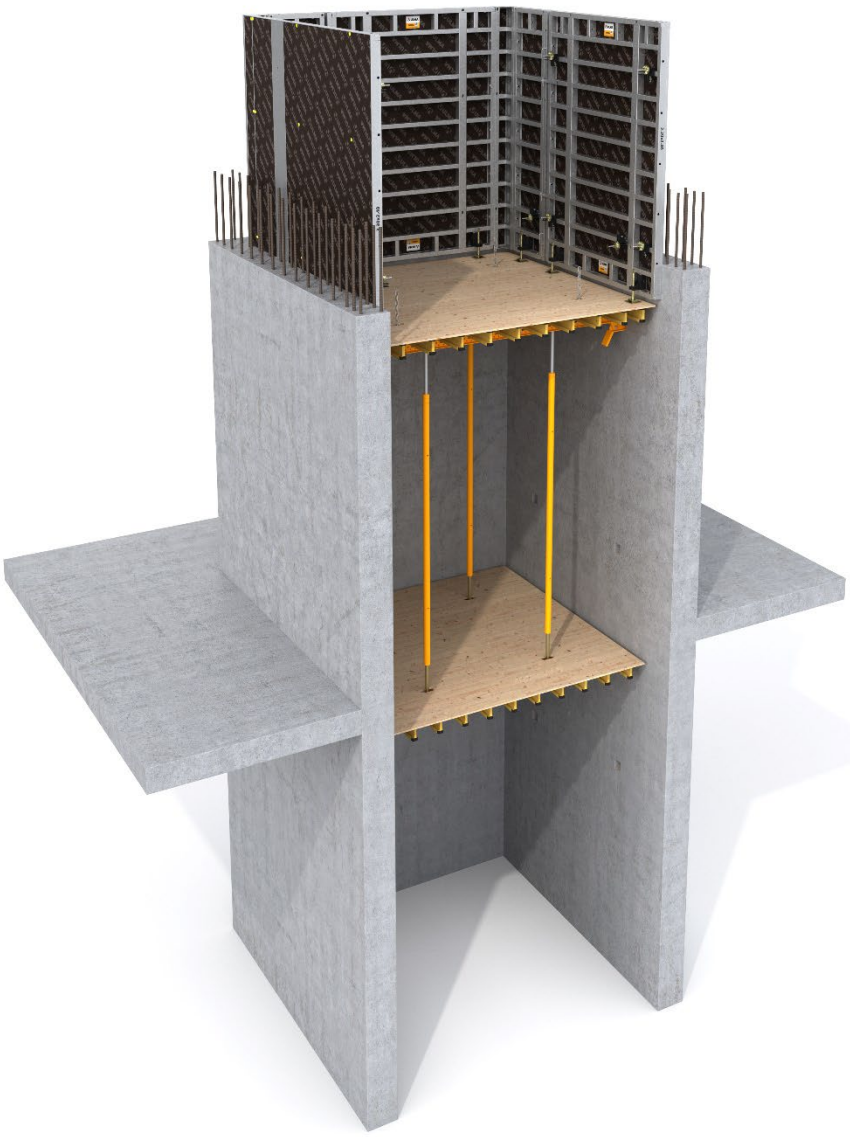
USER GUIDE

PLATFORM KSP

SHAFT INTERNAL FORMWORK



IMPORTANT:

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

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

All instructions regarding safety and operations contained in this document, and the data on stress and loads must be respected. ULMA Construction'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 parts 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 or all our warranties.

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


Safety note


Control note


Warning note


Information note

"Original document" produced and approved by ULMA Construction.

1. Product description

KSP shaft platform is used in internal hollows where due to space limitations it is not possible to use climbing brackets (elevator shafts, bridge piers and any other hollow geometry to be casted or poured in place). It provides support to the wall formwork and can be used as working platform to carry out various tasks such as formwork erection and plumbing.

One of its special features is that by using the gravity pawl bracket and the different ULMA walers it is possible to cover a wide range of spans in this kind of internal hollows.

The KPS platform is mainly used with the standard climbing brackets on the opposite side of the wall. It is made up of walers (DU or MK) and the gravity pawl bracket.

Basic system features are:

- Walers range that may be used:

  DU-100

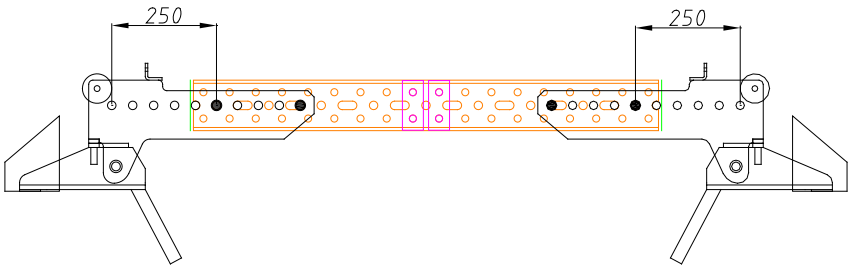
  DU-120

  MK-120

  MK-180

  140 or 160 mm section height walers could also be used if the holes match with those of DU or MK

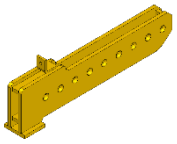
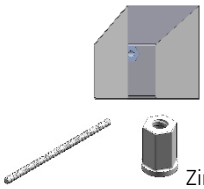
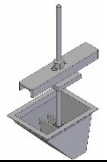
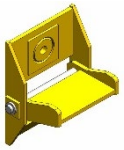
- Maximum 250 mm regulation on each side (holes separation: 50 mm)

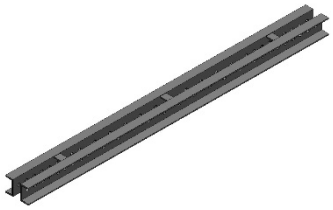


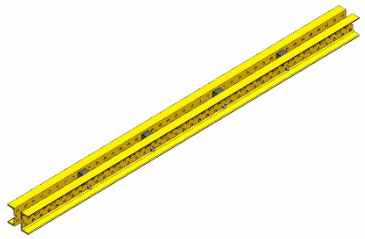
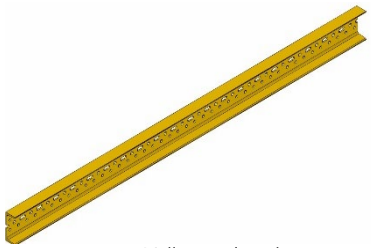
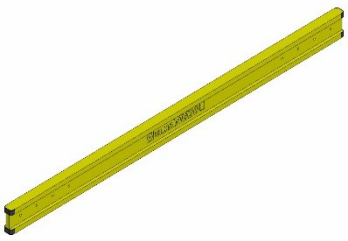
- Possibility to hang cone recovery platform.
- Different anchors on the wall are possible, with GP boxes or folding brackets.

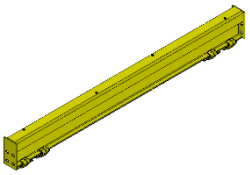
2. Components and accessories

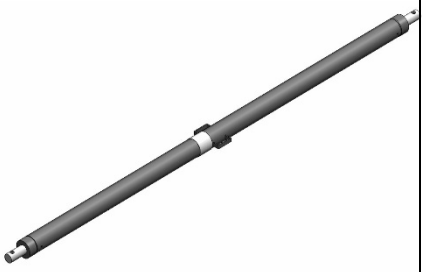
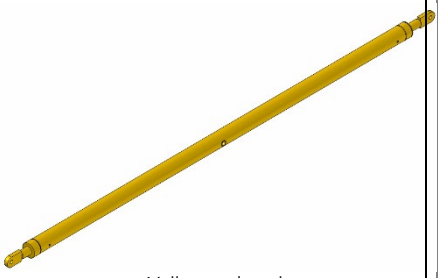
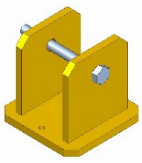
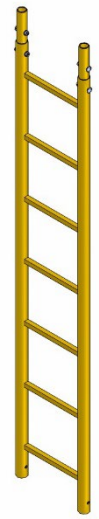
2.1. GRAPHIC DESCRIPTION

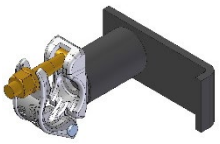
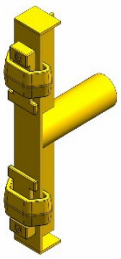
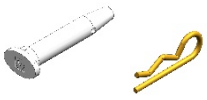
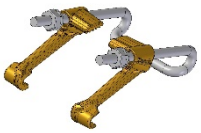
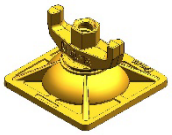
Code	Weight (kg)	Name
WALL FIXING BRACKETS		
0306032	22	GRAVITY PAWL BRACKET  Yellow painted
0306054	15	SHORT GRAVITY PAWL  Yellow painted
0306072	8.7	ADJUSTABLE BRACKET  Yellow painted
0306001 1861033 7238001	1.5 0.6 0.22	GP BOX OUT SHORT PIN 0.35 EXAG NUT 15  Zinc coated
0306002	6.2	GP RETRIEVABLE BOX OUT 
0306020	13.5	FOLDING BRACKET  Yellow painted
0306059	29	ADJUSTABLE SLAB BRACKET  Yellow painted

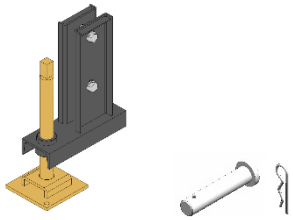
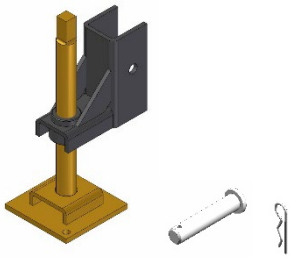
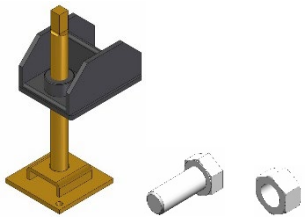
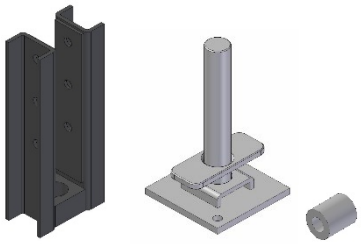
Code	Weight (kg)	Name
DU-100 WALERS		
1960006	4.9	WALER DU-100/0.5
1960007	15.4	WALER DU-100/0.75
1960010	20.5	WALER DU-100/1
1960012	25.8	WALER DU-100/1.25
1960015	31.1	WALER DU-100/1.5
1960020	41.6	WALER DU-100/2
1960025	52	WALER DU-100/2.5
1960030	63	WALER DU-100/3
1960037	78	WALER DU-100/3.75
1960050	104	WALER DU-100/5
1960060	125	WALER DU-100/6  Black painted
DU-120 WALERS		
0111070	9.1	WALER U-120/0.7
0111100	26.5	WALER DU-120/1
0111150	39.7	WALER DU-120/1.5
0111200	53	WALER DU-120/2
0111250	66	WALER DU-120/2.5
0111300	79	WALER DU-120/3
0111350	93	WALER DU-120/3.5
0111400	106	WALER DU-120/4
0111450	119	WALER DU-120/4.5
0111500	133	WALER DU-120/5
0111600	159	WALER DU-120/6  Black painted
MK-120 WALERS		
1990104	6	PROFILE MK-120/ 0.5
1990105	7.5	PROFILE MK-120/ 0.625
1990106	9.1	PROFILE MK-120/ 0.75
1990107	10.7	PROFILE MK-120/ 0.875
1990209	29.4	WALER MK-120/1.125
1990213	41.9	WALER MK-120/1.625
1990217	54	WALER MK-120/2.125
1990219	60	WALER MK-120/2,375
1990221	69	WALER MK-120/2.625
1990225	81	WALER MK-120/3.125
1990229	93	WALER MK-120/3.625
1990233	108	WALER MK-120/4.125
1990237	120	WALER MK-120/4.625
1990239	126	WALER MK-120/4.875
1990245	147	WALER MK-120/5.625

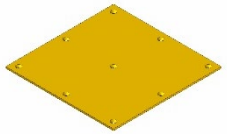
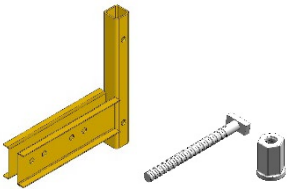
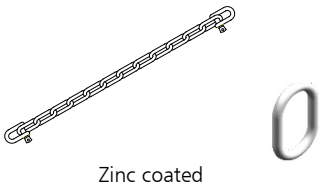
Code	Weight (kg)	Name
		 Yellow painted
		MK-180 PROFILES
1990017	44.1	PROFILE MK-180/2.125
1990021	55	PROFILE MK-180/2.625
1990025	65	PROFILE MK-180/3.125
1990029	75	PROFILE MK-180/3.625
1990037	96	PROFILE MK-180/4.625
1990045	117	PROFILE MK-180/5.625
1990061	159	PROFILE MK-180/7.625
1990085	222	PROFILE MK-180/10.625
		 Yellow painted
1991200	9.1	LONG MAST CONNECTOR HWS
		 Black painted
		VM TIMBER BEAMS
1940191	7.25	TIMBER BEAM VM20/1.45
1940172	9.5	TIMBER BEAM VM20/1.9
1940197	10.75	TIMBER BEAM VM20/2.1
1950129	12.25	TIMBER BEAM VM20/2.45
1940196	13.25	TIMBER BEAM VM20/2.65
1940144	14.5	TIMBER BEAM VM20/2.9
1950130	16.5	TIMBER BEAM A VM20/3.3
1940146	18	TIMBER BEAM VM20/3.6
1950112	19.5	TIMBER BEAM VM20/3.9
1940178	22.5	TIMBER BEAM VM20/4.5
1950113	24.5	TIMBER BEAM VM20/4.9
1940149	29.5	TIMBER BEAM VM20/5.9
		 Yellow painted

Code	Weight (kg)	Name
		HM BEAMS
0190504	8.8	BEAM HM-050(4C)
0191004	14	BEAM HM-100(4C)
0191504	19.2	BEAM HM-150(4C)
0192004	24.5	BEAM HM-200(4C)
0192504	29.7	BEAM HM-250(4C)
0193004	34.9	BEAM HM-300(4C)
0193504	40.1	BEAM HM-350(4C)
0194004	45.3	BEAM HM-400(4C)
		 Yellow painted
		CONE RECOVERY PLATAFORM
0306045	1.7	BRIO-WALER DU CONNECTOR
		 Yellow painted
9050901	0.43	BOLT M10X60 DIN 931
9056600	0.06	SELF BLOCKING EXAGONAL NUT M10
		 Zinc coated
2127825	1.1	DOUBLE SPIGOT
		 Bichromate coated
2127500	4.6	STANDARD 1
2127501	7.4	STANDARD 1.5
2127502	9	STANDARD 2
2127503	13.6	STANDARD 3
2127956	14	STANDARD 4
		 Galvanized

Code	Weight (kg)	Name
1960130 1960125 1960410	31.8 36.4 42.9	PUSH PULL PROP E 2.15-2.75 PUSH PULL PROP E 2.7-3.3 PUSH PULL PROP E 3.25-4  Black painted and zinc coated
1900134 1900123 1908168 1900147	7.8 24.2 43.3 51	PUSH PULL PROP 1.1-1.7 PUSH PULL PROP 2.4-3.5 PUSH PULL PROP 3.6-4.8 PUSH PULL PROP 5-6  Yellow painted
LADDER		
0333010	1.6	LADDER FIXER  Yellow painted
0333008 0333009	19.6 27.1	LADDER C2.1 LADDER C3  Yellow painted

Code	Weight (kg)	Name
0333011	1.6	LADDER HANGER  Black painted and zinc coated
0260505	3.7	SIMPLE BRACING  Yellow painted
0333012	12.7	LADDER PROTECTION  Yellow painted
ACCESSORIES		
0252070 0250000	0.3 0.1	PIN E20 x70 COTTER PIN R/5  Zinc and bichromate coated
1960375	0.85	RVM20 CLAMP 2T  Zinc and bichromate coated
1900256	1.2	PLATE WASHER NUT 15  Zinc coated

