
CC-4 PANEL

ALUMINIUM MODULAR FORMWORK



IMPORTANT:

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

The pictures in this documents 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 of the indications regarding safety and operations contained in this documents, and the data on stress and loads should be respected. ULMA's Technical Department must be consulted anytime that field changes alter our equipment installation drawings.

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

Our equipment is designed to work with accessories and elements made by our company only. Combining such equipment with other systems is not only dangerous but 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" prepared and approved by ULMA.

All rights reserved.

Neither all nor part of this document may be reproduced or transmitted in any way by any electronic or mechanical procedure, including photocopy, magnetic recording or any other form of information storage or retrieval system without the written permission of **ULMA** .

© Copyright by ULMA C y E, S. Coop

1. PRODUCT DESCRIPTION	4
1.1. MAIN SYSTEM ITEMS	5
1.2. SYSTEM FEATURES	6
2. COMPONENTS AND ACCESSORIES	7
2.1. GRAFIC DESCRIPTION	7
2.2. PARTS DESCRIPTION	15
3. ASSEMBLY, USE AND DISMANTLING	26
3.1. BASIC GRID ASSEMBLY	26
3.2. DISMANTLING INSTRUCTIONS	31
3.3. ASSEMBLY AND DISMANTLING OF BASIC GRID: RAMPS	33
3.4. ASSEMBLY AND DISMANTLING OF BASIC GRID: TWO WAY SLOPE SLABS	33
4. SOLUTIONS	34
4.1. 90° ASSEMBLY	35
4.2. INFILLINGS ON COLUMN	37
4.3. SOLUTIONS BETWEEN WALLS	41
4.4. PERIMETER FORMWORK	49
4.5. APPROACHING IN DROP PANELS	60
4.6. RAMPS	61
4.7. TWO WAY SLOPE SLABS: MOUNTAIN AND VALLEYS	62
5. FEATURES	63
5.1. GRIDS	63
5.2. MAXIMUM SLAB THICKNESS	64
5.3. LOADS TRANSFERRED TO THE PROP	65
5.4. WORKING LOADS - EP PROP WITH CC-4	66
5.5. WORKING LOADS - ALUPROP WITH CC-4	68
6. CONDITIONS OF USE	69
6.1. GENERAL SAFETY ADVICES	69
6.2. STORAGE	74
7. LEGAL REFERENCES	76

1. Product description

CC-4 is a horizontal formwork system for solid and lightened slabs, providing high quality finishings, directed to the requirements of building construction.

It is characterised by its **safe and fast assembly and dismantling**, as its main parts are **made of aluminium**, and its Drophead provides the workers with a plus in terms of safety.

The CC-4 system is designed to work with Panel or Board. Below, the two system options are shortly described.

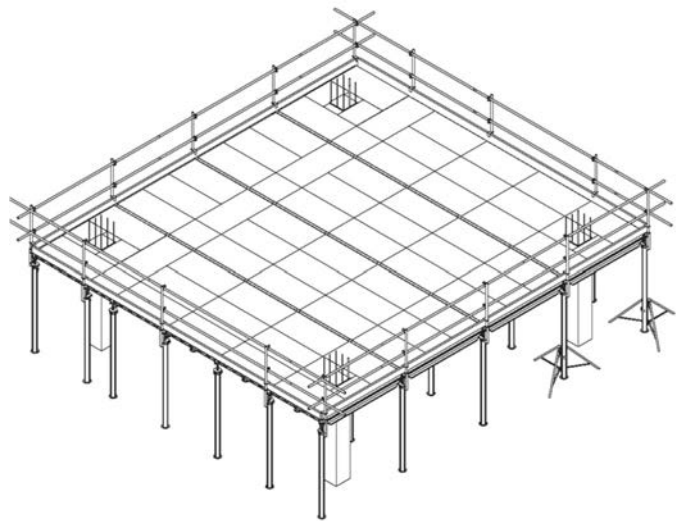
CC-4 PANEL SYSTEM

Formwork system for solid slabs primarily designed to cover large slabs in **building** construction **with regular slab geometry and span between columns**, and with **superior finishing requirements**.

The CC-4 Panel system consists of Dropheads CC, Beams CC, Transversals CC TE and Panels CC. The Panels - together with the Transversals and the Dropheads - form the shuttering face.

With the basic grid 2.32 m x 1.5 m, a Prop rate of **0.29 Props/m²** can be achieved.

Depending on the used grid, slabs up to **90 cm thickness** can be obtained.



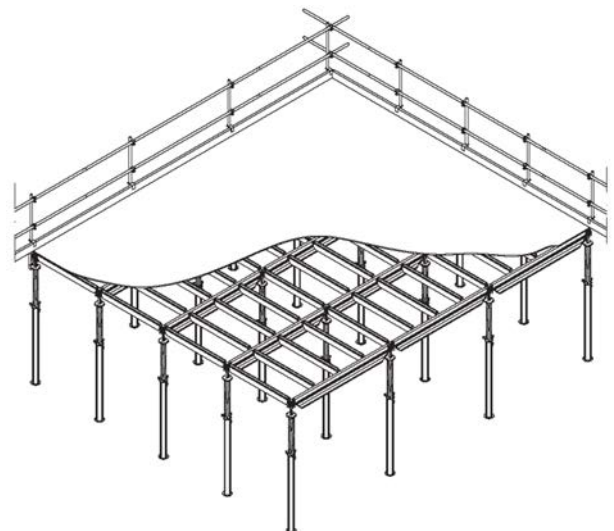
CC-4 PLY SYSTEM

Formwork system primarily designed to cover any slab geometry in **building** construction and where **excellent finishings** are demanded.

The CC-4 Ply System consists of Dropheads CCT, Beams CC and Transversals CC TR which form the basic grid. Standard boards are placed on top of the grid, which constitute the shuttering face of the formwork.

Since it is a drophead system, the Beams, Transversals and Boards can be retrieved when the Drophead CCT is released.

The outstanding feature of this system is its **flexibility**.

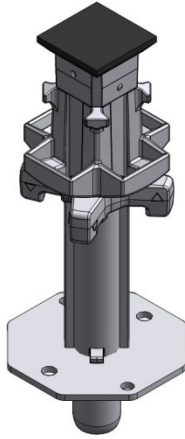


The present document focuses on the CC-4 Panel system option.

1.1. MAIN SYSTEM ITEMS

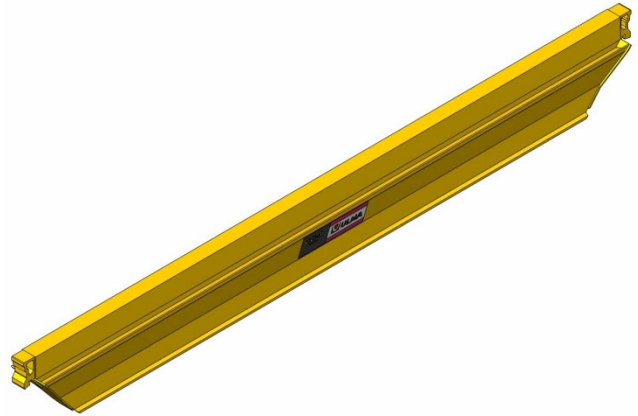
These are as follows:

DROPHEAD CC



It is equipped with a drop system which assists the stripping, letting the Panels, Beams and Transversals descend to be easily retrieved. Along with the Prop, it is the only remaining part of the system.

BEAM CC



It establishes the grid length, which can be 2.32 m or 1.57 m.

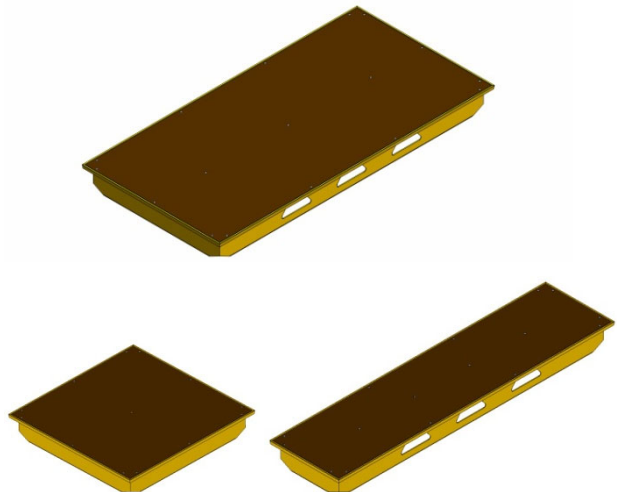
TRANSVERSAL CC TE



It establishes the grid width, which can be 1.5 m or 0.75 m between axes.

The Transversal is in contact with the concrete. It is designed to keep the joints between the Panels tight.

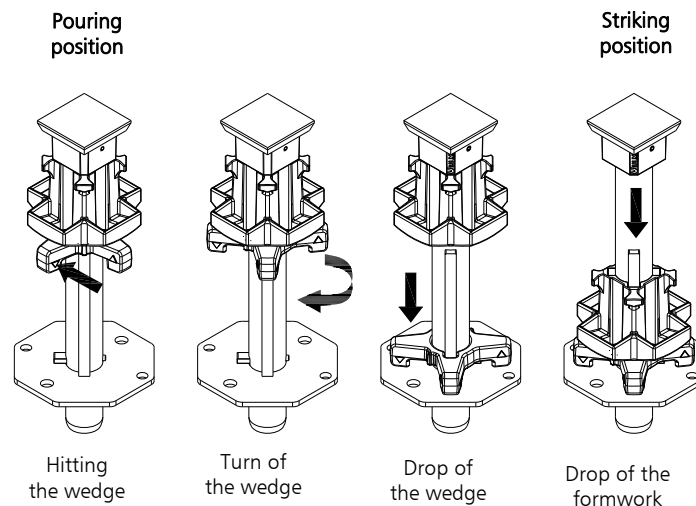
PANEL CC



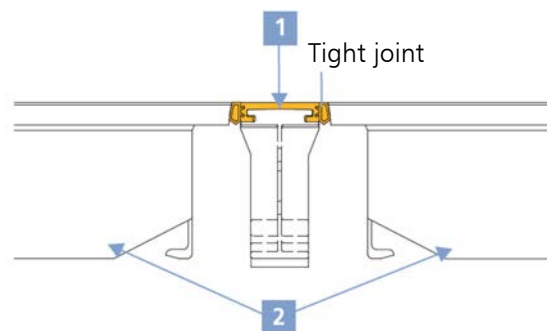
The formwork face is a plywood or composite Board which fits in the frame. The openings in the frame facilitate its manual handling.

1.2. SYSTEM FEATURES

- Great assembly efficiency thanks to its lightness.
- The Panels' formwork face offers superior concrete finishing.
- The special stripping system provides a safety surplus for the workers as it inhibits the free fall of the materials at dismantling.




- **Most of the formwork can be retrieved** after three days, only the Dropheads CC and the Props remain to sustain the slab until dismantling.
- It allows the **assembly of the grid previously** to the placing of the Panels.
- **High flexibility** due to the possibility to work in both Beam directions in one assembly (one Beam can rest on the other at 90°).
- **Efficient solutions** for infillings on column and wall, perimeter protection and safety.
- The Transversal CC TE made of plastic **provides a tight joint between the Panels** and prevents concrete leaking.



1.- Transversal CC TE
2.- Panels


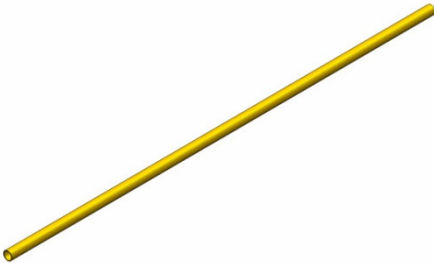
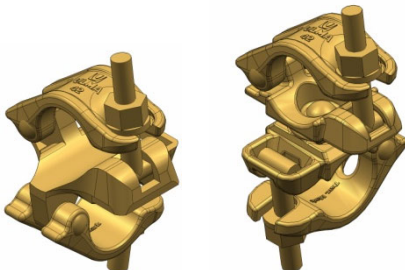

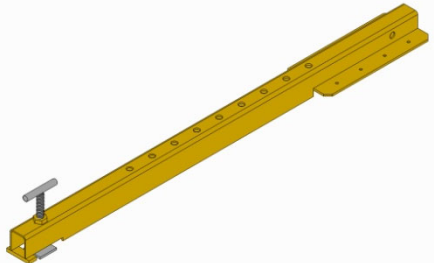
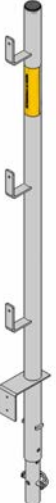

2. Components and accessories

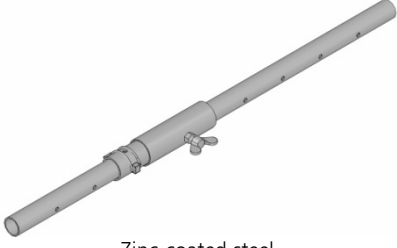
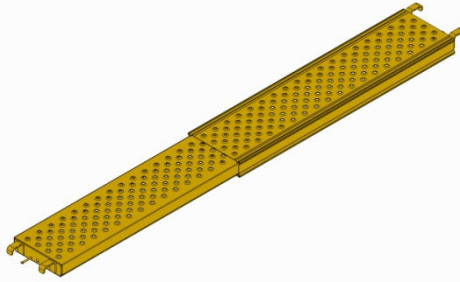


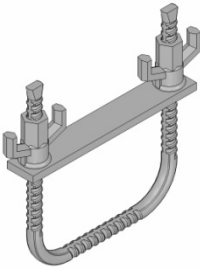
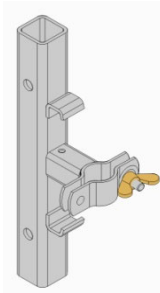
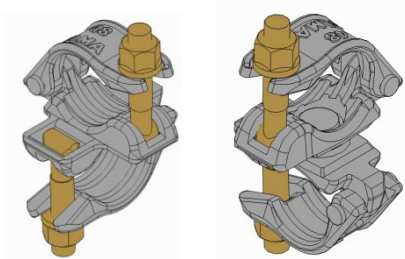

2.1. GRAFIC DESCRIPTION





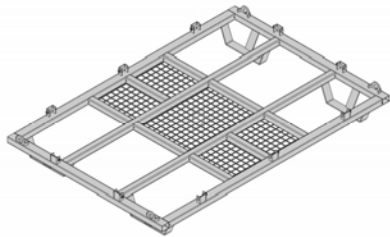
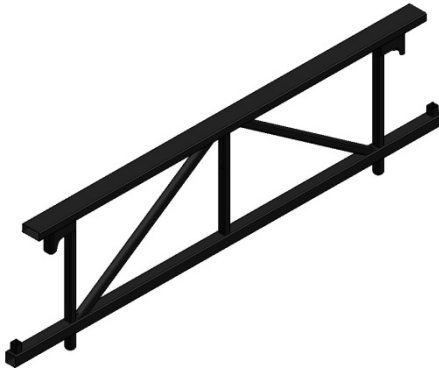
Item No.	Weight kg	Item name	Item No.	Weight kg	Item name
1870060	4.9	BASIC GRID ITEMS DROPHEAD CC	1870400	5.3	TRANSVERSAL CC TE 1.5 ALU
			1870405	2.7	TRANSVERSAL CC TE 0.75 ALU
		Galvanized steel	1870407	1.4	TRANSVERSAL CC TE 0.375 ALU
					
					Aluminium
1870090	15.4	PANEL CC 1.5x0.75 PLYWOOD	1870035	3.5	TRANSVERSAL CC TE 1.5
1870096	8.3	PANEL CC 0.75x0.75 PLYWOOD	1870040	1.7	TRANSVERSAL CC TE 0.75
1870165	9.1	PANEL CC 1.5x0.375 PLYWOOD			
1870265	4.7	PANEL CC 0.75x0.375 PLYWOOD			Plastic
					Recoverable material
		Yellow-painted aluminium and plywood	1870500	3.7	UNIVERSAL HEAD CC
					
1870029	16	BEAM CC 2.32			Zinc-coated steel
1870031	10.6	BEAM CC 1.57			
			1870155	4.6	DROPHEAD CCT
		Yellow-painted aluminium			
					Black-painted steel






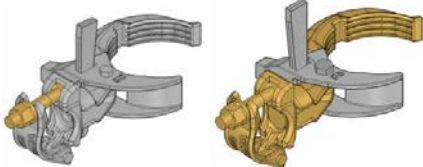
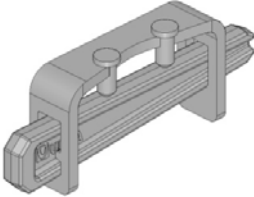

Item No.	Weight kg	Item name	Item No.	Weight kg	Item name
1870105	9.5	BEAM CC W 1.5	1870464	8.9	EDGE BEAM 2.32
1870150	4.6	BEAM CC W 0.75	1870465	5.7	EDGE BEAM 1.57
1870375	2.1	BEAM CC W 0.375	1870466	2.7	EDGE BEAM 0.82
 Aluminium			 Yellow-painted aluminium		
1870705	10,3	BEAM CC W 27 1.5	1870760	8,9	EDGE BEAM 27 2.32
1870710	4,9	BEAM CC W 27 0.75	1870765	5,8	EDGE BEAM 27 1.57
 Aluminium			 Black-painted aluminium		
1870045	6.8	TRANSVERSAL CC TR 1.5	1870205	2.5	INFILLING SUPPORT CC
1870050	3.4	TRANSVERSAL CC TR 0.75	 Yellow -painted steel		
 Aluminium			1870100	30.8	PERIMETER BEAM CC
1870745	6,3	TRANSVERSAL CC TR 27 1.5	 Yellow-painted aluminium		
1870750	3,2	TRANSVERSAL CC TR 27 0.75	1870200	4	PERIMETER CLAMP CC
 Aluminium			 Black-painted steel		

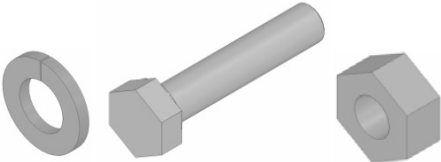
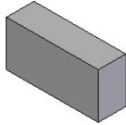
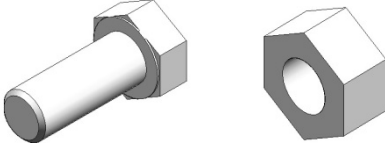
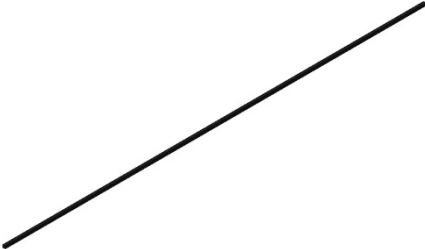
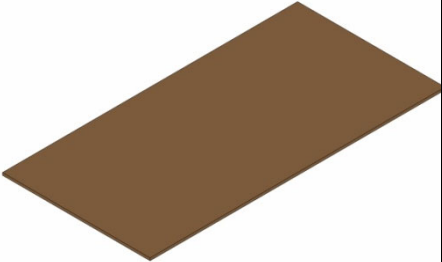
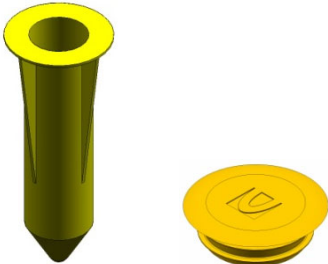
Item No.	Weight kg	Item name	Item No.	Weight kg	Item name
1870440	5.8	SLOPE CC HEAD  Bichromate-treated steel	1870255	0.31	WIND CLIP  Bichromate-treated steel
		SAFETY ITEMS			
1870099	0.2	FIXING HOOK CC  Bichromate-treated steel	1870120	2	HANDRAIL SUPPORT CC  Bichromate-treated steel
1870140	3	CLAMP CC  Black-painted steel	1860516	3.9	SAFETY HANDRAIL S-V  Yellow-painted steel
1870101	2.2	TIE PIECE CC LD  Bichromate-treated steel			
1870080	1	HEAD CC FD  Black-painted steel			

Item No.	Weight kg	Item name	Item No.	Weight kg	Item name
1902210	3.4	SAFETY HANDRAIL POST 	2023800	8.4	TUBE 42/4070 WITH SOCKET
		Yellow -painted steel	2034000	6.2	TUBE 42/3.1
			2033800	4.2	TUBE 42/2.1
			2033700	3	TUBE 42/1.55
					
					Black-painted steel
			2012600	1.2	RIGHT ANGLE COUPLER 42/42
			2012400	1.3	SWIVEL COUPLER 42/42
					
					Bichromate-treated steel
2211156	9.6	HANDRAIL POST 1.50 	2211256	10.2	WALL HANDRAIL SUPPORT 
		Zinc-coated steel			Yellow-painted steel
2211185	8.1	HANDRAIL POST 1.50 WOOD 	2125649	13.1	TUBE 48x4100 WITH SOCKET
		Galvanised steel	2125290	5.5	TUBE 48/1.6
			2125291	7	TUBE 48/2.1
			2125647	8.7	TUBE 48/2.6
			2125249	11.4	TUBE 48/3.1
			2125648	12.1	TUBE 48/3.6
			2125250	14.6	TUBE 48/4.1
			2125251	18	TUBE 48/5
			0200600	19.9	TUBE 48/6
					
					Galvanised steel

Item No.	Weight kg	Item name	Item No.	Weight kg	Item name
2211172	3.2	EXTENDING LEDGER  Zinc-coated steel	2067035	12.5	EXTENDING PLATFORM 1-1.6
			2067043	20.6	EXTENDING PLATFORM 2-2.7
			2067048	17.3	EXTENDING PLATFORM 1.5-2.35  Yellow-painted steel
2211225	16.8	TOE BOARD 4000x200x50  Wood	2128152	19.3	TRAPDOOR PLATFORM 1.5 
2170526	2.3	PROP BRACING CLAMP  Zinc-coated steel	1870512	2	HANDRAIL SUPPORT SH  Zinc-coated steel
2125148	1.2	RIGHT ANGLE COUPLER 48/48	MISCELLANEOUS AND AUXILIARY PARTS		
2125147	1.3	SWIVEL COUPLER 48/48  Galvanised steel	1870185	3.2	LIFTING FORK CC  Galvanised steel

Item No.	Weight kg	Item name	Item No.	Weight kg	Item name
1870190	7.6	STRIKING TOOL CC 	1870285	1.8	STEEL SLING MAXI PALLET 
		Black-painted steel			Galvanised Steel – Painted steel
1870085	97	PANEL PALLET CC 	1860676	12.5	STOPEND B 1x0.3
		Black-painted steel	1860690	22.6	STOPEND B 2x0.3
1870144	87	BEAM PALLET 1.57 CC	1860696	14.4	STOPEND B 1x0.4
1870145	87	BEAM PALLET 2.32 CC 	1860705	25.9	STOPEND B 2x0.4
		Black-painted steel	1860709	10.5	FILLER STOPEND 0.3
			1860712	13.2	FILLER STOPEND 0.4
					Yellow -painted steel
					Yellow -painted steel
					REMAINING MATERIAL
			1870160	12.4	SUPPORTING FRAME CC 1.5
			1870115	7.3	SUPPORTING FRAME CC 0.75
1870300	79	MAXI PALLET CC PANELS 			
		Galvanised steel			Black-painted steel