Code	Weight (kg)	Name
7238001	0.22	EXAG NUT 15
		
		Zinc coated
0306022	11.4	SCREW JACK TR35X5/VM
1901027	0.14	PIN Ø16X65
9370571	0.01	COTTER PIN R/3
		
		Black painted / Zinc coated/ Bichromate coated
0306027	9.8	SCREW JACK TR35X5/ORMA
1901009	0.3	PIN Ø20X85
9023100	0.01	COTTER PIN R/4
		
		Black painted / Zinc coated/ Bichromate coated
0306004	12	SCREW JACK TR35X5
0241230	0.04	BOLT M12X30 DIN933-5.6
0241200	0.02	NUT M12 DIN 934-5.6
		
		Black painted / Zinc coated/ Bichromate coated
0302022	12.2	WALER SCREW BRACKET TR53x6
0262004	12.5	BASE SCREW JACK TR53X6/350
0661505	0.35	BUSHING D40 d20 L47
		
		Black painted / Zinc coated

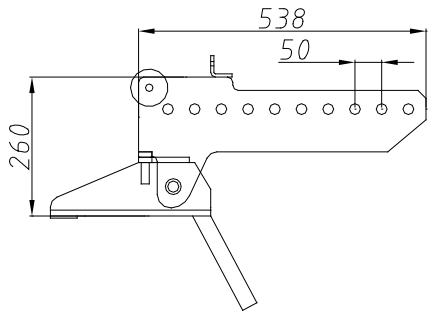
Code	Weight (kg)	Name
0242483	0.38	BOLT M24X80 DIN-933-10.9
1901080	1	CONE DW 15/M24
		
		Bichromate coated
0230104	0.16	TIE ROD 15/0.1
0230014	0.21	TIE ROD 15/0.135
0230019	0.29	TIE ROD 15/0.185
0230024	0.37	TIE ROD 15/0.235
0230029	0.45	TIE ROD 15/0.285
0230034	0.53	TIE ROD 15/0.335
0230039	0.61	TIE ROD 15/0.385
0230050	0.80	TIE ROD 15/0.5
0230100	1.7	TIE ROD 15/1
		
0306005	1.96	PLATE (250X250X4)
		
		Yellow painted
2211165	6.6	VM HANRAIL SUPPORT
1861122	4.23	PANEL BOLT
7238001	0.22	EXAG NUT 15
		
		Yellow painted/ Zinc coated
2211156	9.6	HANDRAIL POST 1.5 (*)
0121000	7.2	HANDRAIL POST D50/1.5 (**)
		
		(*)Zinc coated (**)Yellow painted
0306003	2.3	CHAIN 2G LT/842 (2TN)
9001102	0.5	LIFTING RING A16
		
		Zinc coated

2.2. ELEMENTS DESCRIPTION

2.2.1. Gravity Pawl Bracket (0306032)

This is the basic element of this system. It is used to support the platform on the wall. Several holes ø20 are available along the bracket in order to adjust the size of the platform according to the different internal hollows dimensions.

The bracket is made up of two high strength steel plates with a pawl at one end to transfer the loads to the concrete wall.



2.2.2. Short Gravity Pawl Bracket (0306054)

It is used in those cases where the standard pawl cannot be used due to space limitations, namely for hollows smaller than 1.3 m.

It also can be used with special walers with a fixed measure.

2.2.3. Adjustable bracket (0306072)

It is used together with the Folding bracket when it is not possible or allowed to leave the GP boxes in the concrete wall. It is mainly used for residential buildings Several holes ø20 are available along the bracket in order to adjust the size of the platform according to the different internal hollows dimensions.

2.2.4. Adjustable slab bracket (0306059)

It is used in those cases where one side of the platform is supported on an existing slab.

2.2.5. DU/MK walers

It is the main structural element for the KSP platform. The brackets are assembled on its ends to reach the required dimensions.

Different platform dimensions are possible by combining the different walers and brackets.

The waler range available is: DU-100, DU-120, MK-120 and MK-180"

2.2.6. VM timber beam/HM beam/RVM20 clamp

It is placed on the waler as secondary beam to build the working platform, which will afterwards be covered with board. The connection between walers and VM beams is done by means of RVM20 clamps.

2.2.7. Pin E20X70 (0252070)

It is used to fix the brackets to the waler. Two units are needed per bracket. The pins are placed as separated as possible avoiding using the MK waler's slotted holes.

2.2.8. GP box out (0306001)

It is used to leave a cavity in the concrete wall, which afterwards will be used as support for the KSP platform gravity pawls. It is fixed to the formwork panel's shuttering face by a short tie rod 0.35 m.

2.2.9. GP retrievable box out (0306002)

It is installed from the internal formwork face keeping in mind that a hole of 155x205 is needed on the panel plywood. It can not be used on ORMA panels.
It is fixed to the formwork by a U profile and a tie rod and recovered after concrete pouring from the inner side of the platform.

2.2.10. Folding bracket (0306020)

It is used when it is not allowed to have the cavities in the concrete wall, for example on fair-face walls. This bracket is fixed to the wall using the previously embedded cone DW15/M24. Afterwards, the Folding bracket is fixed by fastening an M24x80 bolt into the cone.
In this solution, the walers may also be used without the Adjustable bracket. In that case, the waler rests directly on the folding bracket.

2.2.11. Screw jack TR35X5/VM (0306022)

It is used to plumb and level the ENKOFORM panels assembled with VM timber beams. It is formed by one support attached to one of the timber beams by means of the incorporated bolts.
Maximum regulation height: 270 mm.

2.2.12. Screw jack TR35x5/ORMA (0306027)

It is used to plumb and level the ORMA panels. It is formed by one support attached to the panel's ribs by a 20x85 pin and a cotter pin R/4 pin.
Maximum regulation height: 270 mm.

2.2.13. Plate 250x250x4 (0306005)

It is a distribution plate on which the different screw jacks rest. It allows better sliding and moving of these jacks during the assembly and stripping process.
The plate has some holes so that it can be fixed to the platform with nails.

2.2.14. BRIO-Waler DU connector (0306045)

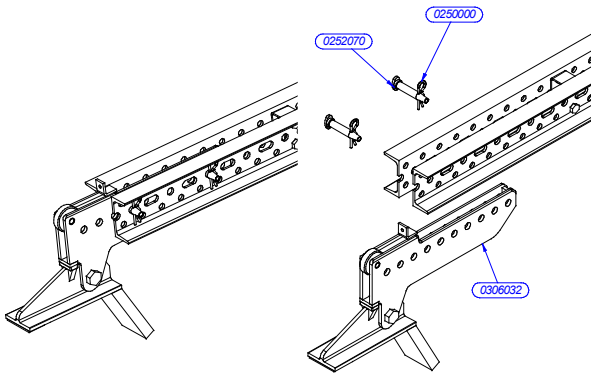
It is used to hang the BRIO standards for cone recovery platform solution.
It is assembled on any of the waler's holes by inserting a pin E20x70. It also allows installing the Lifting ring A16 in between the two plates.
The connection with the BRIO standard is done by two M10x60 bolts and two M10 nuts.

3. Assembly, Use and Disassembly

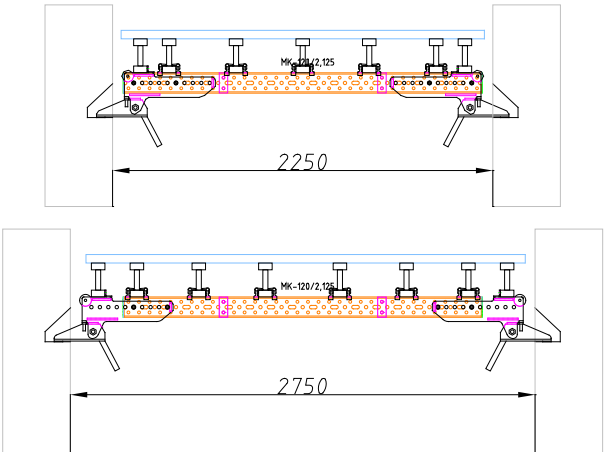
3.1. MAIN PLATFORM

3.1.1. Gravity pawl bracket and Adjustable bracket

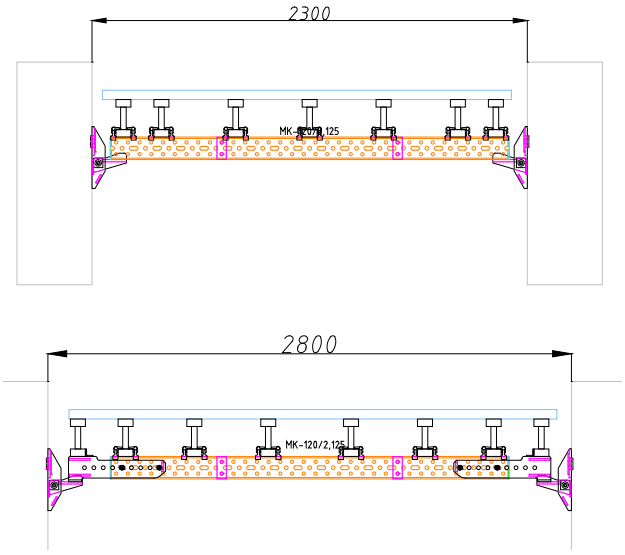
The first step in the KSP platform assembly is to fix the Gravity Pawl Brackets, the Adjustable Brackets or the Short Gravity Pawls on the waler.



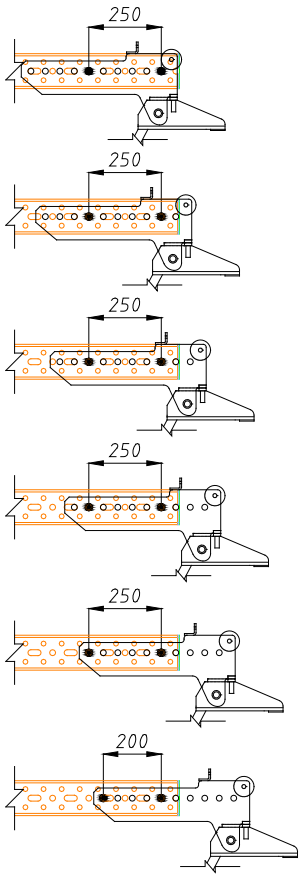
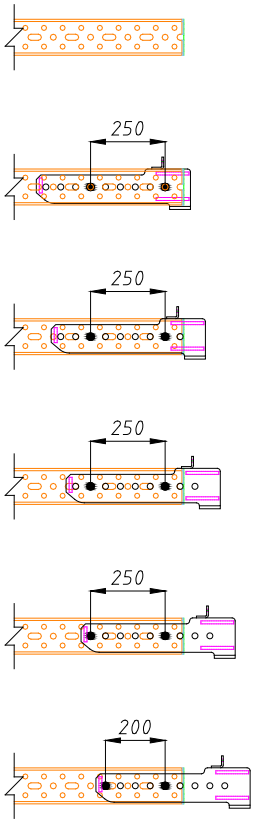
The Gravity Pawl Bracket provides a maximum adjustment of 250 mm. Using 2 brackets per waler, 500 mm adjustment is achieved. Taking into account that a waler length every 500 mm is available, almost all dimensions can be obtained.



The Adjustable Bracket provides a maximum adjustment of 200 mm (250 mm is not necessary because for some hollow lengths, it is used the waler without the Adjustable Brackets).

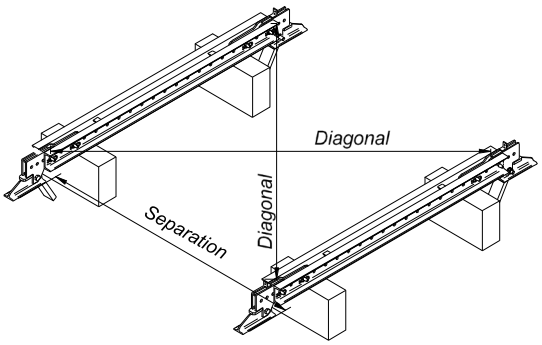


The connection is done by two E20x70 pins with their cotter pins R/5 and they are placed in the position shown below:

POSSIBLE POSITIONS OF THE GRAVITY PAWL BRACKET	POSSIBLE POSITIONS OF THE ADJUSTABLE BRACKET
	

3.1.2. Walers positioning

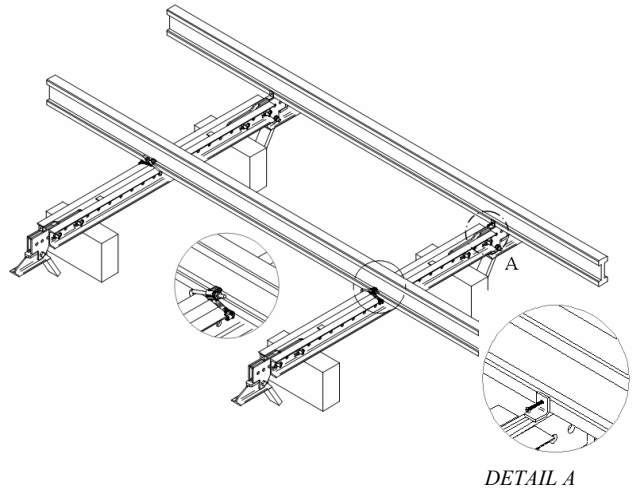
Once the brackets are assembled on the walers, the next operation consists of positioning the walers. In order to do it properly, some timber planks should be used to support the set, preventing the Gravity pawl from touching the floor. In this operation, walers are spaced following the assembly drawings and diagonals are measured to avoid making a parallelepiped shape.



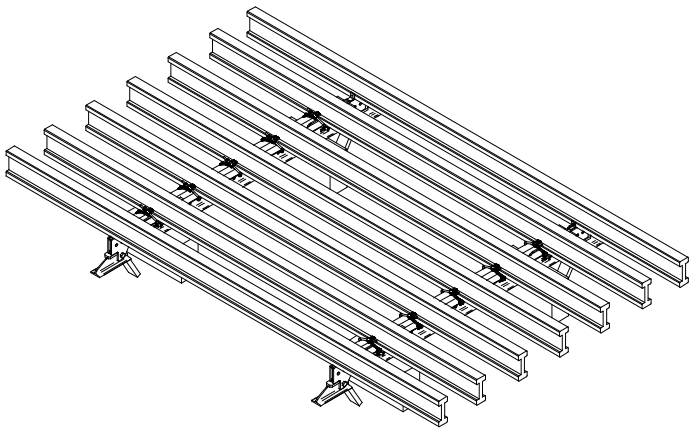
3.1.3. Secondary beams positioning

Timber beams VM

Once the walers are positioned, secondary beams are fixed on them using the RVM20 2T clamp. The beams placed on the gravity pawls are directly screwed to them using screws (5x30 screw); (detail A).



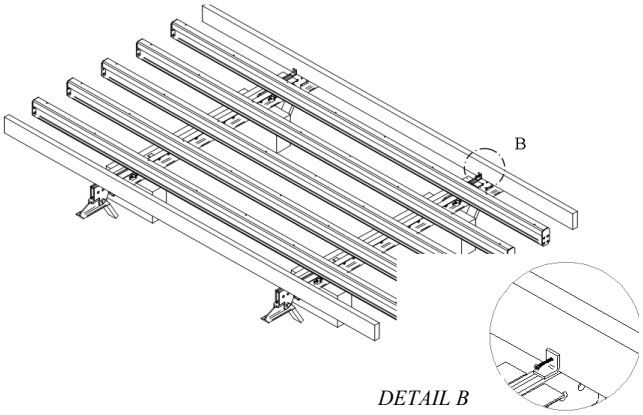
DETAIL A



HM beams

If HM beams are used as secondary beams, the way of placing them is the same as for VM beams, but in this case it is necessary to keep in mind that is not possible to assemble these beams on the Gravity pawl. The end HM beams should be replaced by 5x15 planks.