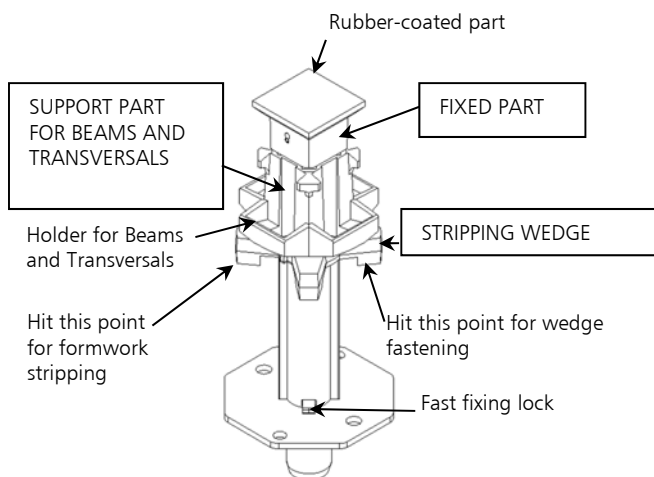
Item No.	Weight kg	Item name	Item No.	Weight kg	Item name
1870990	5.5	SUPPORTING TRANSVERSAL 0.75	2220055	4.5	SUPPLEMENT 1m
1870999	9.9	SUPPORTING TRANSVERSAL 1.5			
					Aluminium
		Black-painted steel	2220090	11.2	UNIVERSAL TRIPOD
		SHORING PARTS			
2200048	14.7	EP C25			Galvanised steel
2200000	16.6	EP C+D30	2220120	17.8	BRACING FRAME 2.32m
2200068	21.3	EP C+D35	2220125	13.6	BRACING FRAME 1.5m
2200012	23.7	EP C+D40	2220130	14.7	BRACING FRAME 1.57m
2200084	29.1	EP C+D45	2220140	8.7	BRACING FRAME 0.75m
2200057	31.7	EP C+D50			
2200023	19	EP C+E30			Galvanised steel
2200033	26.4	EP C+E40	2220075	1.8	FIX BRACING HOOK
			2220100	2.3	SWIVEL BRACING HOOK
		Galvanised steel			
2220010	17.6	ALUPROP 1.65-2.8			Galvanised steel
2220020	21.6	ALUPROP 2.2-3.7	2220080	1.1	ALUPROP CLAMP
2220030	25.4	ALUPROP 3.3-4.8			
2220040	29.6	ALUPROP 4.5-6.0			zinc-coated steel
					
		Aluminium			

Item No.	Weight kg	Item name	Item No.	Weight kg	Item name
9000001 9521592 0241000	0.001 0.044 0.01	SPRING WASHER B10 DIN127 HEXAGONAL SCREW M10x50 DIN933 NUT M10 DIN 934 5.6 	1870260	0.03	FILLER 70x35x21  Plastic
9169600 9054900	0.045 0.018	HEXAG.SCREW M12x30 DIN933-5.6C HEXAGONAL NUT M12 DIN 985-5 Z 			
1870112	2.1	CONSUMABLES AND SPARE ITEMS FILLER 90/6 CC  Plastic			
1940166	40.7	PLYWOOD 1.25x2.5x0.021BETO  Phenolic film			
1860533 1904100	0.1 0.007	PLASTIC HANDRAIL SUPPORT PLASTIC PLUG d42  Plastic			

2.2. PARTS DESCRIPTION

2.2.1. Drophead CC

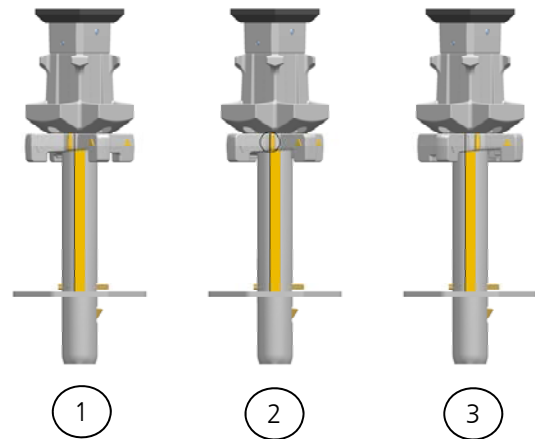
The Drophead CC is the essential part of the CC-4 formwork. It constitutes the support for the Beams CC and the Transversal CC TE which form the basic grid. The Drophead CC (along with the Prop) is the only load-bearing part of the system.



At the top of the support for Beams and Transversals, some protrusions are placed to reduce the looseness between the parts and increase the grid stability before placing the Panels.

Additionally, it includes some openings to help the evacuation of the concrete laitance and the subsequent cleaning works.

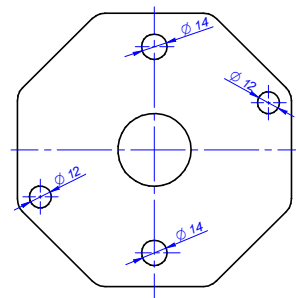
The swivel wedge can be hit from any side. Small arrows printed on it indicate the hitting direction for striking (arrow ▽) and fastening (arrow Δ). Moreover, the wedge carries marks at 180° which refer to the minimum wedging position. The position of this mark with respect to the tube guide indicates whether the wedging is correct or not.



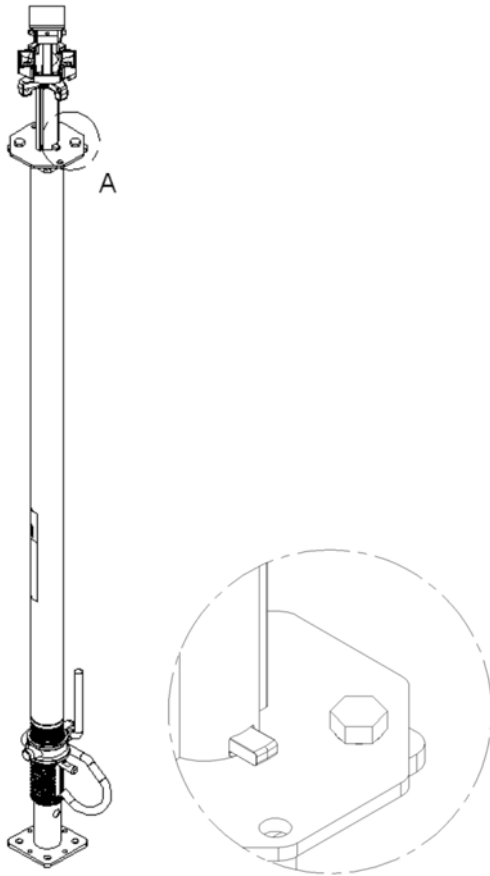
1	BAD WEDGED
2	MINIMUM WEDGING
3	WELL WEDGED

The Drophead is equipped with a fast-fixing system assisted by a spring to easily lock it onto the Prop (European Prop or Aluminium Prop). The button on the Drophead's plate unlocks the Prop which then can be pulled out of the Drophead.

There are four holes with different diameters in the plate to fix the Drophead to the Prop.



Whenever the EP Prop is used upside down, the Drophead needs to be screwed to the EP Prop: With Bolt M12x30 (9169600) and Nut M12 (9054900).



The drophead system enables a fast formwork stripping. Turning the wedge, the support part of Beams and Transversals drops sliding down the flat bar until it touches the plate, the Beams and Transversals still resting on the support. The drop height is 150 mm.

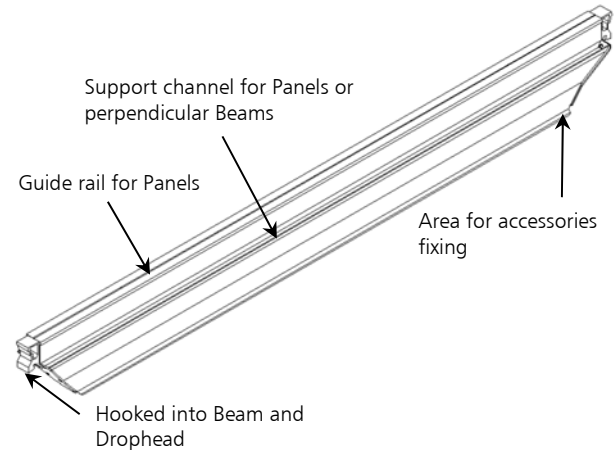
The fixed rubber-coated part keeps in contact with the concrete, and the Drophead holds the slab whereas the Beams and the Transversals can be retrieved for the next building stage.

2.2.2. Beam CC

The Beams CC are the longitudinal parts of the system, directly hooked into the Drophead. They serve as support for the Panels CC as well as for the Transversals CC TR or for the Beams CC W.

The Beams determine the grid length which can be 1.57 m or 2.32 m between axes.

They are made up of an aluminium profile on whose ends hooks and end plates are welded.



The aluminium profile has channels where likewise the Panels, the Beams and the Transversals rest on. The shape of both, hooks and support channel, allows to first rest one end of the Beam or Panel on the channel to be able to raise the other side while preventing the parts from falling down. The guide rail eases the placing of the Panels by guiding them along the Beams. At the bottom part, the protrusions serve as fixing area for different accessories.

The aluminium profile is chamfered at its ends in order to easier hook first one Beam side into the Head and then raise the other.

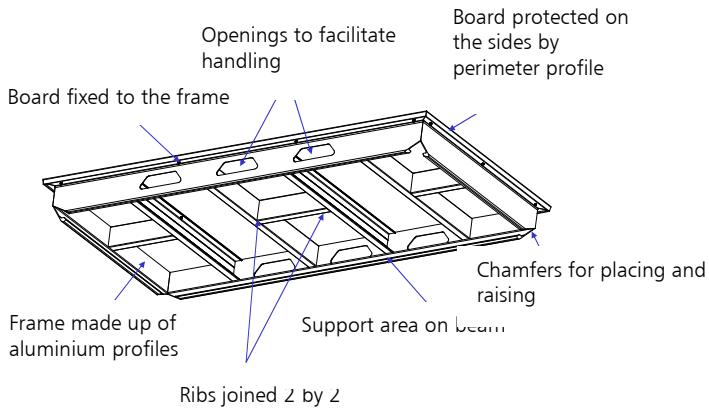
The profiles of all beam types and the supports have inclined surfaces to improve tightness and stability.

2.2.3. Panel CC

The Panel CC is the main part in contact with the concrete. This accounts for the relevance of the shuttering face and the joints between Panels, Transversals and Dropheads.

They are made up of a frame of welded aluminium profiles to which the shuttering board is attached. A

perimeter profile on the frame protects the board edges. The inclined external shape of the perimeter profile eases the assembly and improves the contact between Panels.



Four ribs inside the frame form, together with the perimeter profile, the support area of the board. These ribs and the perimeter profiles are joined two by two to increase the stiffness of the frame as well as the resistance against shocks.

The shuttering face consists of a 9 mm thickness plywood sheet which fits into the frame.

The openings on the Panel's sides facilitate their handling by the workers.

The inclined surface of the Beam support channel helps the Panel slide into place until it touches the next Panel on the other side of the same Beam.

Chamfers in the Panel's corners enable its placing and raising to its final position.

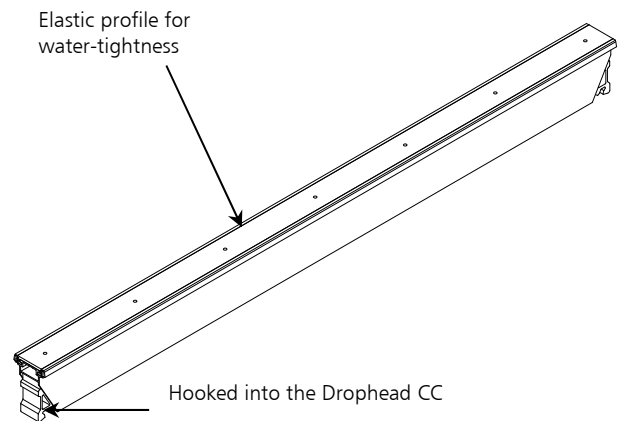
2.2.4. Transversal CC TE ALU

The Transversals CC TE ALU are the secondary beams of the system. They are hooked directly into the Dropheads CC. It is the determining part for the grid width, which can be 1.5 m or 0.75 m distance between axes. The part makes a tight joint between the Panels of each grid. Its top side is in contact with

the concrete and covers the gap between the Dropheads CC.

The Transversals CC TE ALU, together with the Dropheads CC and Beams CC form a grid sufficiently stable to be erected first. The Panels can be placed afterwards.

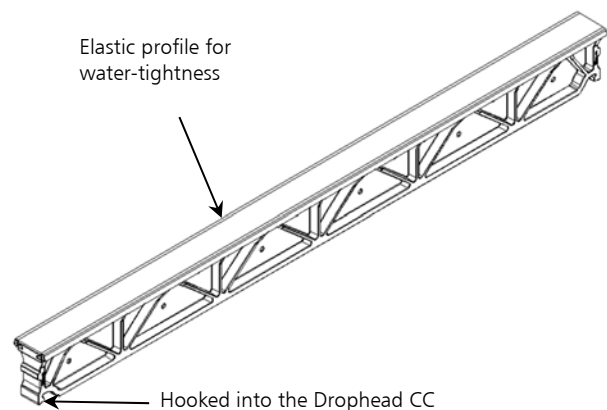
The Transversal CC TE is made of aluminium with an elastic profile which assures the water-tightness of the joint with the Panel.



2.2.5. Transversal CC TE

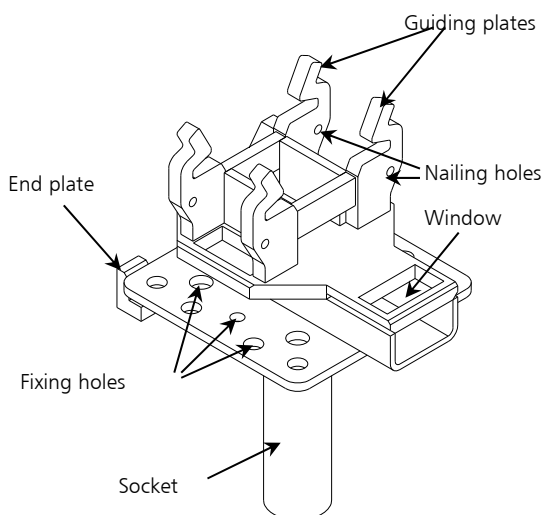
The Transversals CC TE are also the secondary beams of the system. They are similar to Transversals CC TE ALU.

The Transversal CC TE is made of plastic with an elastic profile which assures the water-tightness of the joint with the Panel.



2.2.6. Universal Head CC

The Universal Head CC is a complementary part of CC-4 system. This head is used to start the assembly of the formwork for a wall or a corner (VM Beam support) parallel to the direction of CC beams and to start from the wall (CCW Beam support) in perpendicular direction to the beams CC. Also serves as a bearing support of Beam CC, as a starting point or reinforcement in Beam CC, and providing support of the Transversal CC TR in the case of wall infilling in the direction perpendicular to the Beam CC. With this head also can be assembled formwork approaching to areas of the drop panel, minimizing infilling board. Is not in contact with the concrete.

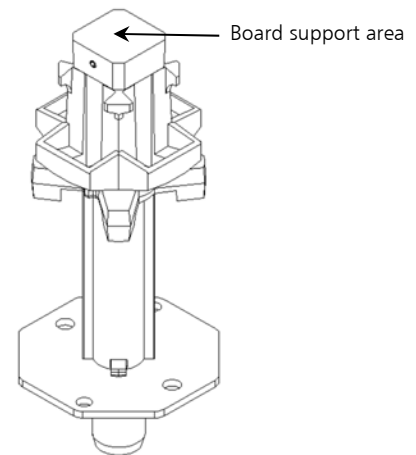


2.2.7. Drophead CCT

The Drophead CCT is similar to the Drophead CC but 21 mm shorter because the plywood is placed on top of it. In the CC-4 Panel option, this part is used in infilling areas. As the Drophead CCT is not in contact with the concrete, the plywood does not have to be cut to the Drophead's dimensions. It cannot be used with 27 mm thickness board.

The Drophead CCT is the central part in the CC-4 Ply option of the system. There, the board is placed on the grid of Transversals CC TR and Beams CC W carried by the Drophead CCT.

For the indications of the minimum wedging and the way of fixing the head to the props, the ones described in the heading of the CC head should be considered.

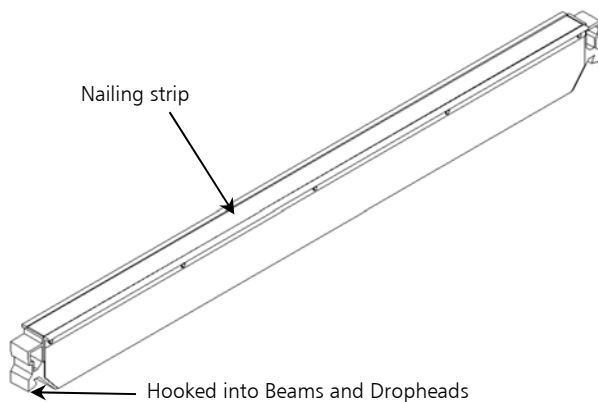


2.2.8. Transversal CC TR

The Transversals CC TR are another type of secondary beams, mainly used in the CC-4 Ply option of the system. In the CC-4 Panel option, they are used to form a support grid for the board in infilling areas on walls and columns. It requires 21 mm thickness board. This type of transversal is usually hung into the Beam CC, but it can also be used with the Drophead CC, the Drophead CCT and the Beam CC W. In case of using 27 mm thickness board, Transversal CC TR 27 has to be used.

In the CC-4 Ply system option, the Transversal – together with the Drophead CCT and the Beam CC – are the main system parts.

The Transversal CC TR consists of an aluminium profile with an aluminium hook at each end. A plastic nailing strip is incorporated on the upside of the part.

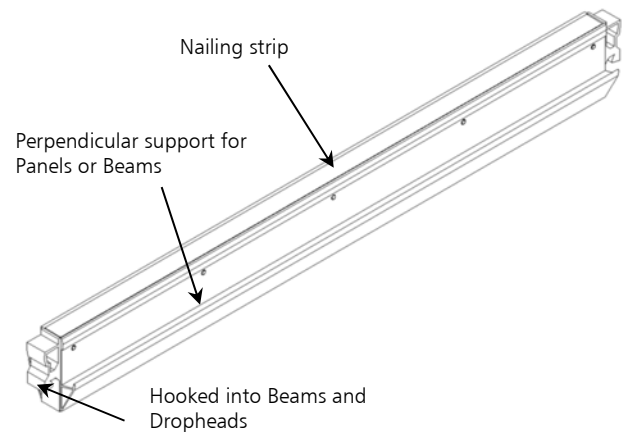


2.2.9. Beam CC W

The Beam CC W is a combination of the Beam CC and the Transversal CC TR. It consists of an aluminium profile similar to the one of the Transversal CC TR but has got a similar support channel to the one of the Beam CC. It fulfils the main functions of the Beam CC, i.e. support for Beams, Transversals and Panels in a 90° assembly. By means of the incorporated nailing strip, it eases to cover the infilling areas in the CC-4 Panel option, and the fixing of the board with nails in the CC-4 Ply option of the system.

The Beam CC W offers a high level of flexibility for both, the CC-4 Panel and the CC-4 Ply option.

It is a transversal part with lengths of 1.5 m or 0.75 m between grid axes. It can be used either with the Drophead CC or with the Beam CC for a 90° assembly. On the Beam CC W, the Transversal CC TR can be placed in direction of the main Beams. It would be even possible to make a 90° assembly with the Beam CC with the condition that this one is properly shored.



In case of using 27 mm thickness board, Beam CC W 27 has to be used. It has the same characteristics but the geometry of the profile changes.



Beam CC W

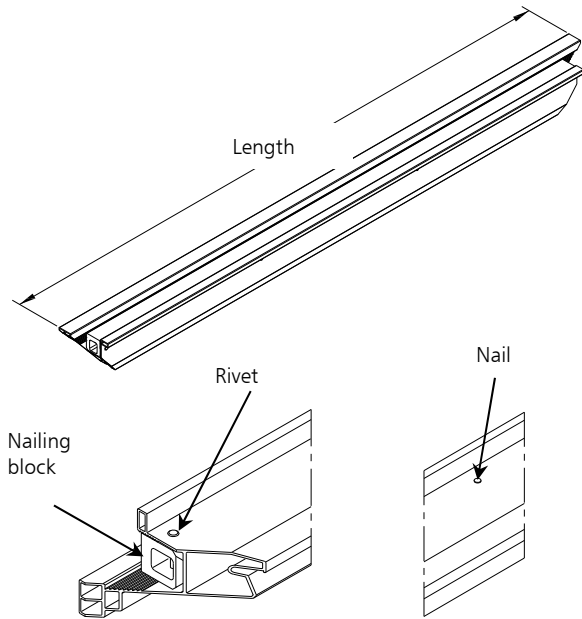


Beam CC W 27

2.2.10. Edge Beam

The Edge Beam facilitates the infilling on wall in direction of the Beam CC.

The Edge Beam contains a nailing block to the infilling board and it is not needed any special cutting in 21 mm board, to rid the Dropheads CC. In case of using 27 mm thickness board, Edge Beam 27 should be used. Therefore, the Edge Beam rests in the Beam CC and fits between Dropheads CC, leaving the top of its profile at the same level to the panels and Dropheads CC.



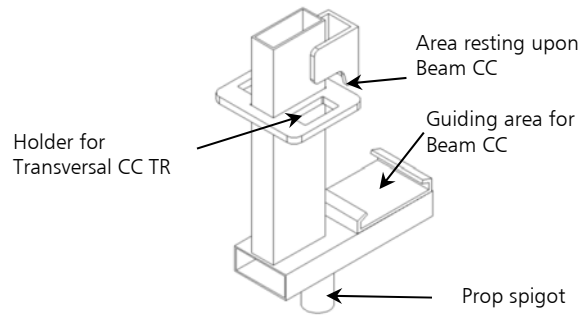
2.2.11. Infilling Support CC

The Infilling Support CC facilitates the infilling on wall in direction of the Beam CC.

It can be slid along the Beam CC for placing, and offers a connection to hang the Transversal CC TR into. The Transversal CC TR, as mentioned above, is used to nail plywood onto it in infilling areas instead of using Panels. For fixing the part to the Beam CC, first introduce it from the beam's end and then slide it until the required position.

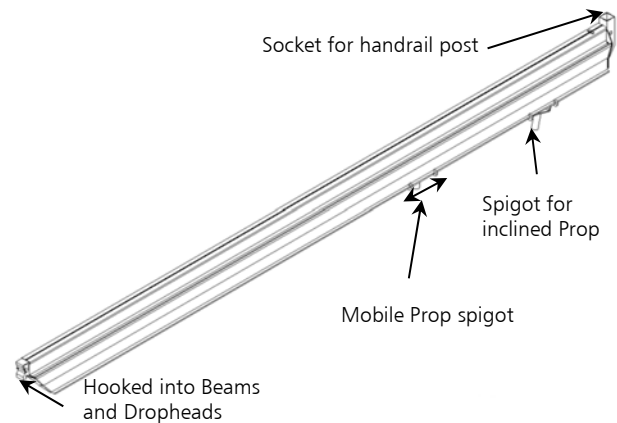
The part includes a spigot for a reinforcement Prop. The reason is that the Beam CC on which the Infilling Support CC works must not be loaded.