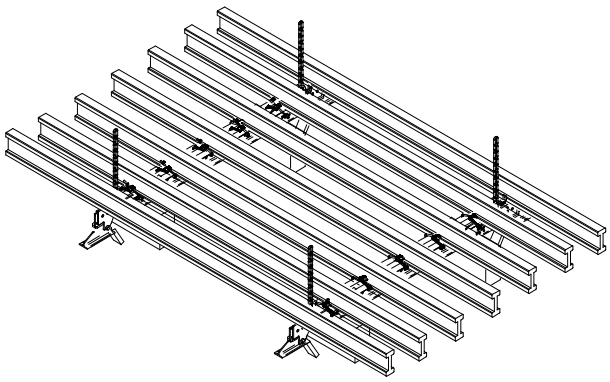
The planks are fixed to the Gravity pawls using screws in the same way as for the VM beams.



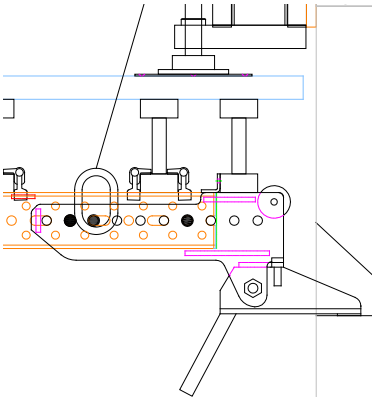
DETAIL B

3.1.4. Lifting chains assembly

In case platform and formwork have to be lifted together, it is required to assemble lifting chains.



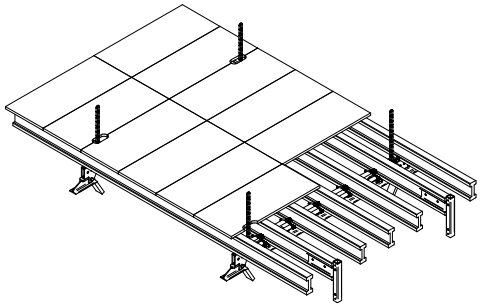
These chains are directly fixed on the waler by a E20x70 pin (this pin will be an extra pin different to the ones used to fix the Gravity pawl bracket). In case it is necessary to assemble the chain in the area where the Gravity pawl is located, the Ring A16 has to be used.



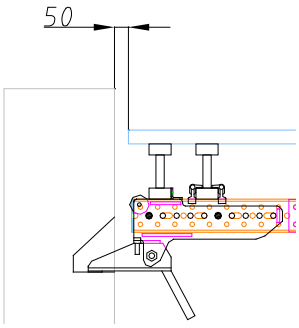
It is possible to join two CHAIN 2G LT/842 (0306003), extending the total length.

3.1.5. Board assembly

The platform structure is covered by 3-layer timber boards or timber planks

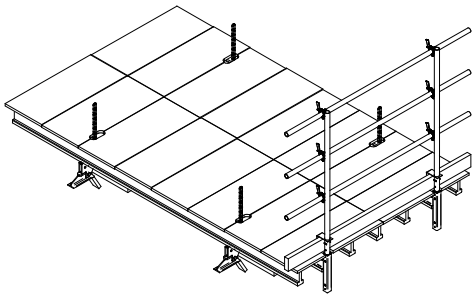


It is recommended to adjust the board taking into account that the distance from its edge to the wall will be approximately 50mm.



3.1.6. Perimeter protections

In case of fall risk from any of the platform's edges, it is necessary to install perimeter protections handrails. It is convenient to install the handrail support while assembling the beams and before covering them with the board. Once the VM handrail support is installed by a Short pin 0.35m and hexagonal nut 15, and the platform is covered with boards, toe boards and ledgers can be fixed to these supports.



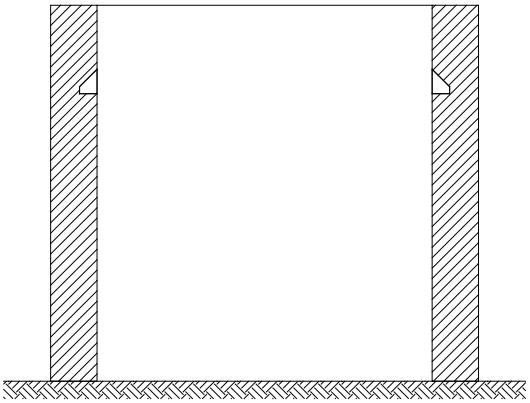
3.2. MAIN PLATFORM PERFORMANCE

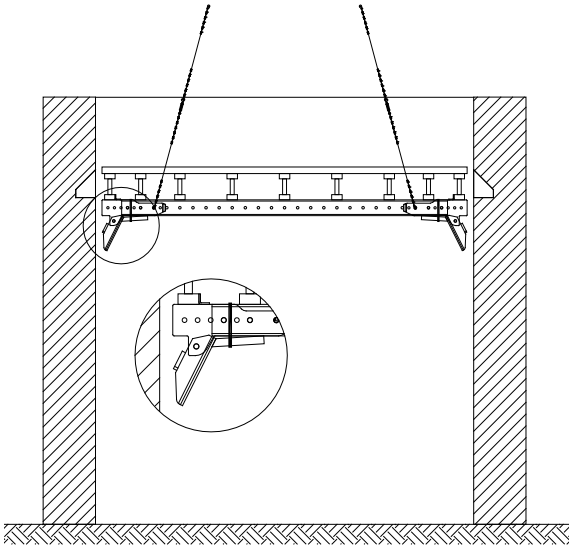
The first pour of the shaft to build is done supporting the formwork directly on the foundation. This formwork has to include the boxes or cones (in the case of Folding Bracket), used to support the main platform in the following pouring step.

Depending on if boxes or Folding brackets are used, there are different solution possibilities:

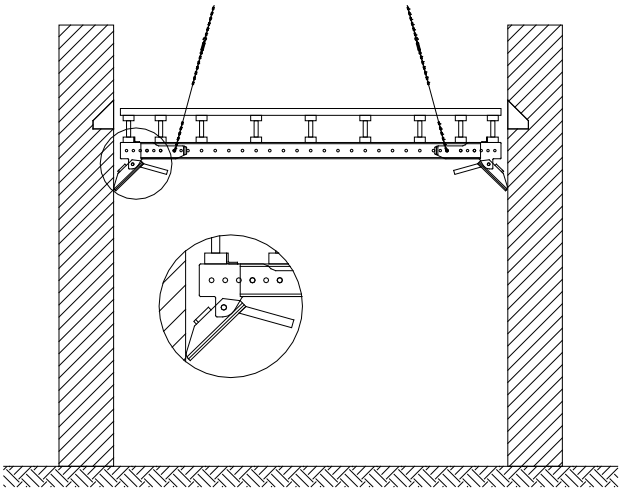
3.2.1. GP Box Out:

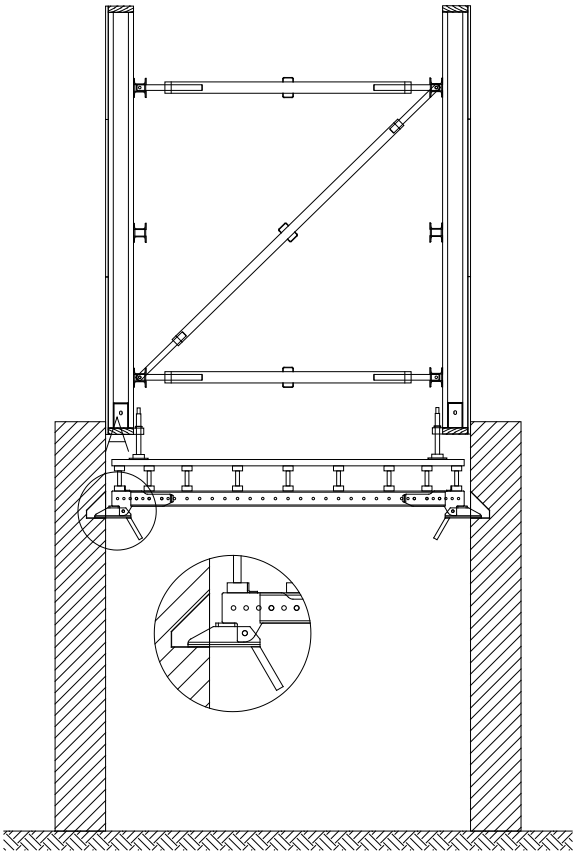
To be able to insert the main platform into the shaft, pawl brackets have to be previously folded. The best way is to tie the mobile part of the pawl to the waler using cords. Afterwards, the platform will be inserted in the shaft until the hollow made by the Box Out. The cords must be cut in that moment.





Once the cords are cut, the pawls will go to their final position by gravity influence. The platform has to be lifted till the Gravity Pawls rest on the previously made cavities.

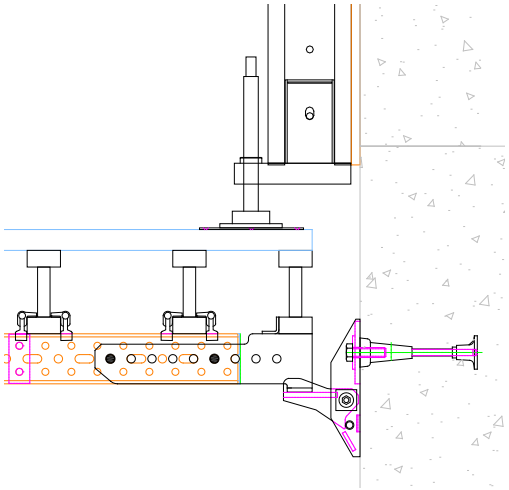




Once the platform rests in the working position, the formwork can be placed and braced on top of it, using chains if necessary to connect the formwork to the platform.

3.2.2. Folding bracket

After the first pouring formwork panels are stripped off; the Folding Bracket can be fixed to these cones embedded in the concrete wall with an M24x80 bolt. Once the Folding brackets are fixed to the cones in the wall and as they stand out of the wall, the main platform can be inserted in the shaft and left resting through the Adjustable brackets of the platform on the Folding brackets.

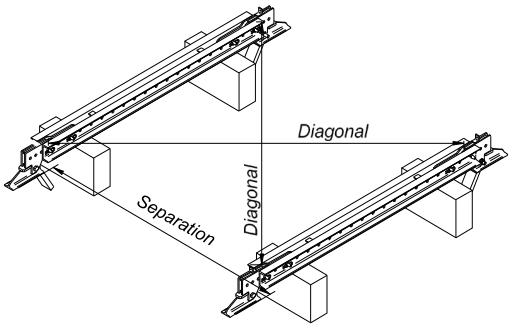


3.3. CONE RECOVERY PLATFORM

Once the second wall step poured, a lower platform may be necessary to recover the material left behind or to do additional jobs.

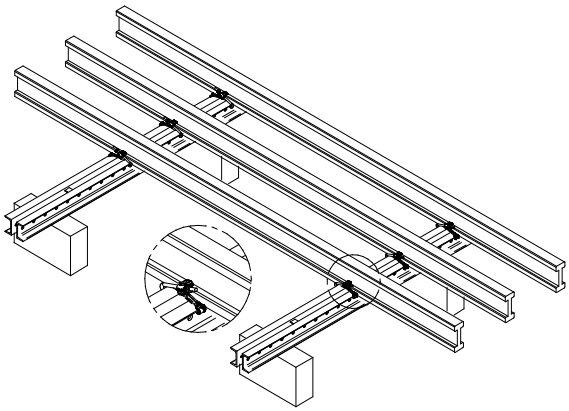
3.3.1. Walers positioning

The first step to assemble the cone recovery platform is placing the walers according to the dimensions given in the assembly drawings. Diagonals have to be measured to avoid deviations.



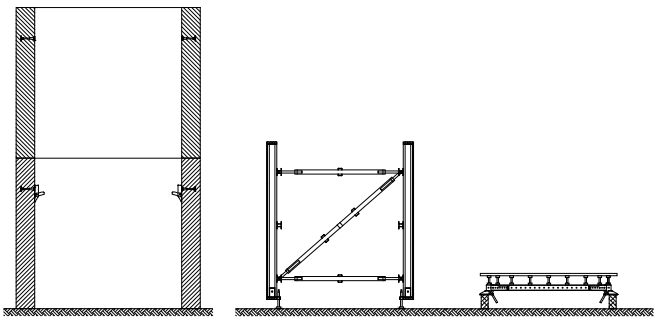
3.3.2. Beams positioning

VM beams are positioned and fixed on the walers using clamps.



3.3.3. Platforms connection

The assembly of cone recovery platform and the main platform is done outside the shaft

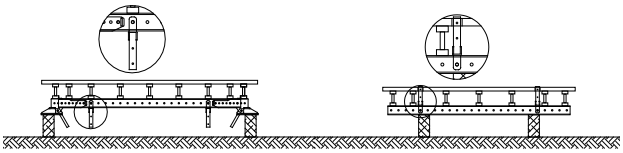


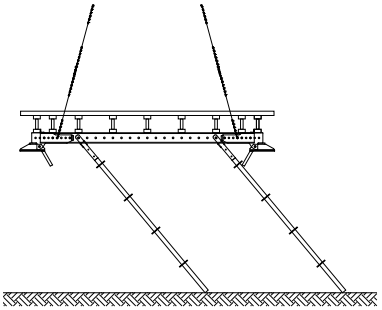
There are three different connection types between main platform and cone recovery platform:

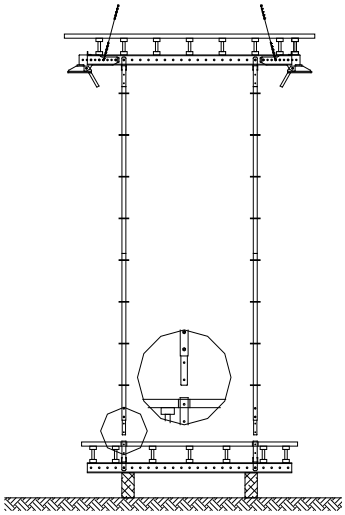
- Connection by BRIO standards
- Connection by push-pull props E
- Connection by DW15 tie rods

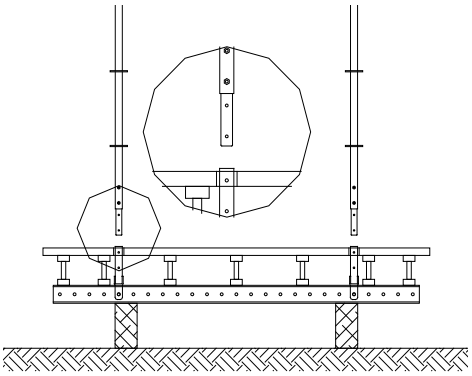
- **Connection by BRIO standards:**

BRIO HEAD/DU and BRIO scaffolding standards are used for this solution:





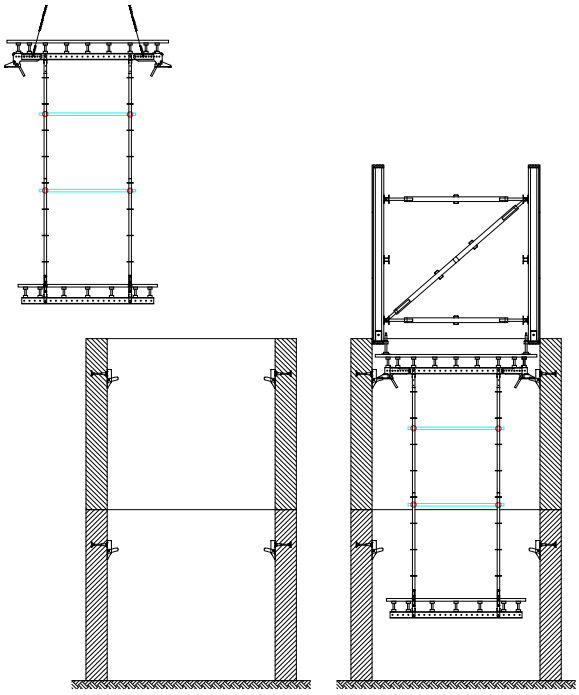




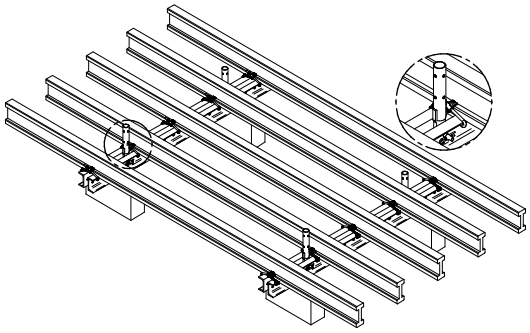
In these cases the best option is to preassemble BRIO HEAD/DU on the main and cone recovery platforms. Once the platform is lifted, BRIO standards can be assembled.