The Infilling Support CC cannot be used with 27 mm thickness board.



2.2.12. Perimeter Beam CC

The Perimeter Beam CC facilitates the erection of the perimeter formwork of the slab. The stopend is placed on it and, it provides a perimeter working surface. It can rest on the Drophead CC or on a Beam CC, perpendicular to the same. This way the overhang of the formwork is obtained, both in direction of the Beams and perpendicular to them.



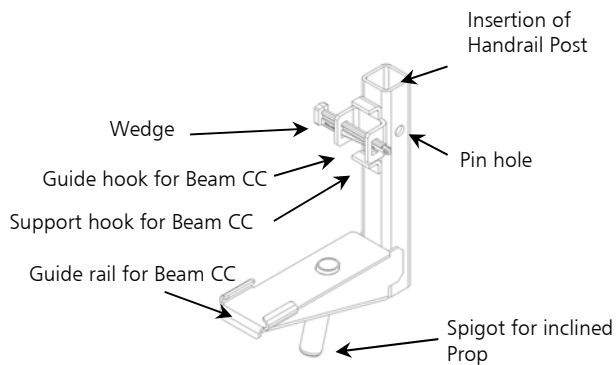
The Perimeter Beam CC has the same profile as the main Beam (Beam CC). Additionally, it features two Prop spigots, a mobile one and an inclined one, and a handrail socket at one end. On the Perimeter Beam CC, five Panels 1.5 x 0.75 m and either the Support Frame CC or the Transversal CC TE can be placed.

2.2.13. Perimeter Clamp CC

The function of the Perimeter Clamp CC is the same as for the Perimeter Beam CC; this is, to allow the

formwork to project over the slab to facilitate its closure offering a working area for the placing of the stopend.

The Perimeter Clamp CC is especially useful when the projecting distance is limited and the assembly needs to be fast.

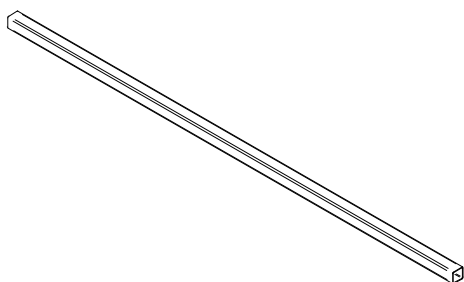


Unlike the Perimeter Beam CC, the Perimeter Clamp CC is an auxiliary part, and always works attached to the Beam CC which can be 2.32 or 1.57 m. By attaching the Beam to the Clamp, a Beam type is formed which facilitates the perimeter solution.

This part incorporates a socket for the handrail post and a spigot for an inclined Prop.

2.2.14. Filler CC 90/6

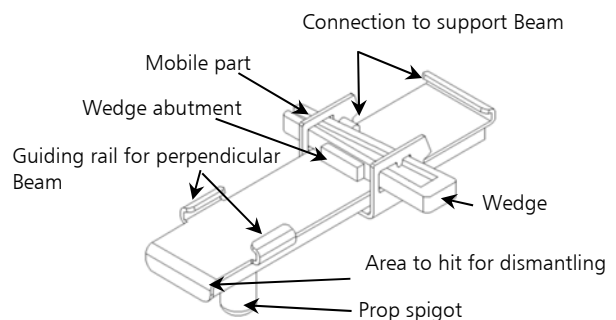
The Filler CC 90/6 covers the remaining gap (35 mm x Beam length) in a 90° assembly in the CC-4 Panel option. The most common filler lengths in a linear 90° assembly are 2.25 m and 1.5 m. The infillings on column might require special lengths. Therefore, the Filler CC 90/6 is offered as consumable part.



2.2.15. Clamp CC

This part is necessary for the 90° assembly with the Perimeter Beam CC, and it can also be used with the Beam CC. It is a connection part between the Beams at a 90° assembly. With the Perimeter Beam CC, it is used to avoid its overturning by serving as abutment. This inhibits the hook coming out of the support channel (for perpendicular Beams or Panels). Therefore, it is classified as safety part. At the same time, it stiffens the joint between the different Beams CC.

In the figure below, the different parts of the Clamp CC are indicated:



For assembly, first the Clamp is inserted in the lower part of the Beam at 90° until it touches the support Beam. Then, the mobile part is tied to the support Beam by means of the wedge. Finally, a Prop is placed in the spigot of the Clamp to reinforce the connection. The Clamp CC stays in this position until the stripping of the perimeter formwork. It avoids the overturning of the Perimeter Beam CC during the process of stripping.

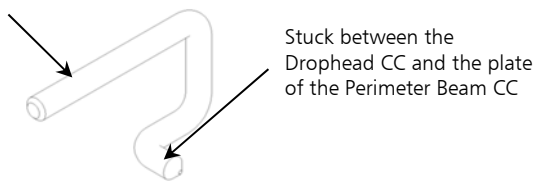
2.2.16. Fixing Hook CC

This part resumes the same function as the Clamp CC when the Perimeter Beam CC is assembled on the Drophead. Therefore, it is classified as safety part. The Fixing Hook CC ties the hook of the Perimeter Beam

CC to the Beam holder of the Drophead CC. In doing so, it avoids the overturning of the Perimeter Beam CC. This part is made up of a bent rod with a chamfer at the end which is inserted into the Beam holder of the Drophead CC.

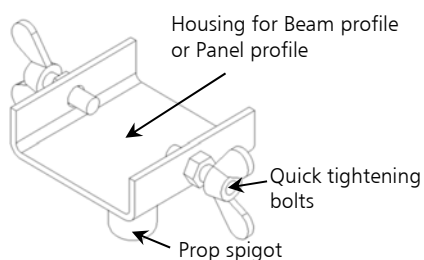
The assembly of the Fixing Hook CC is done by inserting the straight end into the hook opening of the Perimeter Beam CC, the way that the bent part gets stuck between the bottom part of the Beam holder of the Drophead CC and the plate of the Perimeter Beam CC.

Insertion of the straight end into the hook opening of the Perimeter Beam CC



2.2.17. Head CC FD

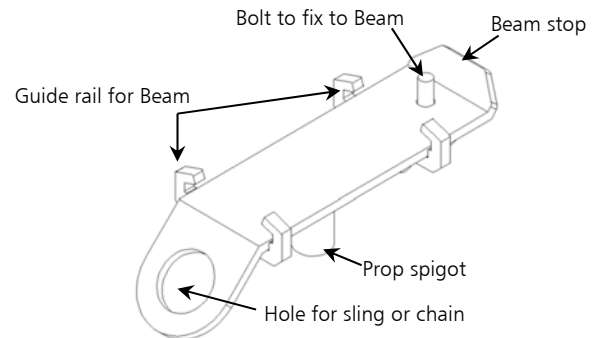
The Head CC FD is an auxiliary head. With it additional Props can be placed below Beams or Panels. The Props which shore the Heads CC FD are always dismantled at stripping. Unlike the Drophead CC, this is a recoverable part.



It is commonly used below 90° Beams.

2.2.18. Tie Piece CC LD

With this part the Beam can be tied to the slab by a cable or chain. It is fixed at the bottom part of the Beam. The Tie Piece CC LD is especially useful for perimeter solutions.



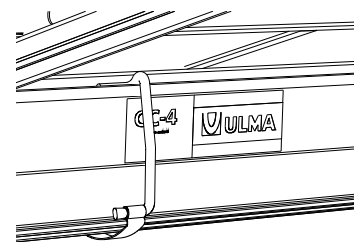
The part can be slid along the Beam with help of the guide rail, and it includes a Prop spigot. The hole in the part is used to hold the sling or chain at one of its ends, the other end will be fixed to the concrete slab. The Tie Piece CC LD is fixed to the Beam by means of a butterfly bolt.

The Perimeter Beam CC, on its behalf, incorporates a hole where the butterfly bolt fits.

2.2.19. Wind clip

A part used to fasten the Panel CC to the Beam CC, in the event of high wind stress on the perimeter grid and in formworks of great height subject to wind.

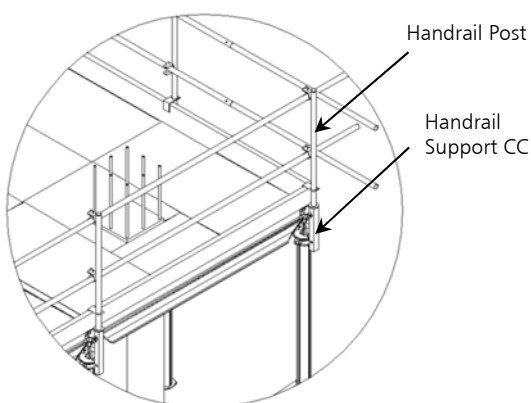
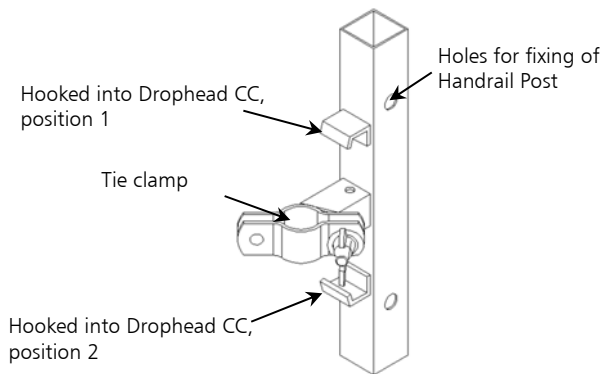
Is pushing the perimeter rib of the Panel and is fixed at the bottom of the Beam CC.



2.2.20. Handrail Support CC

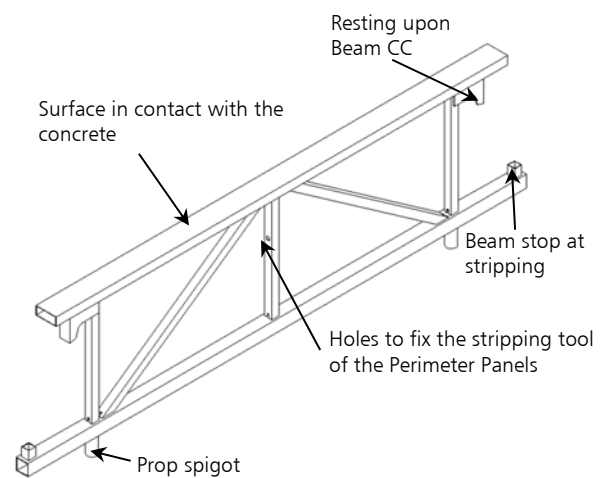
The Handrail Support CC placed in the Drophead CC provides a socket for the Handrail Post. Safety handrails prevent workers from falling to different level in areas where no perimeter formwork is required.

The Handrail Support CC consists of a vertical tube to place the Handrail Post. Fixed with a pin, a clamp tied to the tube of the Drophead CC and two hooks. These hooks allow placing the Handrail Support CC in any side of the Drophead without being disturbed by the head flat bars to tie the clamp.



2.2.21. Supporting Frame CC

The Supporting Frame CC 1.5 is used with the Perimeter Beam CC for the perimeter formwork of the slab. Always placed between the third and fourth Panel of the Perimeter Beam CC by inserting Props into its spigots, it works as shoring part for the slab perimeter area. Furthermore, it assists the stripping of the recoverable material by temporarily carrying the Perimeter Beams on its lower profile.