BRIO HEAD/DU are fixed to the walers by means of pins E20x70 and cotter pins R/5

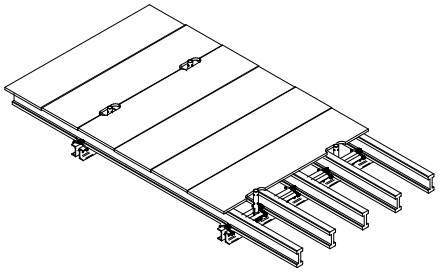
It is recommended to brace the BRIO standards with tubes and couplers.

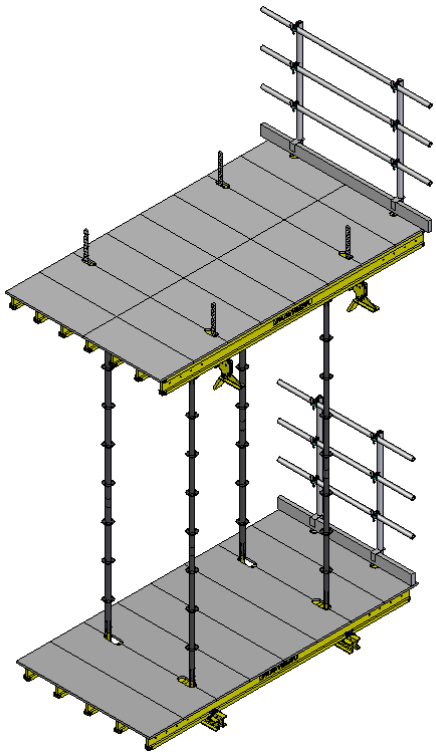


Once the beams are assembled and before covering the platforms with boards, BRIO HEADS/DU have to be fixed in the holes indicated in the assembly drawings.
The heads are fixed to the walers with E20x70 pins and R/5 cotters pins.



The platforms may be covered with boards such as three-layer timber boards or wood planks.



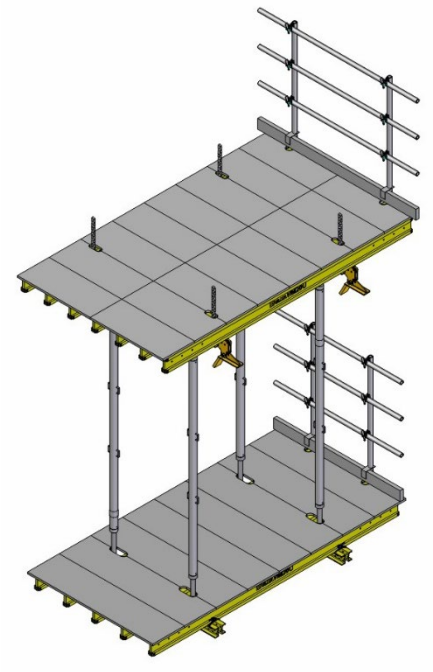


- **Connection by PUSH-PULL PROPS E:**

In this solution push-pull props E are used:

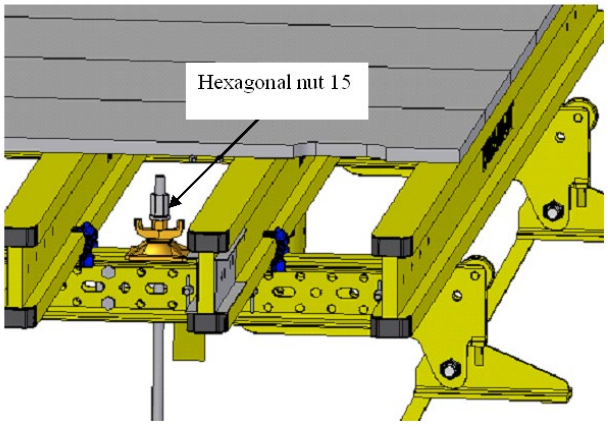
- 1960130 push-pull prop 2.15-2.75
- 1960125 push-pull prop 2.7-3.3
- 1960410 push pull prop 3.2-5.4

The push-pull props E are fixed to the waler by means of E20x70 pins

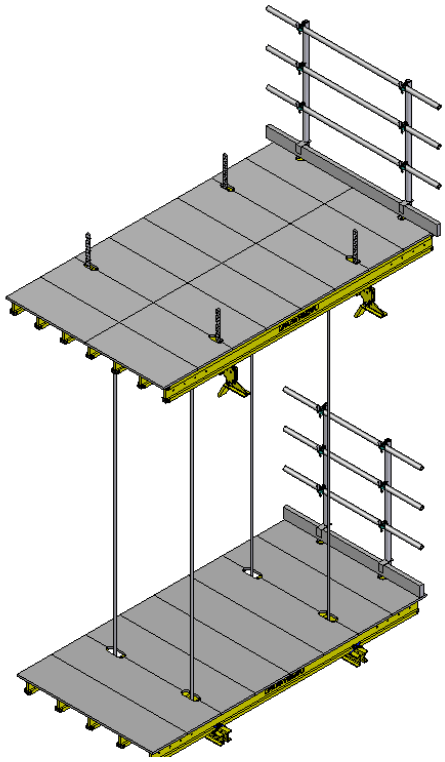


- **Connection by DW15 tie rods:**

Plate washer nut 15, hexagonal nut 15 and DW15 tie rods of the required length are used for this connection

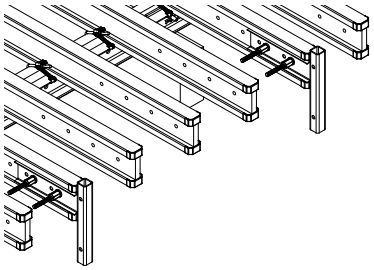


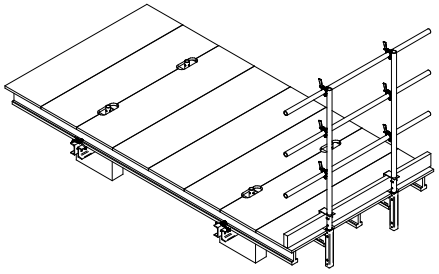
The hexagonal nut 15 works as locknut. It must be firmly tightened to the plate washer nut 15.



3.3.4. Perimeter protections:

As with the main platform, perimeter protection handrails have to be assembled if there is any risk of fall.





For perimeter protection, VM GUARDRAIL STANDARD is used for fixing the handrail post to VM beams. This connection is done by the panel bolt and the Hexagonal nut 15.

3.4. FORMWORK PANELS POSITIONING

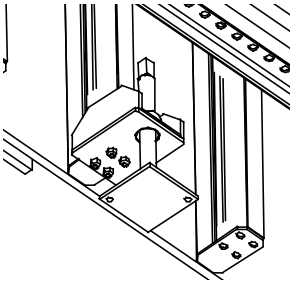
The formwork panels' vertical adjustment is done by fixing two levelling jacks at the bottom of each gang. There are 4 different types of jacks depending on formwork type, all of them are driven by a 24 wrench

- Levelling jack TR35x5/HM
- Levelling jack TR35x5/VM
- Levelling jack TR35x5/ORMA
- Waler vertical adjustment

These jacks rest on one plate to reduce the friction between the jacks' bottom plate and the platform board.

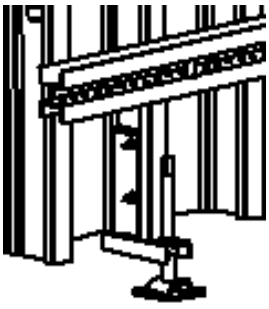
3.4.1. Levelling jack TR35x5/HM

It is used for levelling ENKOFORM gangs formed by HM beams. It is fixed to the HM beams bottom plate by 4 M12x30 bolts and their corresponding nuts.



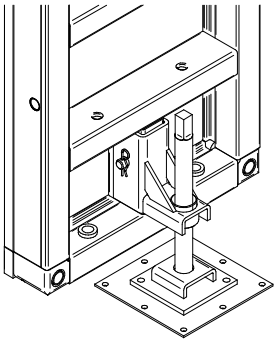
3.4.2. Levelling jack TR35x5/VM

It is used for levelling ENKOFORM gangs formed by VM beams. It is assembled to the beam with two bolts included in it.



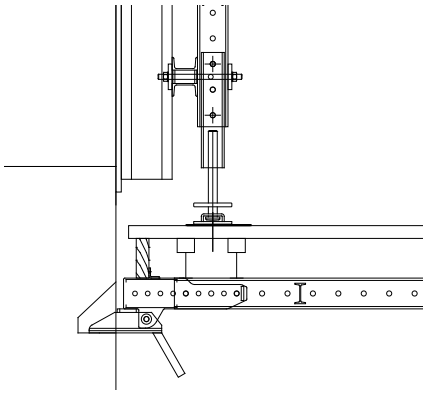
3.4.3. Levelling jack TR35x5/ORMA

It is used for levelling ORMA formwork panels. It is fixed to the panel rib with a 20x85 pin and an R/4 cotter pin.



3.4.4. Waler vertical adjustment

The levelling jack is directly connected to the waler by the TR53x6/350 screw jack and the RU/H-vela TR53x6 bracket, which is fixed to the waler by means of M18x120 bolts with their nuts and D4 d20 L47 collars.



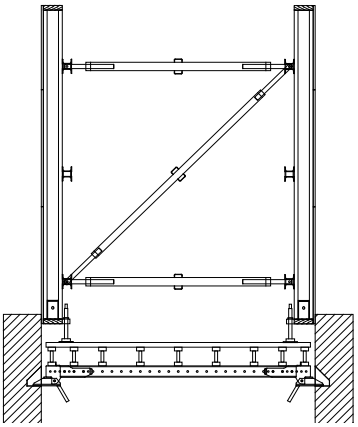
3.5. FORMWORK PANEL PLUMBING

Two different plumbing methods can be used depending on if formwork and platform will be moved together as a complete set or separately.

3.5.1. Complete set

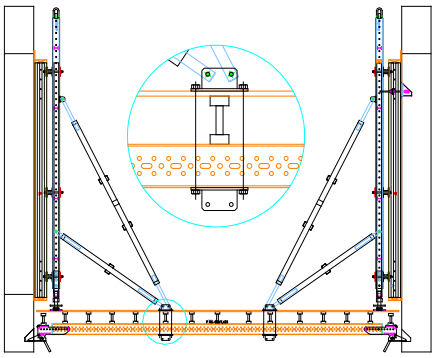
Formwork panels should be braced to assure stability while lifting the set. This bracing is normally done by two horizontal and one diagonal push-pull props fixed on the bottom and top.

The usual bracing way is with two of these push-pull prop sets per gang. It is recommended to place all inclined push-pull props in one set parallel to each other in order to facilitate the set's plumbing.



3.5.2. Separately

When formwork and platform are lifted or moved separately, the formwork panels don't need to be connected. In this case, another bracing way can be done by connecting the push-pull props to the platform. This solution is valid just for plumbing the formwork. Some board reinforcement should be used at the interface between the push-pull props and the board.



3.6. LIFTING

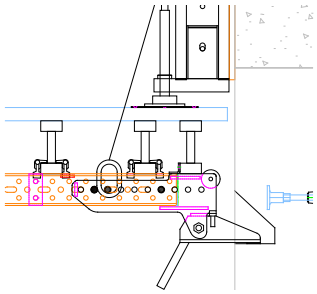
Two different lifting methods can be used depending on if formwork and platform will be lifted together as a complete set or separately.

Each formwork system must be used with its corresponding approved lifting hook

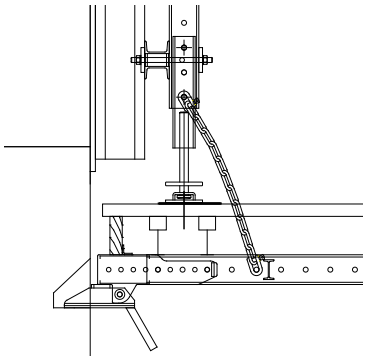
3.6.1. Complete set

Formwork is connected to the main platform by chains. While lifting the formwork, the main platform is pulled by these chains.

The chains are directly connected to the waler by passing a pin E20x70 through the chain's last hole. In case it is necessary to place the chain near the GRAVITY PAWL area, it will be necessary to use an additional LIFTING RING A16.



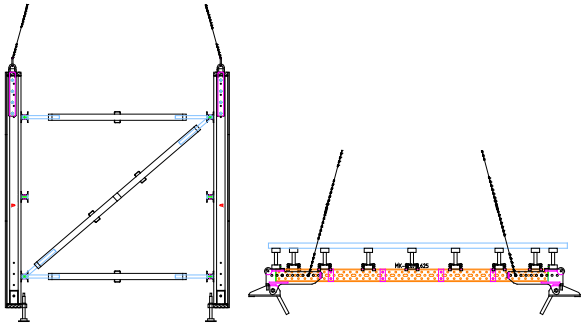
The connection to the vertical waler is done in the same way but, in this case, if the vertical waler adjustment element is also used, one of the D40 d20 L47 collars (code 0661505) has to be removed.



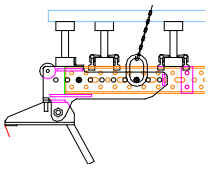
For heavy formwork and platform sets, it is recommendable to use vertical walers

3.6.2. Separately

The formwork and the platform are not connected, so finally they move independently.



To lift the main platform, this should be pulled from the inserted pin.



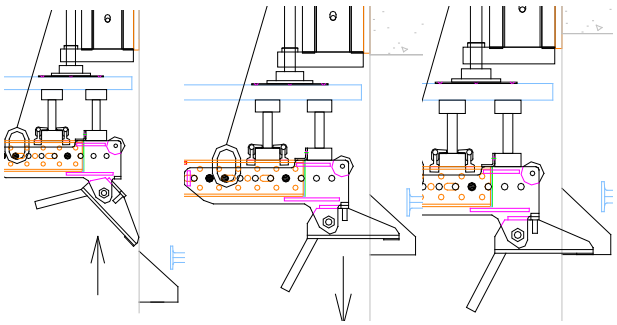
4. Solutions

4.1. MAIN PLATFORM SUPPORTS

When climbing with KSP platforms, it is necessary to provide supports for the platforms on the wall. This support can be created by leaving a cavity in the wall where brackets can rest (BOX-OUT solution) or fixing an articulated bracket on the wall with embedded cone, (FOLDING BRACKET solution).

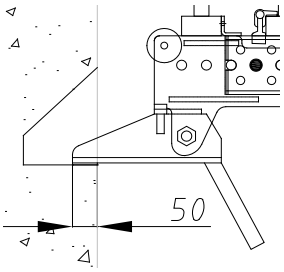
*In **box-out** solution**,** the platform, with the GRAVITY PAWL BRACKETS placed at the end of the main walers, is supported on the cavities previously made in the wall.

When lifting the platform, the pawls fold and leave the cavity (a), returning to their original position when meeting the next cavity (b). Finally, the platform is lowered and left resting on the concrete cavities (c).



(a) (b) (c)

For fair face concrete, making cavities in the wall may not be accepted. The box-out solution is mainly used for elevator shafts or hollow piers.