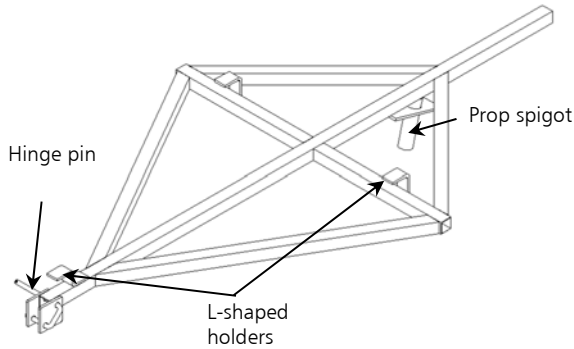
The hole in the centre rib serves to fix the Striking Tool CC. It is used to remove the Panels which are placed at the outside of the Supporting Frame CC 1.5, and which therefore cannot be removed by sliding them along the Beam.

There are two sizes of this part, one for the 1.5 m grid (Supporting Frame CC 1.5) and the other for the 0.75 m grid (Supporting Frame CC 0.75).

2.2.22. Striking Tool CC

The Striking Tool CC is an accessory which facilitates the dismantling of the Panels outside the Supporting Frame CC. These Panels cannot be removed by sliding them along the Beam from the top of the slab.

It is made of a tubular structure which hooks up the Panels by means of L-shaped holders, and afterwards it is fixed to the Supporting Frame CC with a hinge pin. Additionally, it has got an inclined spigot for a Prop that will carry the Panels until proceeding with its stripping.

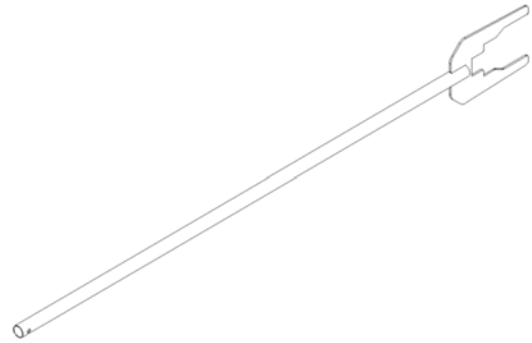


The Striking Tool CC has to be placed before the release of the Dropheads and after the shoring of the Supporting Frame CC. It holds the Panels in their forming position by means of the Prop inserted into the inclined spigot whereas the Dropheads are released and the stripping of the remaining parts is done.

2.2.23. Lifting Fork CC

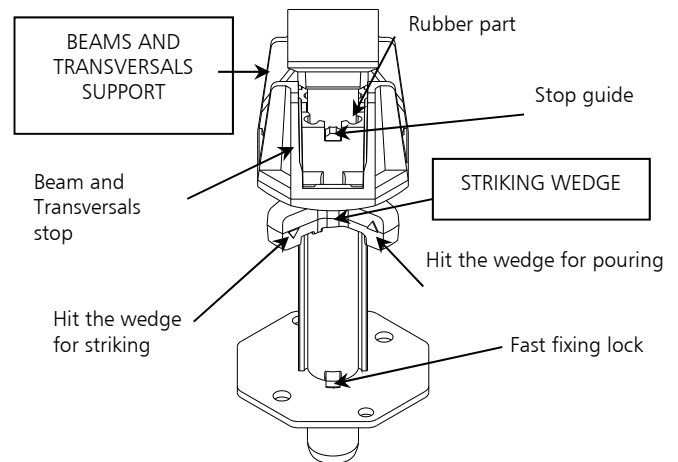
The Lifting Fork CC helps erecting any of the parts which form the grid.

It can be used to lift the Beams CC, the Transversals CC TE, Transversals CC TR, Beams CC W and even the Panels CC, holding them from the ribs.



2.2.24. Slope CC Head

The Slope CC Head is the essential part of the CC-4 Formwork for bidirectional inclined slab solutions (typology of Canada). There, the Slope CC Head is the support of Beams CC and Transversals CC TE (in parts of "mountain" and "valley" of the system) which form the basic grid. The Slope CC Head is the load-bearing part of the system.



At the top of the support for Beams and Transversals, some protrusions are placed to reduce the looseness between the parts and increase the grid stability before placing the Panels.

Additionally, it includes some openings to help the evacuation of the concrete laitance and the subsequent cleaning works.

The swivel wedge can be hit from any side. Small arrows printed on it indicate the hitting direction for

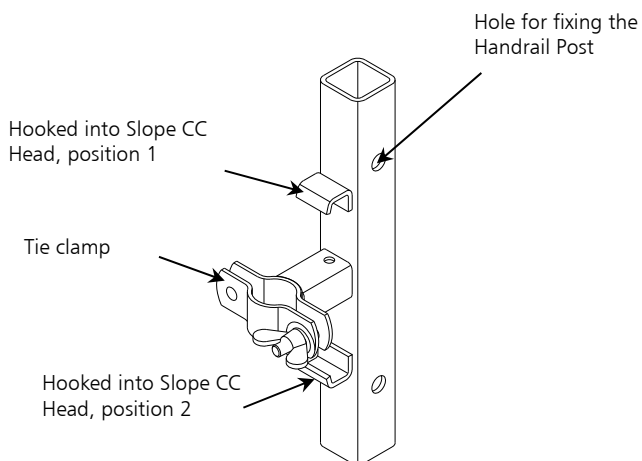
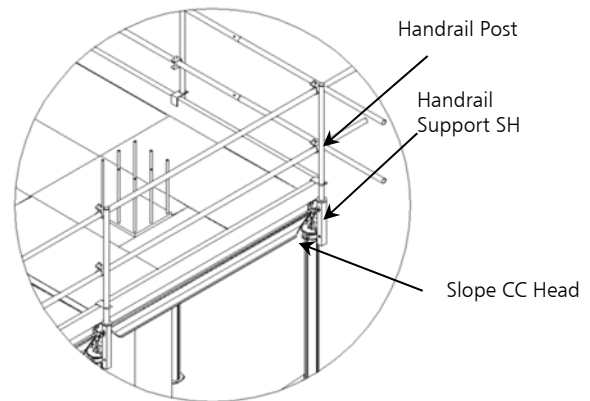
striking (arrow ∇) and fastening (arrow Δ). Moreover, the wedge carries marks at 180° which refer to the minimum wedging position.

For the indications of the minimum wedging and the way of fixing the head to the props, the ones described in the heading of the CC head should be considered.

2.2.25. Handrail Support SH

The Handrail Support SH placed in the Slope CC Head provides a socket for the Handrail Post. Safety handrails prevent workers from falling to different level in areas where no perimeter formwork is required.

The Handrail Support SH consists of a vertical tube to place the Handrail Post. Fixed with a pin, a clamp tied to the tube of the Slope CC Head and two hooks. These hooks allow placing the Handrail Support SH in any side of the Slope CC Head without being disturbed by the head flat bars to tie the clamp.

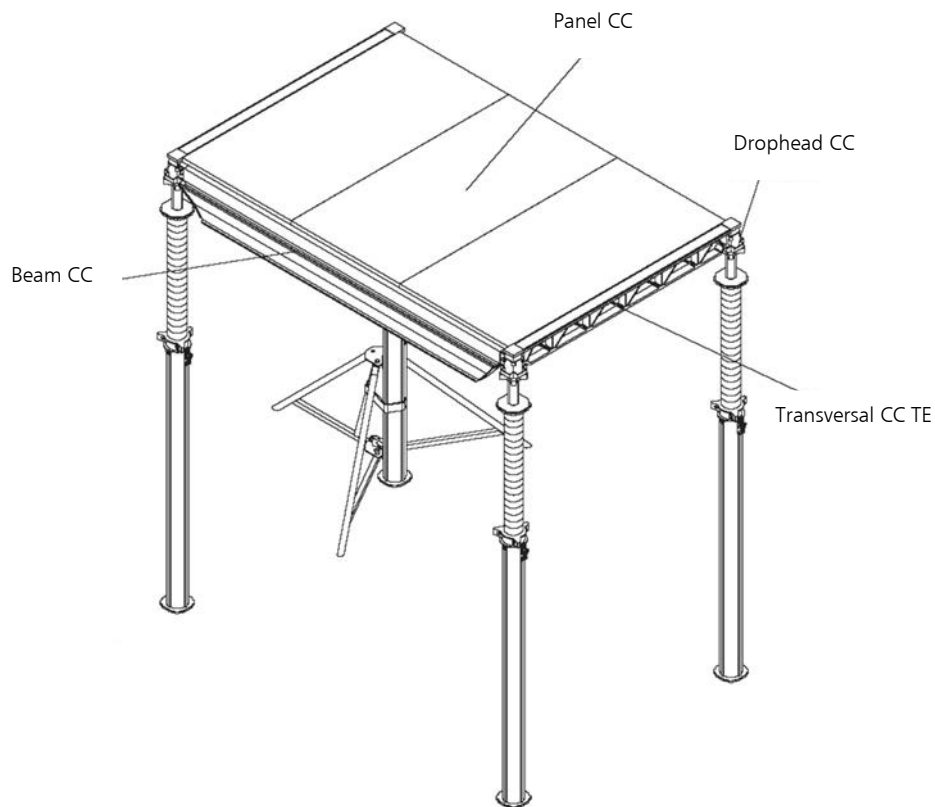


3. Assembly, Use and Dismantling

The basic grid is made up of Beams CC and Transversals CC TE sustained by Dropheads CC. The Panels CC are laid on the Beams.

The parts in contact with the concrete are: Panels CC, Transversals CC TE and Heads CC.

The only remaining part is the Head CC with its respective Prop.

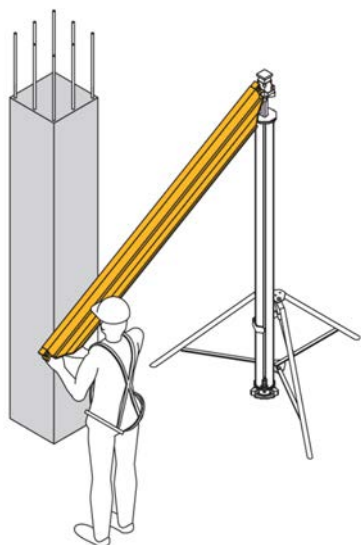


3.1. BASIC GRID ASSEMBLY

Steps to follow:

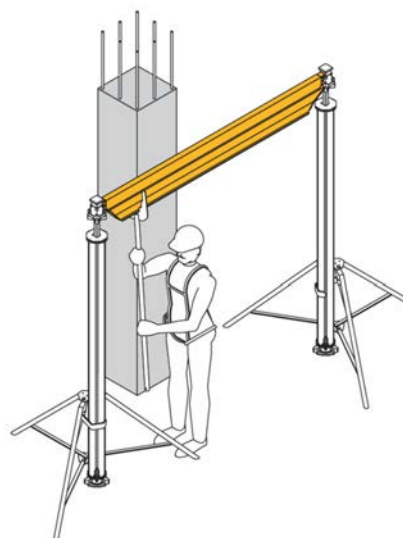
1. Placing of Drophead CC
2. Beam CC erection
3. Placing of Transversal CC TE
4. Basic grid closing
5. Placing of Transversals CC TR and Panels CC
6. Infilling on column
7. Continuation of grid and levelling
8. Placing of Panels CC and infilling on column
9. Grid completion
10. Placing of Panels CC
11. Installation of Safety Handrail

1. Placing of Drophead CC



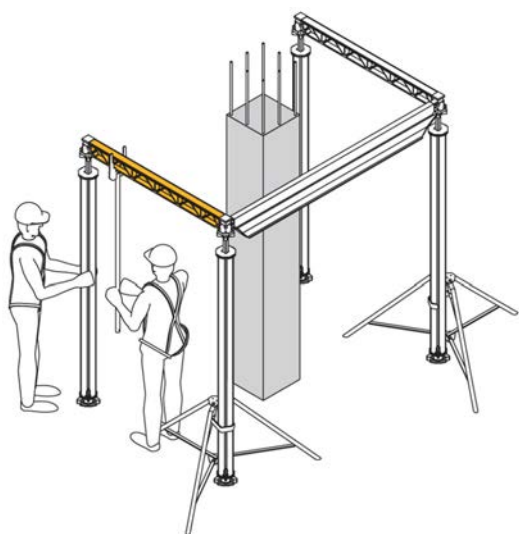
- Insert Drophead CC into the Prop.
- Check that the Drophead's wedge is correctly fastened.
- Around a column, according to the layout, back up the Prop with a Tripod and hang the end of the first Beam CC into the Drophead.

2. Beam CC erection



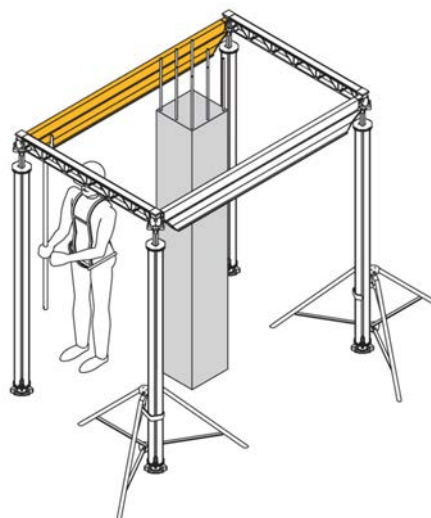
- Insert a Drophead CC into the next Prop, back up the Prop with a Tripod and hang in the other end of the Beam CC (use the Lifting Fork CC).

3. Placing of Transversal CC TE



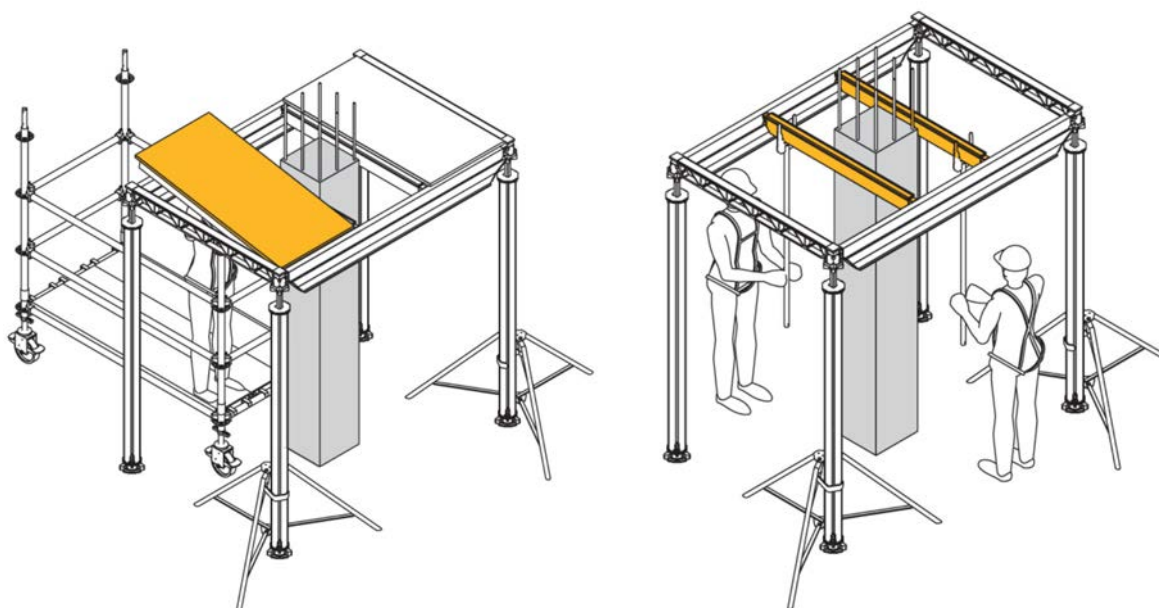
- Position two Props with Dropheads CC and hang into them two Transversals CC TE perpendicular to the Beam CC.

4. Basic grid closing



- Close the basic grid with another Beam CC between the two Transversals CC TE, and position the Beam with regard to the column according to the layout.

5. Placing of Transversals CC TR and Panels CC



- Place the Panels CC and the Transversals CC TR around the infilling area on column.

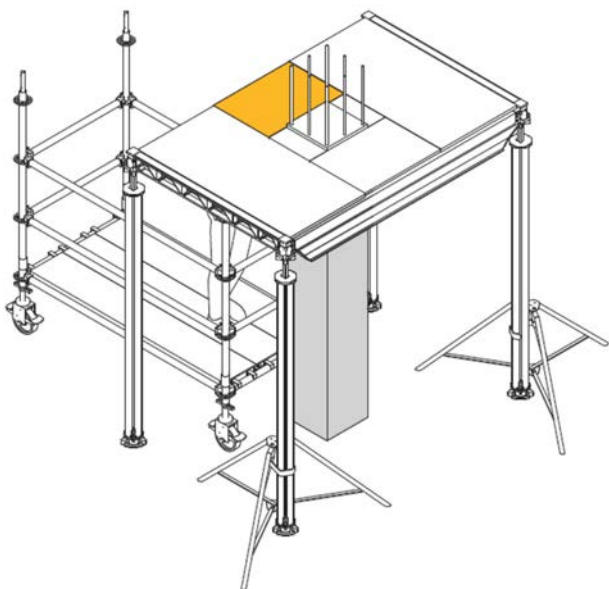


Panels CC should be used wherever possible to avoid the excessive use of infilling board.



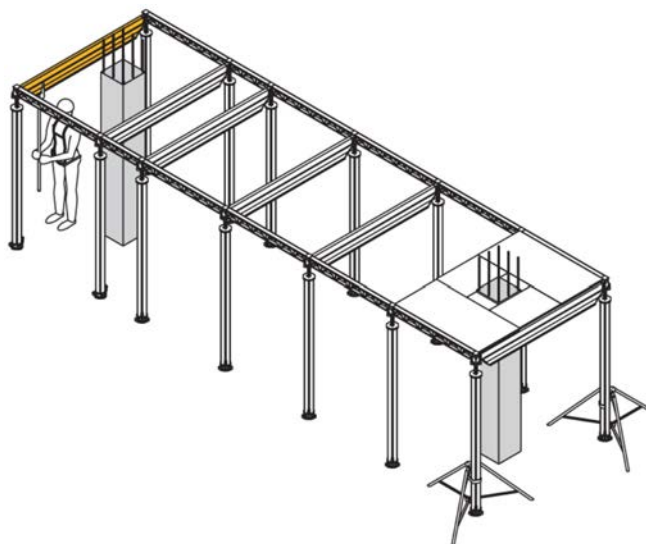
The infilling board should be laid on two Transversals CC TR, if the grid space permits this.

6. Infilling on column



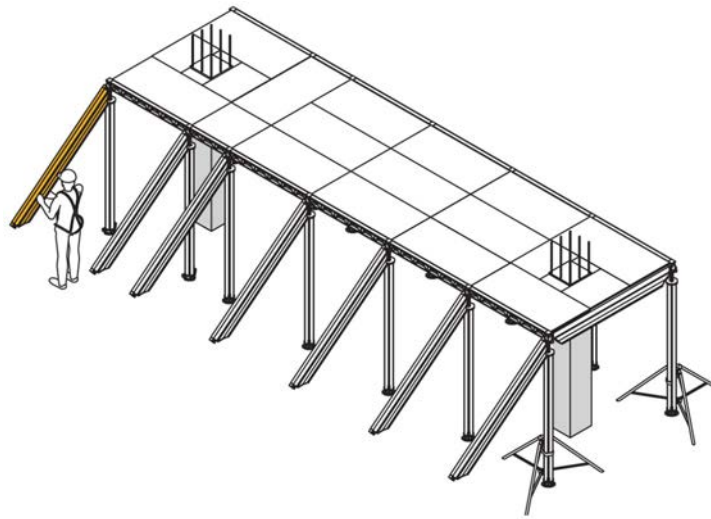
- Fill the area around the column with 21 mm board.
- In case of using 27 mm board, use Transversals CC TR 27 and Beams CC W 27.

7. Continuation of grid and levelling



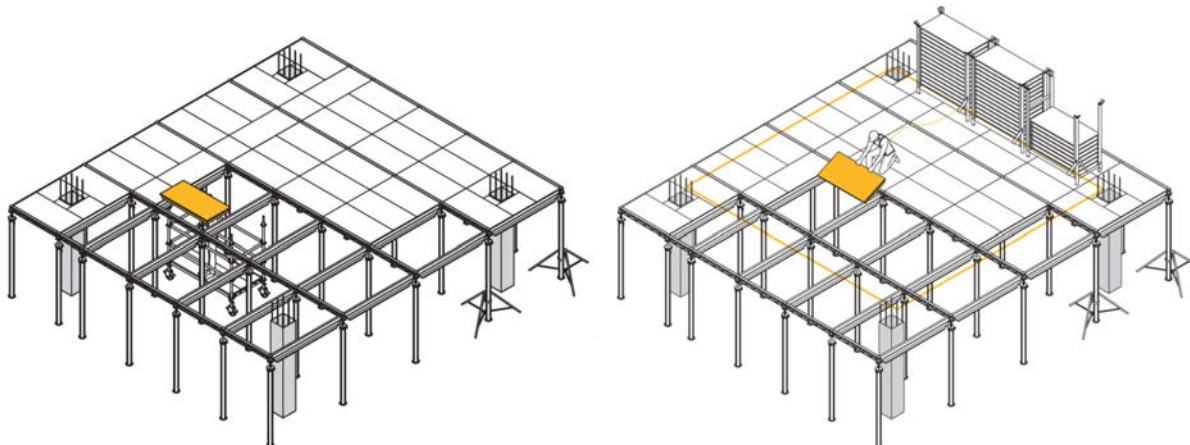
- Continue installing the next grid in direction of the Transversals and level the whole assembly.

8. Placing of Panels CC and infilling on column



- Place the Panels CC and fill the area around the column.
- Hang in one end of Beams CC to continue the assembly in direction of the main beam.

9. Grid completion



- Erect the entire grid and place the Panels CC.

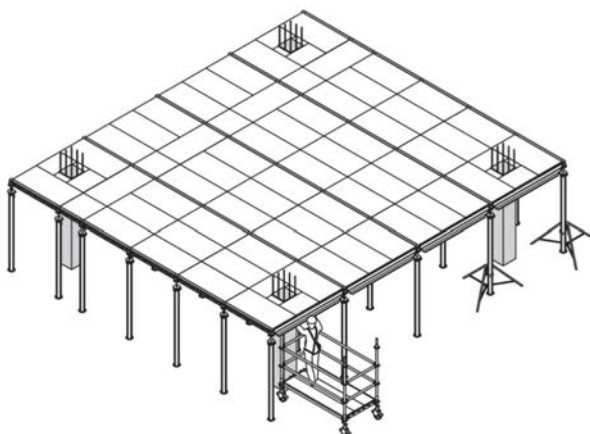
From mobile towers

The Beams and Panels are designed in a way to facilitate their placing from mobile towers. frequently move those towers.

With lifelines

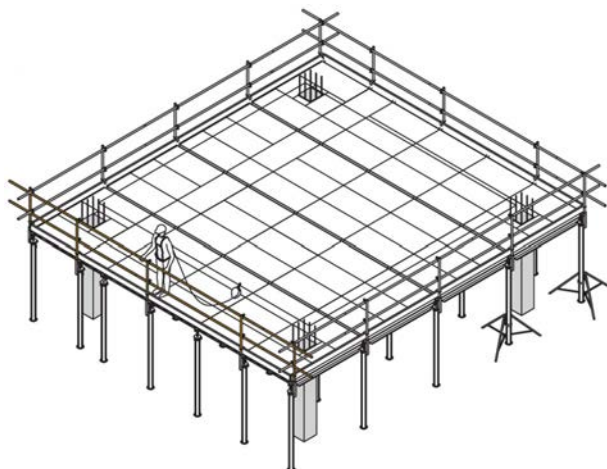
Lifelines allow the placing of several Panels from a fixed point on top of the shuttering face. This is possible due to the sliding of the Panels along the Beams until reaching the Transversals CC TE.