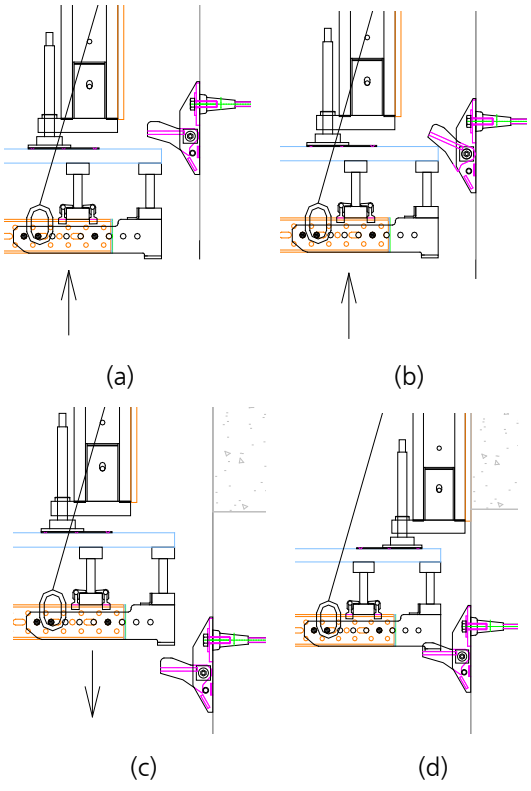


It is very important to guarantee a minimum support of 50mm

The stability of the platform should always be verified in the worst case (platform moved to the top against one of the sides).

*In case of using the **folding brackets** solution; there is not any folding element in the platform. The FOLDING BRACKET is the element including a hinged plate where the platform is supported.

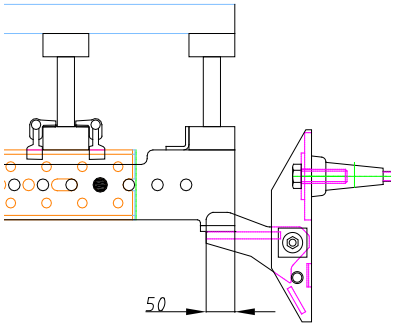
When lifting the platform (a), this hits and lifts the hinged plate of the Folding bracket (b). The plate drops and finally the platform can be rested on this plate (c).



(a) (b)

(c) (d)

The Folding Bracket must be correctly fixed to the wall and the minimum support of the Adjustable Bracket must be 50mm



The stability of the platform should always be verified in the worst case (platform moved to the top against one of the sides).

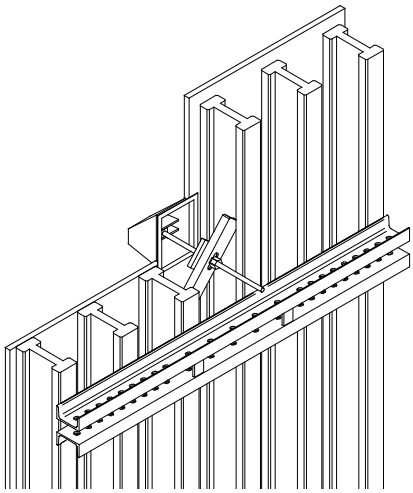
4.1.1. GP Retrievable box-out

This box is mainly used when using ENKOFORM panels with VM or HM beams.

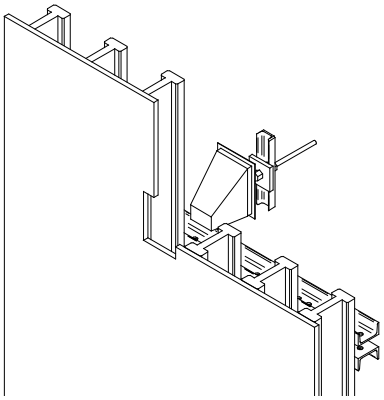
The frame ribs might have to be cut and therewith the panel would be ruined.

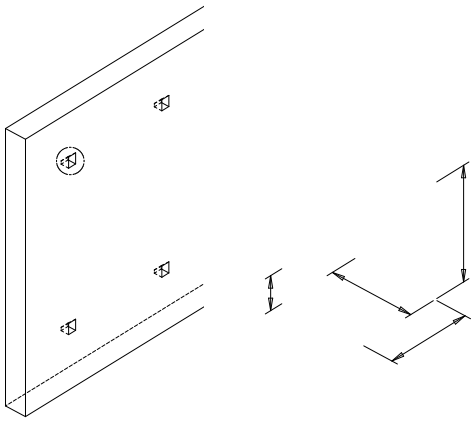
The box can be recovered without totally stripping the formwork off the wall. It facilitates the set's lifting works because only a few mm gap to is required.

The box is stopped by the inner plywood face and fixed between the sides of two shuttering beams.



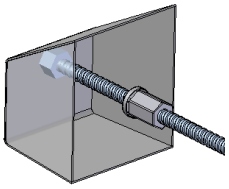
When using this box-out, it is necessary to drill a 205x155 hole in the formwork panel. Therefore this solution is not recommended when working with frame systems like ORMA.



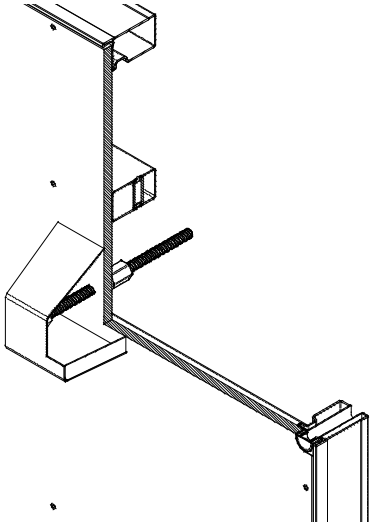


4.1.2. GP box out

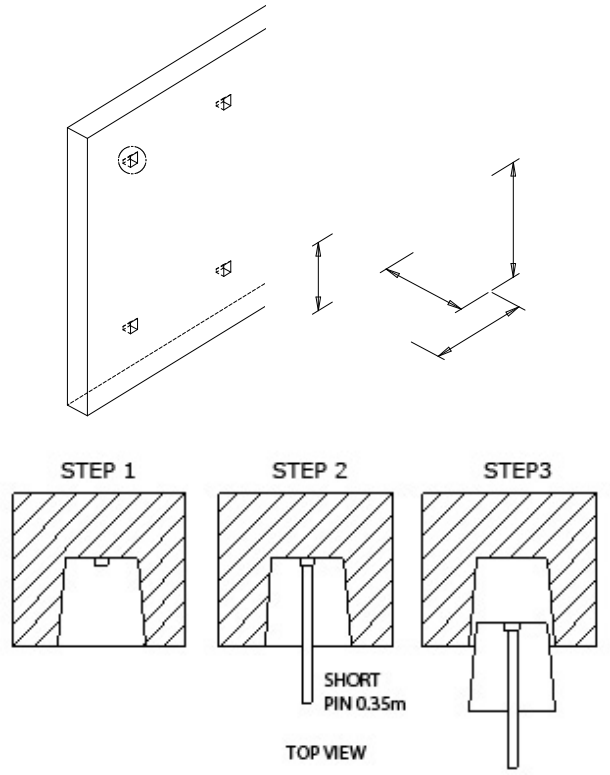
The box is placed from the concrete face of the formwork and fastened with a short pin 0.35m and hexagonal nut 15. To do so, a 18mm hole has to be drilled through the plywood.



This part remains in the concrete and only removing the short pin 0,35m and stripping the formwork a few millimetres from the wall, the formwork set can be moved and lifted.



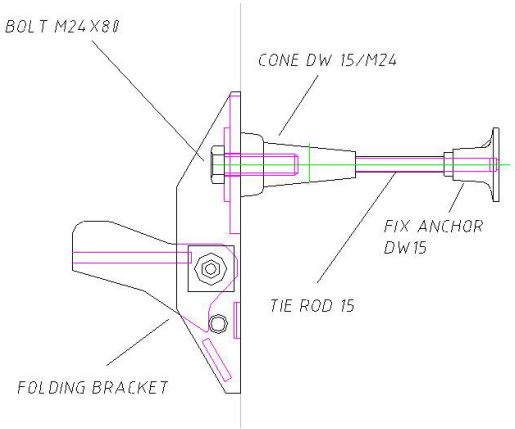
Once the formwork set is lifted for next pouring, the box used in the previous pouring can be recovered from the cone recovering platform with the short pin 0.35m.

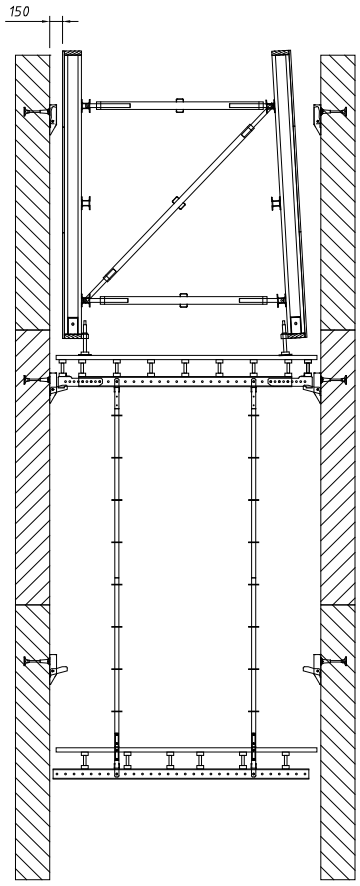


4.1.3. Folding bracket

In this case, the platform horizontal walers rest directly on a hinged plate included in the Folding bracket.
This Folding bracket is fixed with a M24x80 bolt to the cone DW15/M24 previously left in the wall together with its fixed anchor.

⚠ Ensure the full threaded of the rod on the cone and fix anchor.



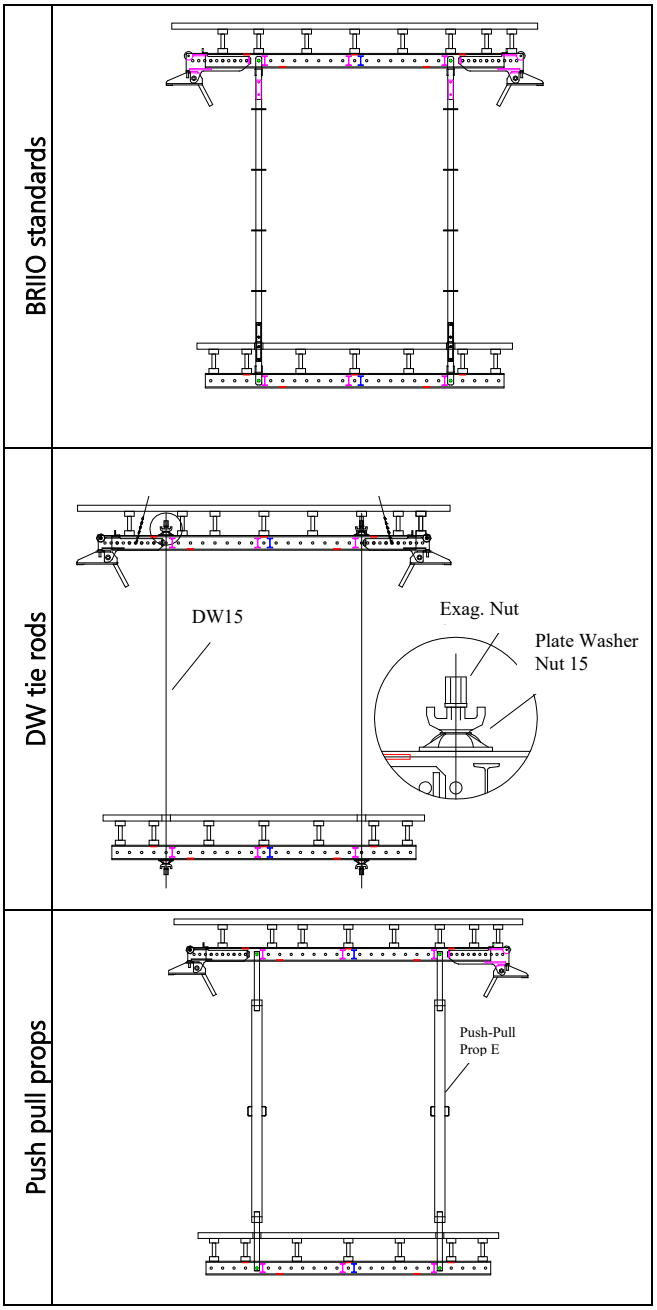


For this solution, it should be kept in mind that the Folding bracket stands out of the wall approximately 100 mm. This is the reason why for lifting the set, the formwork has to be rolled-back at least 100-150 mm. A bigger gap would be even better in order to leave more space for fixing the folding brackets on the wall.

4.2. CONE RECOVERY PLATFORM

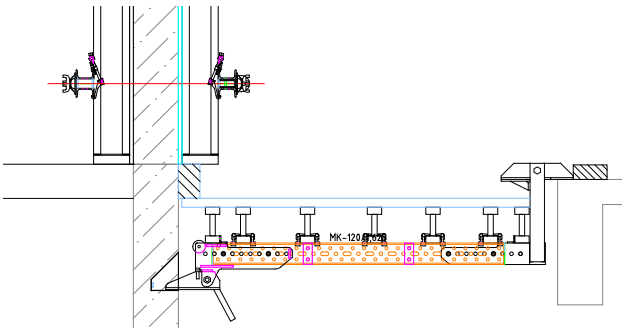
As previously explained, there are three connection ways for main platform and cone recovery platform:

- Connection by BRIO standards
- Connection by E push and pull props
- Connection by DW15 tie rods



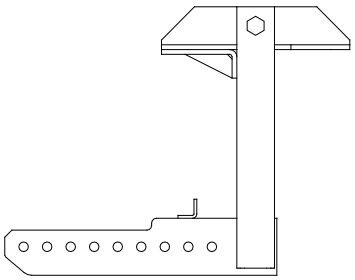
4.3. ADJUSTABLE SLAB SUPPORT

This solution can be applied in those cases where there is an already poured slab. One side of the platform is supported on the slab.



For these cases MK-120, MK-180, DU-100 or DU-120 walers can be used.

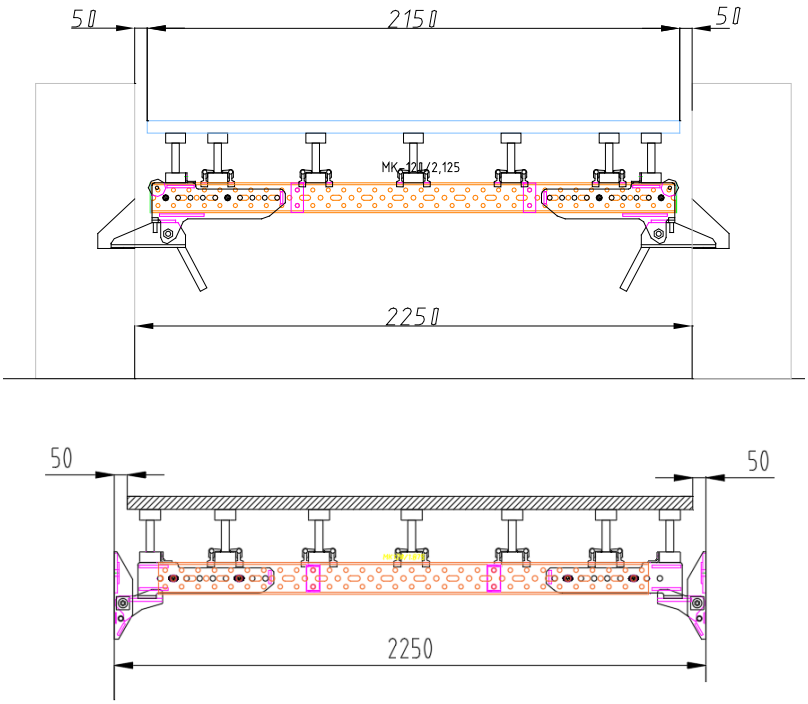
DU-140 or DU-160 walers may also be used as long as their holes match with the ones in the previously mentioned DU or MK walers.



5. Features

5.1. MAIN PLATFORM – GEOMETRY

For main platform lay-out, a minimum 50 mm gap between the edge of the plywood and the wall has to be considered due to possible concrete imperfections.

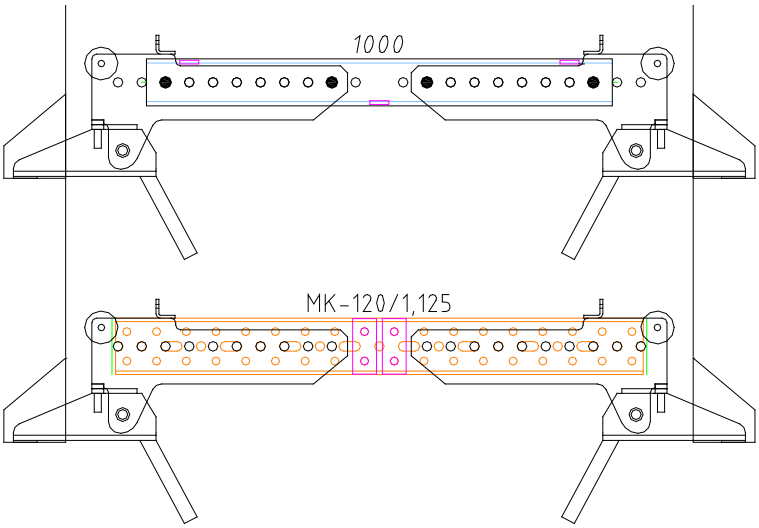


5.2. HOLLOW LENGTHS

5.2.1. Gravity Pawl Bracket solution

The smallest hollows where a platform using the Gravity Pawl Brackets can be installed are:

	DU-100	DU-120	MK-120	MK-180
Minimum lengths	1.35 m	1.45 m	1.35 m	2.25 m

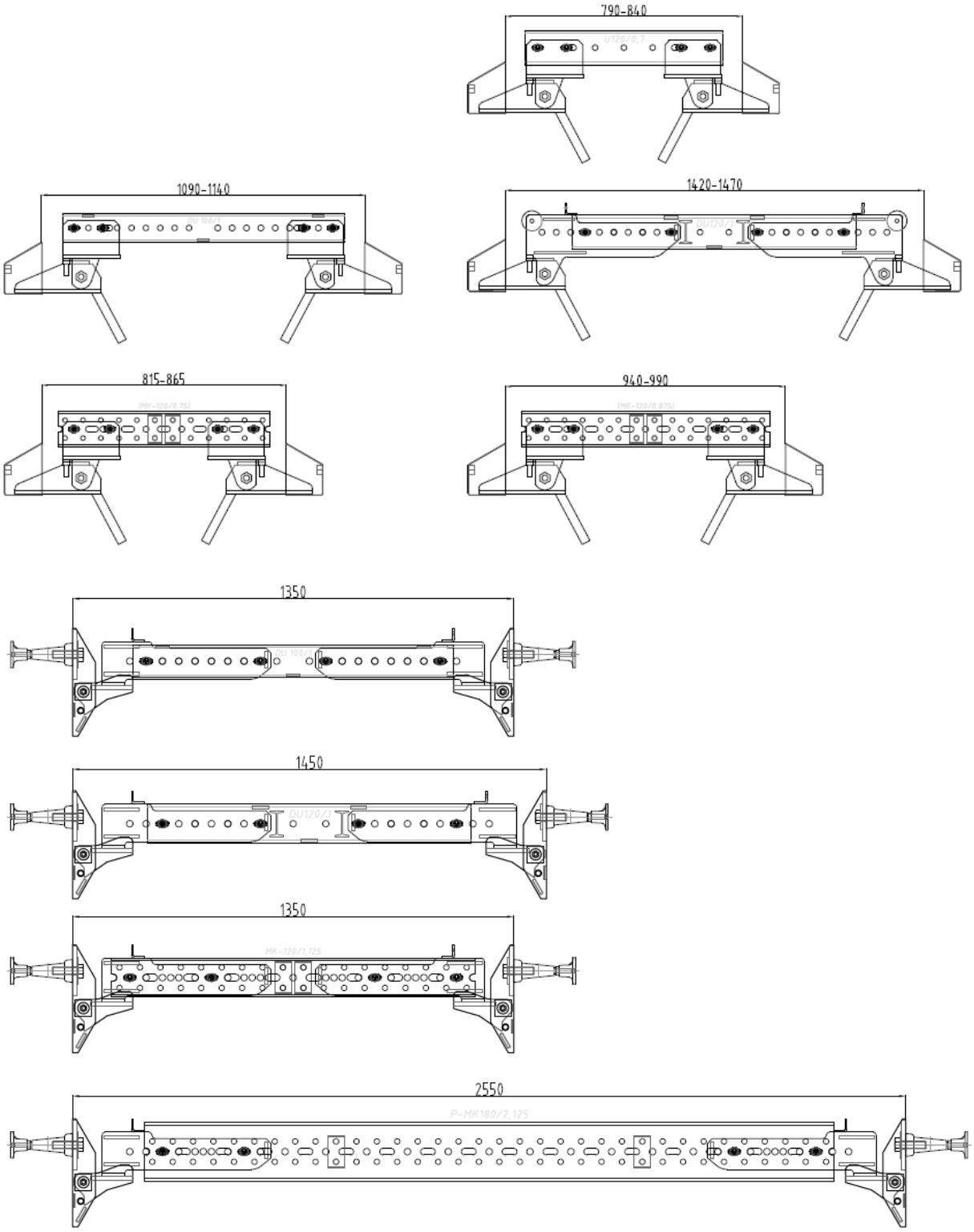


Depending on the loads (see point 5.3) and hollow lengths, DU-100, MK-120, DU-120 or MK-180 walers should be chosen.

Hollow lengths covered by the different walers with Gravity Pawl Brackets are:

DU-100		DU-120		MK-120		MK-180	
WALER	**HOLLOW LENGTH (mm)**	**WALER**	**HOLLOW LENGTH (mm)**	**WALER**	**HOLLOW LENGTH (mm)**	**WALER**	**HOLLOW LENGTH (mm)**
1	1350	1	1450	1.125	1350	2.125	2250
	1550		1650		1700		2700
1.25	1600	1.5	1750	1.625	1750	2.625	2750
	1650		2150		2200		3200
1.5	1650	2	2250	2.125	2250	3.125	3250
	2100		2650		2500		3700
2	2150	2.5	2750	2.375	2550	3.625	3750
	2600		3150		2700		4200
2.5	2650	3	3250	2.625	2750	4.625	4750
	3100		3650		3200		5250
3	3150	3.5	3750	3.125	3250	5.625	5750
	3650		4150		3700		6250
3.75	3900	4	4250	3.625	3750	7.625	7750
	4400		4650		4200		8250
		4.5	4750	4.125	4250	10.625	10750
			5150		4700		11250
		5	5250	4.625	4750		
			5650		5050		
		6	6250	4.875	5100		
			6650		5450		

For smaller hollows, where it is impossible to use the GRAVITY PAWL, SHORT GRAVITY PAWL should be used taking into account the following dimensions:



M20 bolts have to be used instead of E20x70 pins when MK-0.5, MK-0.625, MK-0.75, MK-0.875 profiles or waler DU-120/0.7 are used.

5.2.2. Adjustable Bracket & Folding Bracket

The smallest hollows where a platform using the Folding Bracket can be installed are:

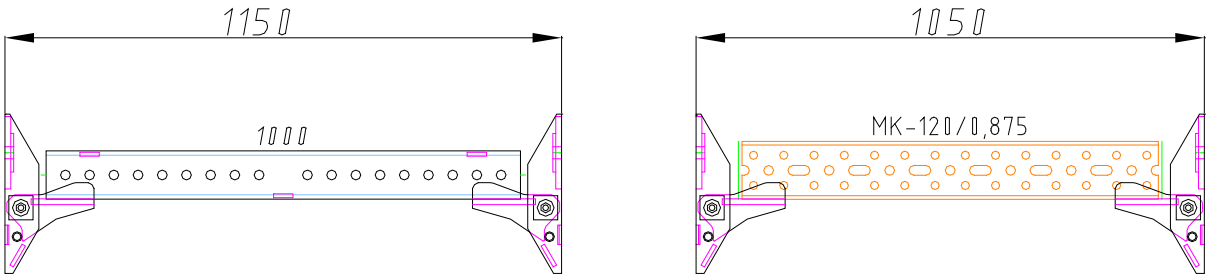
	DU-100	DU-120	MK-120	MK-180
Minimum lengths	1. m 1.35 m	1. m 1.45 m	1.15 m 1.35 m	2.125m 2.55 m

Depending on the loads (see point 5.3) and hollow lengths, DU-100, MK-120, DU-120 or MK-180 walers should be chosen.

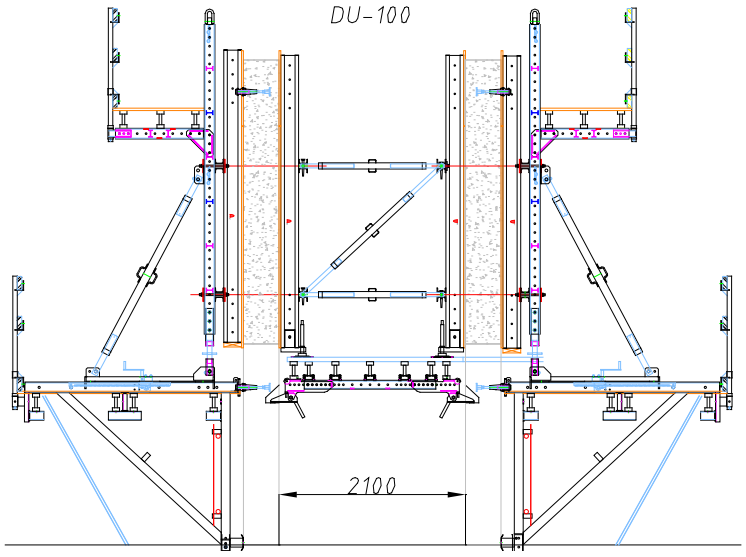
Hollow lengths covered by the different walers with Adjustable and Folding brackets are:

DU-100		DU-120		MK-120		MK-180	
WALER	**HOLLOW LENGTH (mm)**	**WALER**	**HOLLOW LENGTH (mm)**	**WALER**	**HOLLOW LENGTH (mm)**	**WALER**	**HOLLOW LENGTH (mm)**
1	1350	1	1450	1,125	1300	2,125	2550
	1550		1650		1500		2750
1,25	1600	1,5	1700	1,375	1550	2,625	3050
	1700		2150		1750		3250
1,5	1750	2	2200	1,625	1800	3,125	3550
	2100		2650		2000		3750
2	2150	2,5	2700	1,875	2050	3,625	4050
	2600		3150		2250		4200
2,5	2650	3	3200	2,125	2300	4,625	5050
	3100		3650		2550		5250
3	3150	3,5	3700	2,375	2600	5,625	6050
	3650		4150		2800		6250
3,75	3900	4	4200	2,625	2850	7,625	8050
	4400		4650		3250		8250
		4,5	4700	3,125	3300	10,625	11050
			5150		3750		11250
		5	5200	3,625	3800		
			5650		4250		
				4,125	4300		
					4750		
				4,625	4800		
					5050		
				4,875	5100		
					5500		
				5,625	5800		
					6000		

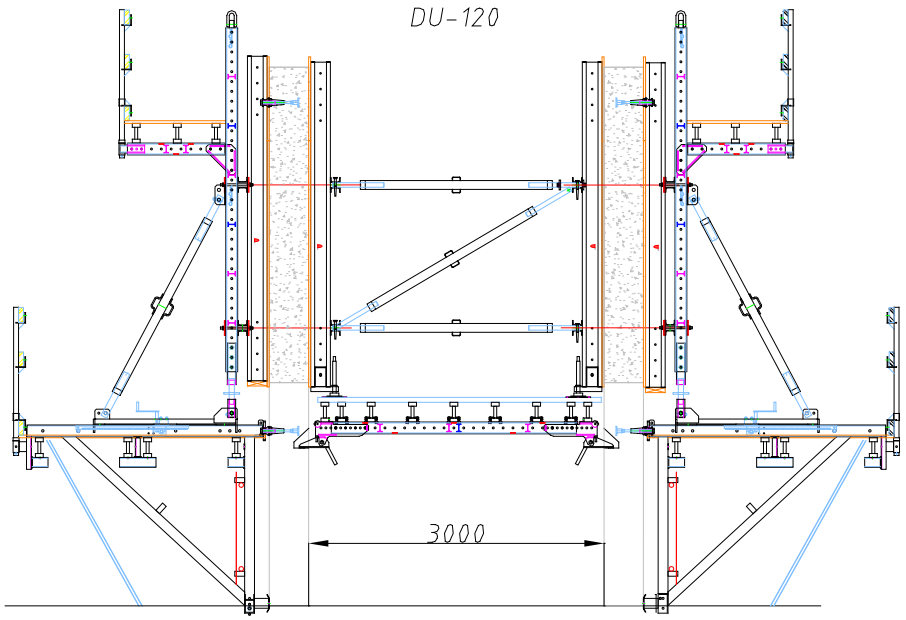
Smaller hollow lengths can be solved as follows:



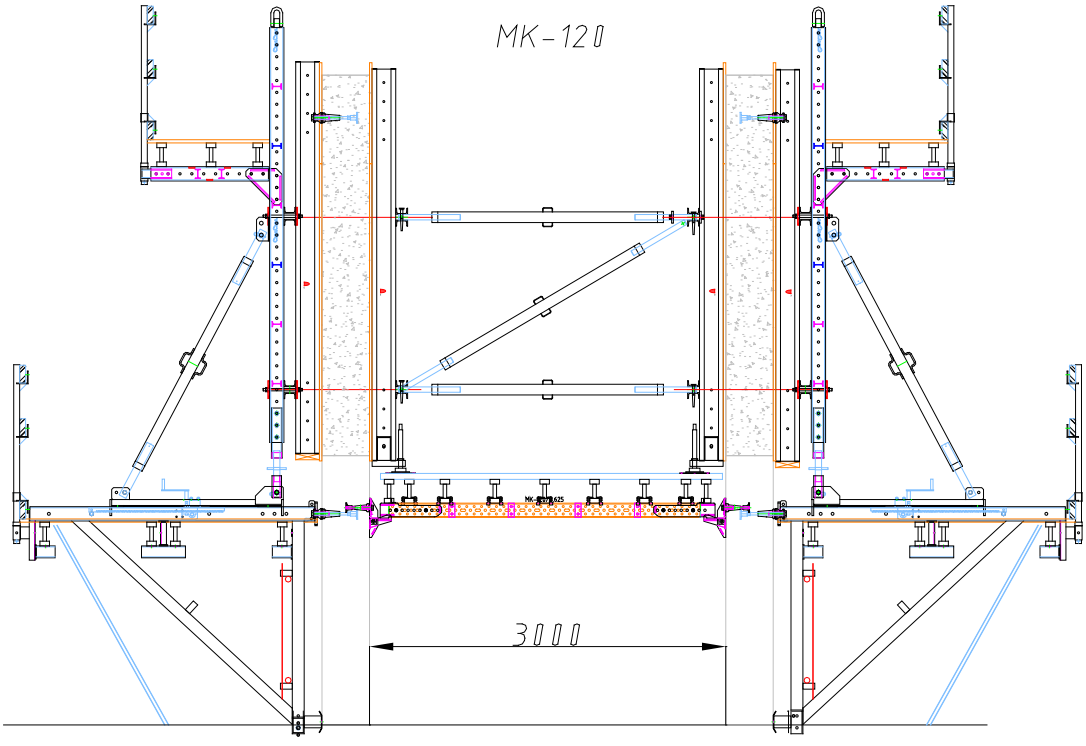
5.2.3. Examples



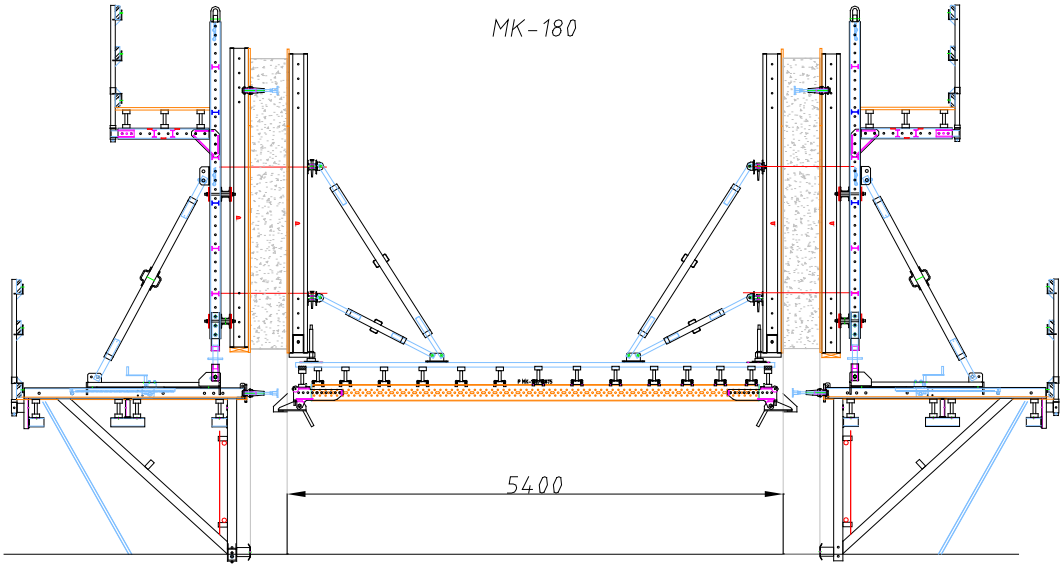
2m hollow solved with DU-100 WALER



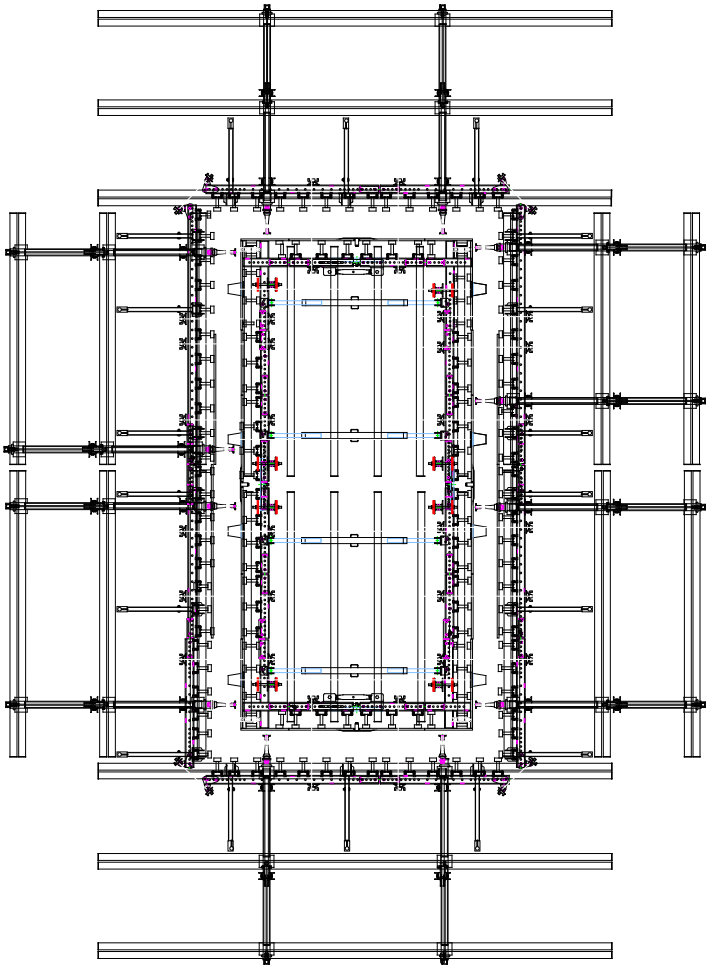
3m hollow solved with DU-120 WALER



3m hollow solved with MK-120 WALER



5.4m hollow solved with MK-180 WALER



2.3 x 5.6 m hollow top view

5.3. MAXIMUM LOADS

In this section a simplified way to calculate and verify KSP Platforms is shown. Is responsibility of each engineer to check that all the simplification hypotheses made in this example (see 5.3.2 "Clarifications…"), are applicable to its particular case.

5.3.1. Loads

The following loads should be taken into account:

- Platform self-weight (PSW_M and PSW_{CR}):
  - Main Platform self-weight (PSW_M)
  - Cone Recovery Platform self-weight (PSW_{CR})

Platform elements	Value (kN/m^2)
DU-120 waler + VM beam + 3-layher (27 mm)	0.4
DU-120 waler + HM beam + 3-layher (27 mm)	0.5

- Formwork self–weight (FSW):
  - ENKOFORM V-100: 0.6 KN/m^2
  - ORMA: 0.8 KN/m^2

- Live load (LL_M and LL_{CR}):
  - Main platform (LL_M): 1.5 KN/m^2
  - Cone recovery platform (LL_{CR}): 0.75 KN/m^2

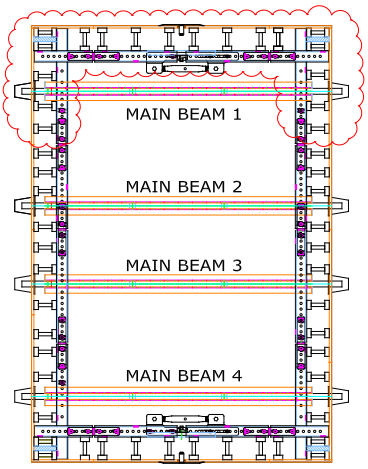
All these loads are distributed along the Main Beam:

$$q = (PSW_M + PSW_{CR} + LL_M + LL_{CR}) * a + \frac{(FSW * a * 2 * h + FSW * l * h)}{l}$$

a = influence width

l = hollow length

h = formwork height

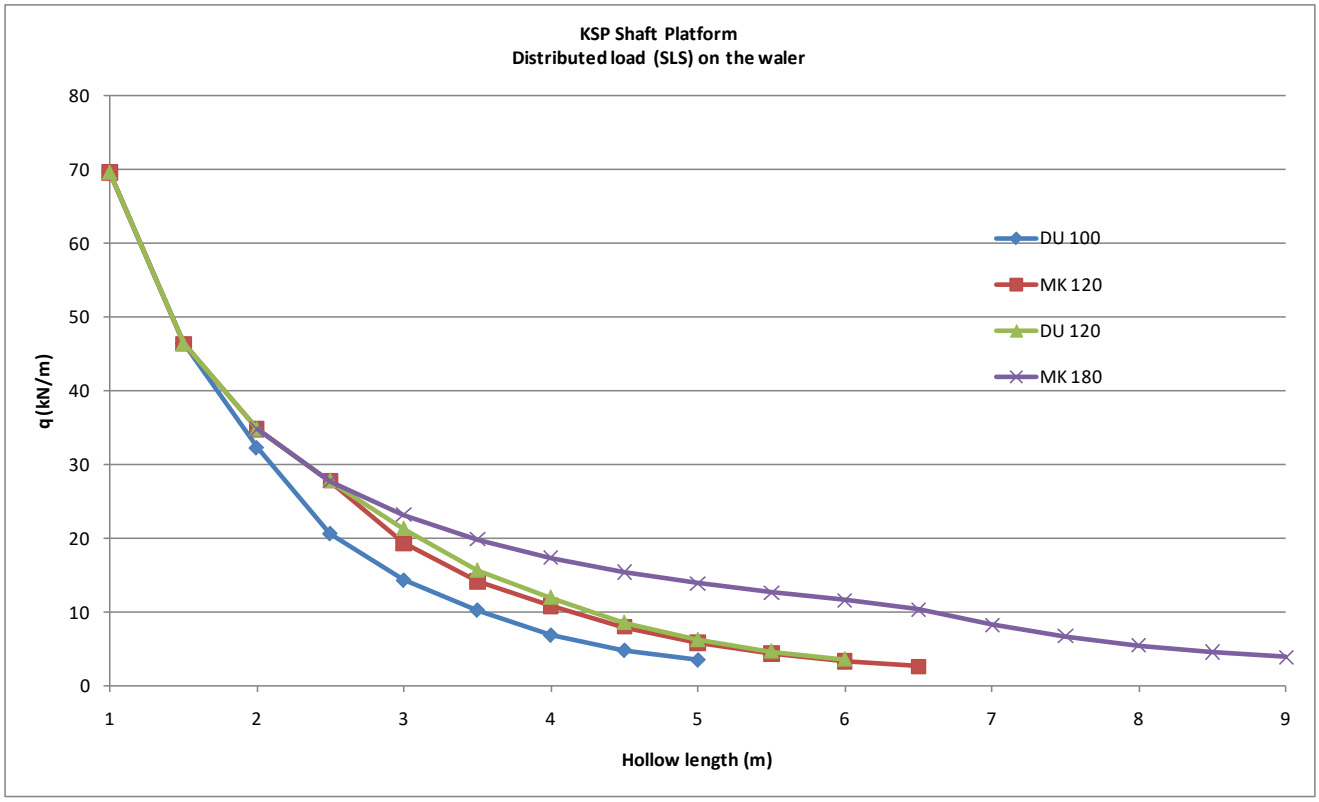


The distributed load (q) calculated in this formula, is the load applied in the main beams 1 and 4.

It must be verified that these beams are the most loaded, if not, the calculations must be done on the most loaded beam.

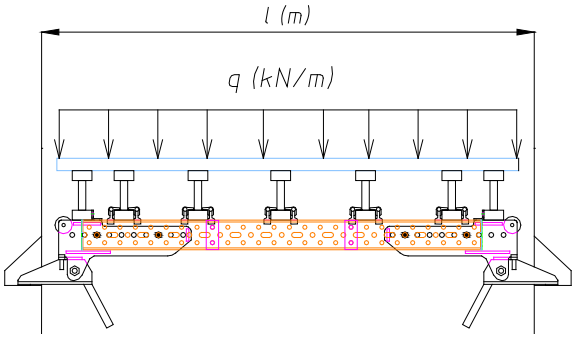
5.3.2. Working loads

- Gravity Pawl Bracket (pin separation ≥ 250mm):



Notes about the diagram:

1. This graphic is valid for shaft platforms formed by Gravity Pawl Bracket (0306032), being connected to the waler with pins separated ≥ 250mm.



GRAVITY PAWL BRACKET

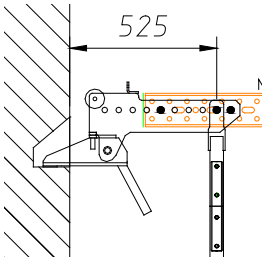
2. For each type of waler, following calculations per waler are included in the working load diagram:

   * Waler strength.
   * Waler deflection (max. deformation L/150).
   * Waler and Bracket connection strength.

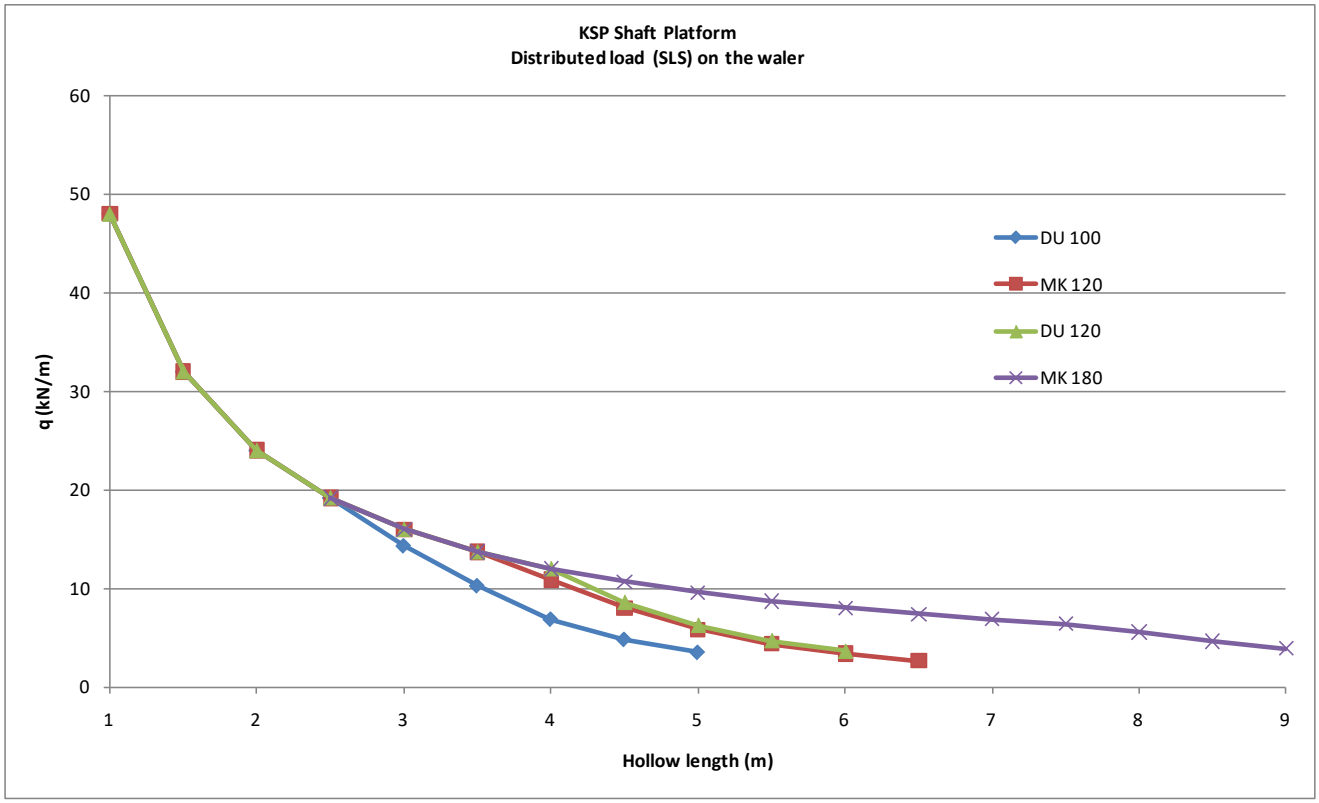
3. Cone recovery platform. This diagram is valid for :

*Without cone recovery platform: for any hollow length

* With cone recovery platform: for hollow lengths >2.1 m (the distance of the connection pin must be ≤ 525 mm from the wall).

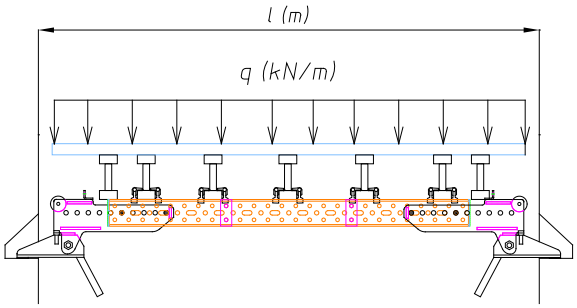


- Gravity Pawl Bracket (pin separation = 200mm) or Adjustable Bracket & Folding Bracket or Short Gravity Pawl Bracket

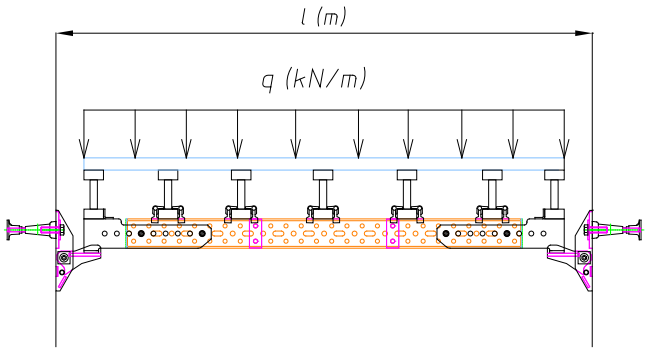


Notes about the diagram:

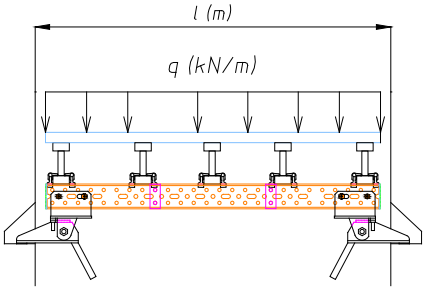
1- This graphic is valid for shaft platforms formed by Gravity Pawl Bracket (0306032) (for pin separation = 200mm), Adjustable Bracket (0306072) used with Folding bracket (0306020) or Short Gravity Pawl (0306054).



GRAVITY PAWL BRACKET (pin sep. =200mm)

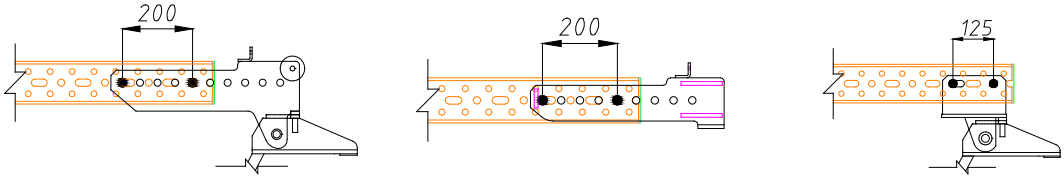


ADJUSTABLE BRACKET + FOLDING BRACKET

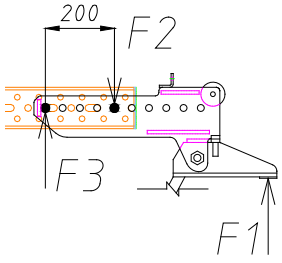


SHORT GRAVITY PAWL BRACKET

2- The values in this table are calculated assuming that for all configurations, the Gravity Pawl Bracket, the Adjustable Bracket and Short Gravity Pawl are in the position shown in the picture below (the most unfavourable position).



3- In all the brackets the following condition is fulfilled: F3 <0.6 * F2max



$F2_{MAX}$ (SLS)		
DU-100	**DU-120/ MK-120**	**MK-180**
90 kN	90 kN	90 kN

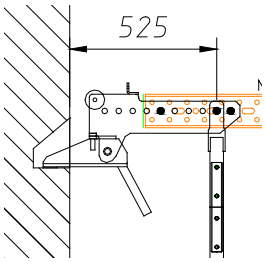
4- For each kind of waler, following calculations per waler are included in the working load diagram:

* Waler strength.
* Waler deflection (max. deformation L/150).
* Waler and Bracket connection strength.

5- Cone recovery platform. This diagram is valid for :

*Without cone recovery platform: for any hollow length

* With cone recovery platform: for hollow lengths >2.1 m (the distance of the connection pin must be <525 mm from the wall).



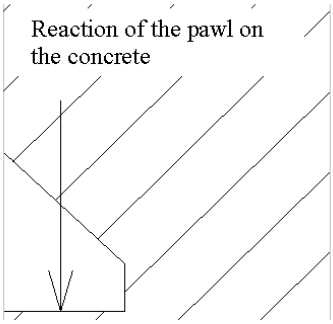
5.3.3. Admissible reactions on supports

Once the maximum **q** load is obtained, reactions on the supports should be calculated:

1. BOX-OUT solution:

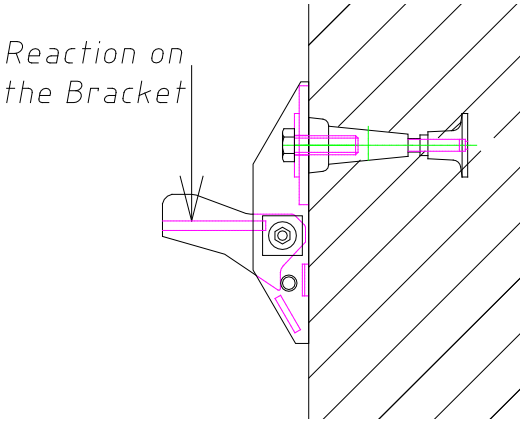
Reactions on these points can't be higher than the concrete compression strength:

Concrete strength (Mpa)	REACCION MAX. (kN)
10	23.4
12.5	29.3
15	35.1



2. Folding bracket solution:

Working load: 25 kN



Once it has been verified that the reaction in the bracket is smaller than 25 kN, the cone DW15/ M24 strength should also be verified.

NOTE: Respecting the minimum shear distances ($c_{1,min.v}$, $c_{2,min.v}$ y $c_{3,min.v}$), with h_{nom}=185mm and with a **concrete strength of 10Mpa**, the **anchoring system is able to support the load of 25kN**.

Min Concrete Strength for using the Folding Bracket: **10MPa**

The **Adjustable Bracket** must be laterally **centred on the Folding Bracket**

5.3.4. Calculation example

DATA:

*Formwork self-weight: ORMA: 0.8 kN/m² (FSW)

*Formwork height (h): 5 m (h)

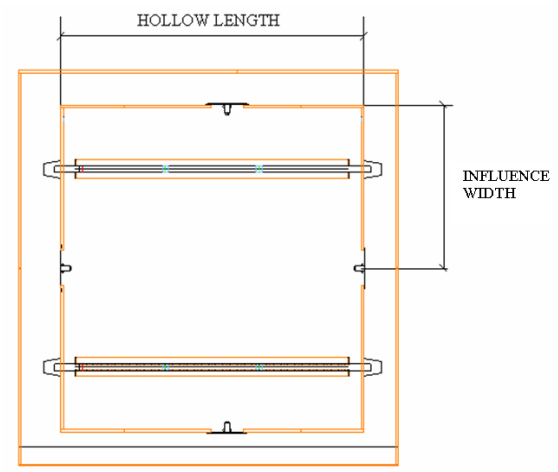
*Hollow length: 3.5 m (l)

*Influence width: 1.5 m (a)

*Cone recovery platform: YES

*Platform self-weight: 0.5 kN/m² (PSW)

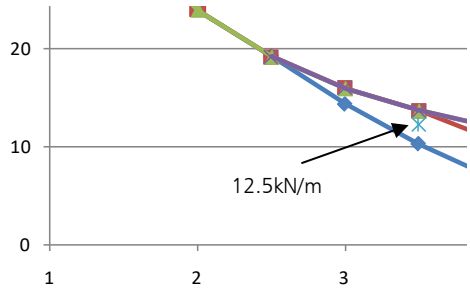
*Live load: 1.5 kN/m² (LL)



CALCULATION:

$$q = (PSW_M + PSW_{CR} + LL_M + LL_{CR}) * a + \frac{(FSW * a * 2 * h + FSW * l * h)}{l}$$

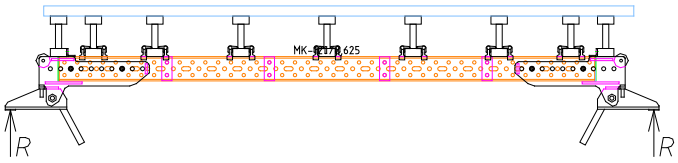
$$= (0.5 + 0.5 + 1.5 + 0.75) * 1.5 + \frac{(0.8 * 1.5 * 2 * 5 + 0.8 * 3.5 * 5)}{3.5} = 12.5 \frac{kN}{m}$$



Finally, MK -120 or DU-120 walers should be used for this hollow.

The next step of the calculation is the reaction verification:

$$R = \frac{q*l}{2} = \frac{13*3.5}{2} = 22.75kN$$



A 10 Mpa concrete would be valid.

This document only refers to the main beams and their supporting. Board and secondary beams have to be calculated by the user. This calculation is not included here.

6. Conditions of use

General conditions of use may vary, and therefore they will be specifically defined for each application. These conditions will be reflected in each application's documentation.

In this document, general conditions of use to be considered are only provided as an example.

6.1. POSSIBLE STAGES OF USE

The following possible statuses of use are considered for the KSP shaft platforms:

- Work: Pouring, reinforcing, preparing or stripping work is being done. These jobs can only be done when the wind speeds are below 64km/hr (0.2kN/m^2).
- Out of service: Situation in which the maximum allowable wind speed of 64km/hr (0.2 kN/m^2) has been exceeded.

When out of service, the following preventive measures should be taken to guarantee the safety of personnel at the construction site:

- Evacuate all personnel working in the platforms. In this stage, it is not permissible to continue working.
- Secure every loose object on the climbing platforms.
- The formwork panels must be drawn in close to the wall and fixed.

6.2. RESISTANCE OF THE ANCHORS

For all applications, the following must be specified: loads on each anchor and the minimum resistance required of the concrete to safely lift the structure.

6.3. GENERAL CONDITIONS FOR HANDLING MATERIALS

6.3.1. Basic safety on the construction site

- Appropriate, certified Personal Protective Equipment (PPE) will be used to guarantee the safety of each worker.

  The following must always be used:
  - Casco de seguridad.
  - Guantes.
  - Botas de seguridad.

  When necessary due to the type of work to be done, the following must be used:
  - Protective glasses or safety shields
  - Hearing protection
  - Breathing mask
  - Safety harness

- Install collective protection equipment such as nets, handrails, etc. to guarantee the safety of the workers when working on high.
- Guarantee appropriate order and cleanliness in the formwork and shaft platform KSP to assure they are properly operated. Keep platforms clean and free of tools, bolts and other parts that could fall from the platforms.

- Only access one platform from another using the ladder installed for that purpose. Always leave the ladder hatches closed after accessing a platform. All ladders must extend 1m above the accessing platform.
- Spread sawdust or sand on all slippery surfaces, where there has been a spill (hydraulic fluid, release agent, etc.).

6.3.2. Safety measures specific to the system

- All personnel, handling the KSP shaft platform, must be trained and must have read the "User's guide" before working with said equipment. Additionally, they must have access to the user's guide at all times.
- If they have doubts or need more information, they should contact ULMA personnel.
- The sequences of movement of the KSP shaft platform will be always realized under the supervision of the agent of the installation that will be formed properly in the use of the system.
- During the assembly of the KSP shaft platform, the used crane must be strong enough to lift and transport all the components and assembled sets.
- Check all the cables and slings. The maximum angle between slings mustn't be bigger than 60º.
- Before beginning to lift the platform, take the appropriate measures to close the lateral accesses to the platforms in order to avoid accidental falls.
- The KSP shaft platform should never be used for the purpose of lifting materials or personnel. Ensure that the number of persons present on the working platforms is kept to the absolute minimum number required for each operation
- Do not stay under the lifting loads and do not help the lifting loads with hands. To guide the lifting loads, use auxiliary elements as ropes,…
- If, due to conditions of the work environment, the crane operator does not have the capacity to view the whole trajectory over which the load is moved, the transport operations will be guided by a signalman, who will communicate with the crane operator using predefined signals.
- During the lifting process, to avoid collisions between various climbing structures, pay special attention to the angles between the structures and to any other object that could interfere with the movement of the system while it is being lifted.
- The structure and its components must be assembled in accordance with the instructions and technical drawings provided by ULMA. All bolts, connections, tie rods, pins, etc.. must be properly assembled.
- All working platforms on the climbing structure must always be kept clean of ice and snow, even when personnel is not working on them.
- The maximum allowable wind speed, when working on the climbing equipment, is 64km/h. The customer is responsible for checking the wind speed every time a lifting process is going to be performed. The platforms must be evacuated when the maximum speed is exceeded, and elements on the platforms must be secured to keep them from falling.
- To correctly operate the climbing system, the customer should ensure that there is always a minimum lighting of 100 lux in the work areas, and more specifically in the areas where the operating equipment will be controlled.
- In the case of extreme wind speeds, i.e. when the system is out of service, all personnel must be evacuated from the climbing structure. Formwork must be drawn in close to the wall and secured in the climbing brackets.

- Before moving the formwork that is on the platform, ensure that no personnel are positioned between the wall or rebar and the formwork panel
- Before beginning any movement (formwork, platforms…), verify that no personnel are exposed to danger of any kind and notify all personnel about the movement that is going to be executed.
- During lifting, operators should be located at each support to guarantee the correct positioning of the different elements (Gravity pawl bracket, Short gravity pawl, adjustable bracket) on the Box out cavity or the Folding bracket.
- It is forbidden for personnel to remain or work on KSP shaft platforms when the weather forecast calls for a lightning storm in the area.
- If it is necessary to work close to high-voltage lines, it's advisable to work without tension. If this is not possible, the according legal references must be followed.
- In accordance with the specifications in the "User's Guide", it is VERY IMPORTANT to place the anchors in the concrete as specified, assuring that loads are transferred from the structure to the concrete correctly. The correct transfer of loads from the anchors to the concrete is the customer's responsibility. The customer should only use ULMA components to support or anchor the KSP shaft platform. ULMA will not be held responsible for the use of materials provided by third parties.
- For proper removal and recovery of the anchors is recommended to use lubricants that facilitate elements extraction from the wall. These lubricants also will avoid possible entry of concrete into the anchors.
- The customer must respect the live load values and the values of the maximum forces to which the anchors can be subjected, as specified in the "User's Guide". Likewise, the customer must respect the minimum concrete strength as specified for the functionality of the KSP shaft platform. The customer is responsible for checking and measuring concrete strength.
- Correct support of the platform on the wall must be guaranteed before working on the platform.

6.3.3. KSP shaft platform maintenance

- Before assembling any system component, verify that it is in perfect conditions to be used (rust, deformations, etc.).
- Check regularly the correct positioning and functionality of the bolts, pins, wedge clamps and other connectors.
- Before the first movement and for every subsequent movement, the pawl's problem-less turning must be verified.
- Do not do any modifications or changes to the elements, nor to the KSP shaft platform assembly without the approval and supervision of ULMA personnel.
- All welding operations, which could have consequences on the functionality of the climbing system, must be performed with the supervision of ULMA personnel.
- A correct packing of the components is essential for their duration.

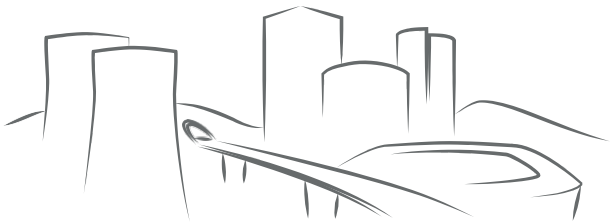
7. Legal references

7.1. LEGAL REFERENCES

- Council Directive 89/391/EEC on the introduction of measures to encourage improvements in the safety and health of workers at work
- Council Directive 89/654/EEC concerning the minimum safety and health requirements for the workplace.
- Council Directive 92/57/EEC on the implementation of minimum safety and health requirements at temporary or mobile construction sites
- Council Directive 92/58/EEC on the minimum requirements for the provision of safety and/or health signs at work
- Council Directive 89/655/EEC- 95/63/EC - 2001/45/EC concerning the minimum safety and health requirements for the use of work equipment by workers at work.
- Council Directive 89/656/EEC on the minimum health and safety requirements for the use by workers of personal protective equipment at the workplace
- Council Directive 90/269/EEC on the minimum health and safety requirements for the manual handling of loads where there is a risk particularly of back injury to workers
- Directive 2002/44/EC on the minimum health and safety requirements regarding the exposure of workers to the risks arising from physical agents (vibration).
- Directive 2003/10/EC on the minimum health and safety requirements regarding the exposure of workers to the risks arising from physical agents (noise).
- UNE-EN 13374: Temporary edge protection systems. Product specifications, test methods.

7.2. STANDARD REFERENCES

- Eurocode 0: Basis of structural design (EN 1990).
- Eurocode 1: Actions on structures. Part 1: General actions. (EN 1991-1).
- Eurocode 1: Actions on structures. Part 1-4: General actions. Wind actions (EN 1991-1-4).
- Eurocode 3: Design of steel structures. Part 1-1: General rules and rules for buildings (EN 1993-1-1).
- Basic building standard, NBE EA-95: Steel structures in building.
- Basic building standard, NBE AE-88: Actions in building.
- DIN 1052 Part 2 (1988) (wooden beam calculations).
- Finnish plywood manual. (Handbook of Finnish plywood).
- Eurocode 5: Design of timber structures. Part 1-1: General. Common rules and rules for buildings (UNE-EN 1995-1-1).
- UNE-EN 12811-1:2005 Temporary works equipment. Part 1: Scaffolding. Behaviour and general design requirements Section 6.2.7.4.1.
- UNE-EN 12812:2008 Scaffolding: Behaviour and general design requirements Section 8.2.4.1.



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