10. Placing of Panels CC

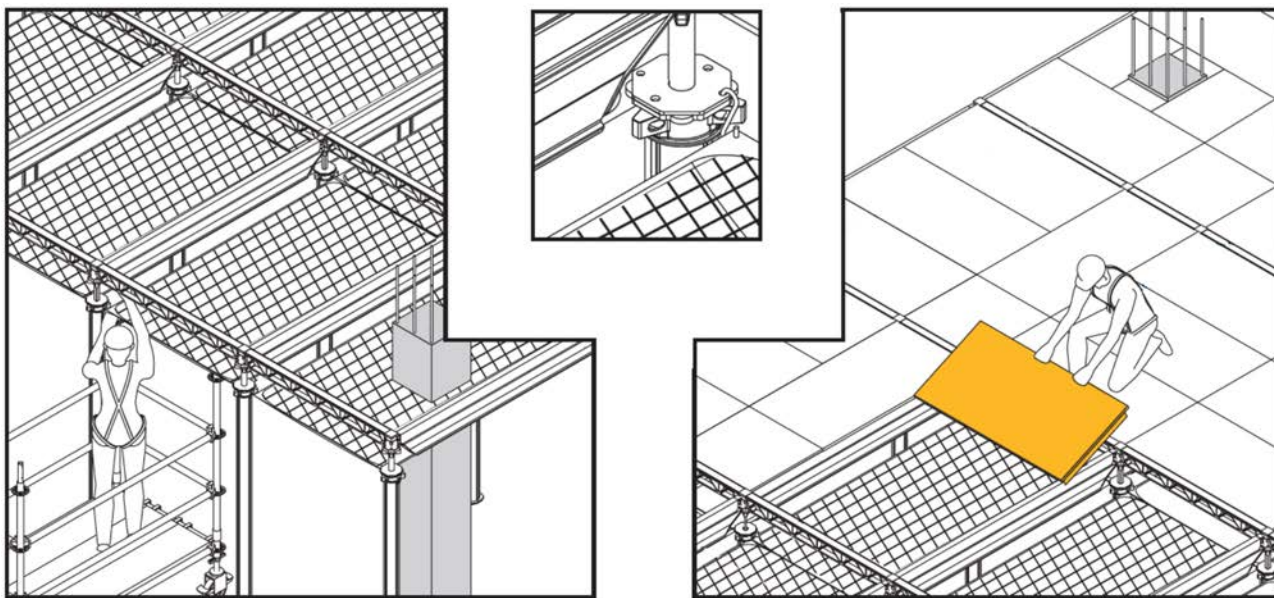


- Finish covering the entire grid with Panels CC and infillings on columns.

11. Installation of Safety Handrail



- Place the Safety Handrails and the Toe Boards being tied with the harness to a lifeline during the whole process.

Alternative Panel CC assembly: **Net under formwork**

*Panels CC assembly with **net under formwork***

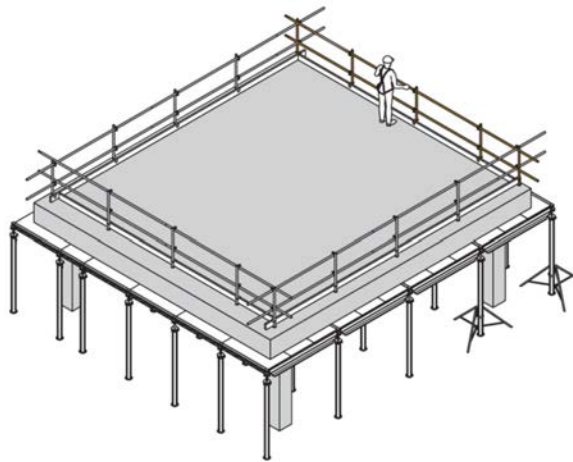
3.2. DISMANTLING INSTRUCTIONS

Basic grid stripping

Steps to follow:

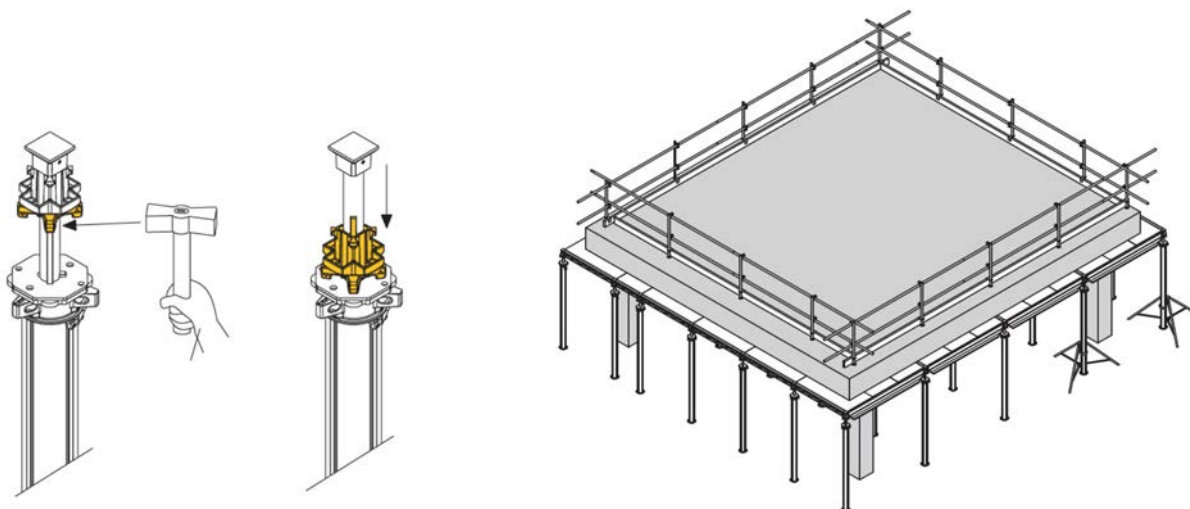
1. Moving of Handrails onto the slab
2. Release of Drophead CC wedge
3. Recovery of Panels CC
4. Recovery of Transversals CC TE
5. Recovery of Beams CC

1. Moving of Handrails onto the slab



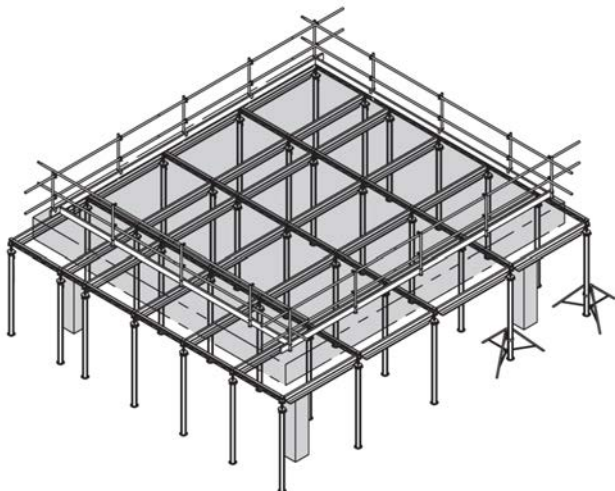
- Move the Safety Handrails (Handrails, Handrail Posts and Toe Boards) to the Plastic Handrail Supports or replace them by another type of perimeter protection.

2. Release of Drophead CC wedge



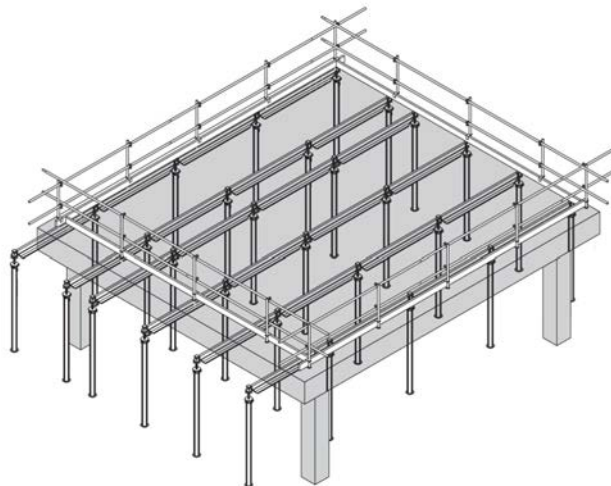
- Remove additional Props of infillings or 90° assemblies.
- Hit the wedge of the Dropheads CC to release them, except the ones of the Perimeter Beams.
- The wedge drops 150 mm, and with it the Beams, Transversals and Panels.

3. Recovery of Panels CC



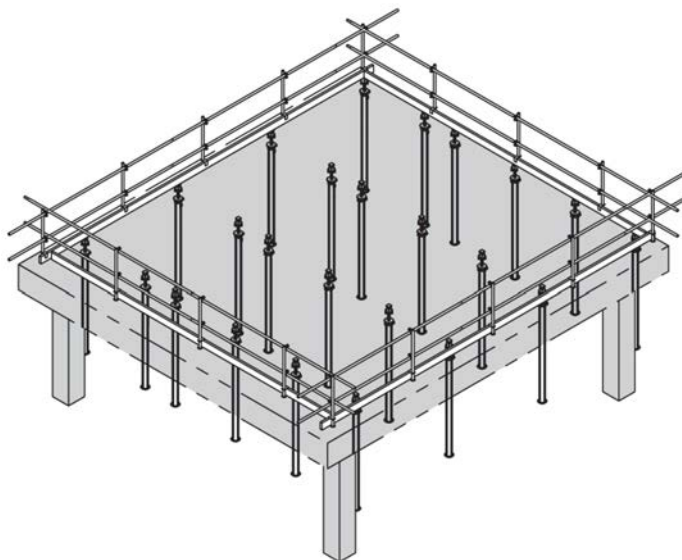
- Remove the Panels.

4. Recovery of Transversals CC TE



- Remove the Transversals CC TE.

5. Recovery of Beams CC



- Remove the Beams CC.



STRIPPING: Under standard curing conditions, the recoverable material is removed at the third day.

3.3. ASSEMBLY AND DISMANTLING OF BASIC GRID: RAMPS

The information in this section is contained in the ITM CC30-01 and ITM CC31-00 "Formwork and striping of basic grid: Ramps".

3.4. ASSEMBLY AND DISMANTLING OF BASIC GRID: TWO WAY SLOPE SLABS

The information in this section is contained in the ITM CC28-01 and ITM CC29-00 "Formwork and striping of basic grid: Two way slope slabs or of mountain and valleys".

4. Solutions

Subsequently, assembly solutions for particular slab conditions are given:

90° Assembly		
Infillings on column	Column inside the basic grid	
	Beam CC position coincides with column position	
	Transversal CC TE position coincides with column position	
	Drophead CC position coincides with column position	
Solutions between walls	Beam CC is parallel to a wall	Panel placing starts from a wall <ul style="list-style-type: none">• With VM Beam and Universal CC Head• With auxiliary beam under Panels and Transversals CC TE
		Infilling on wall <ul style="list-style-type: none">• With Edge Beam• With Infilling Support CC
	Beam CC is perpendicular to a wall	Starting from a wall <ul style="list-style-type: none">• With CCW Beam and Universal CC Head• With CC Beam and Universal CC Head
		Infilling on wall <ul style="list-style-type: none">• With Universal CC Head and Transversal CC TR
	Perimeter formwork	With Perimeter Beam CC
Perpendicular to Beam direction		
With Perimeter Clamp CC		In Beam direction
		Perpendicular to Beam direction
Approaching in drop panels		
Ramps		
Two way slope slabs: mountain and valleys		

4.1. 90° Assembly

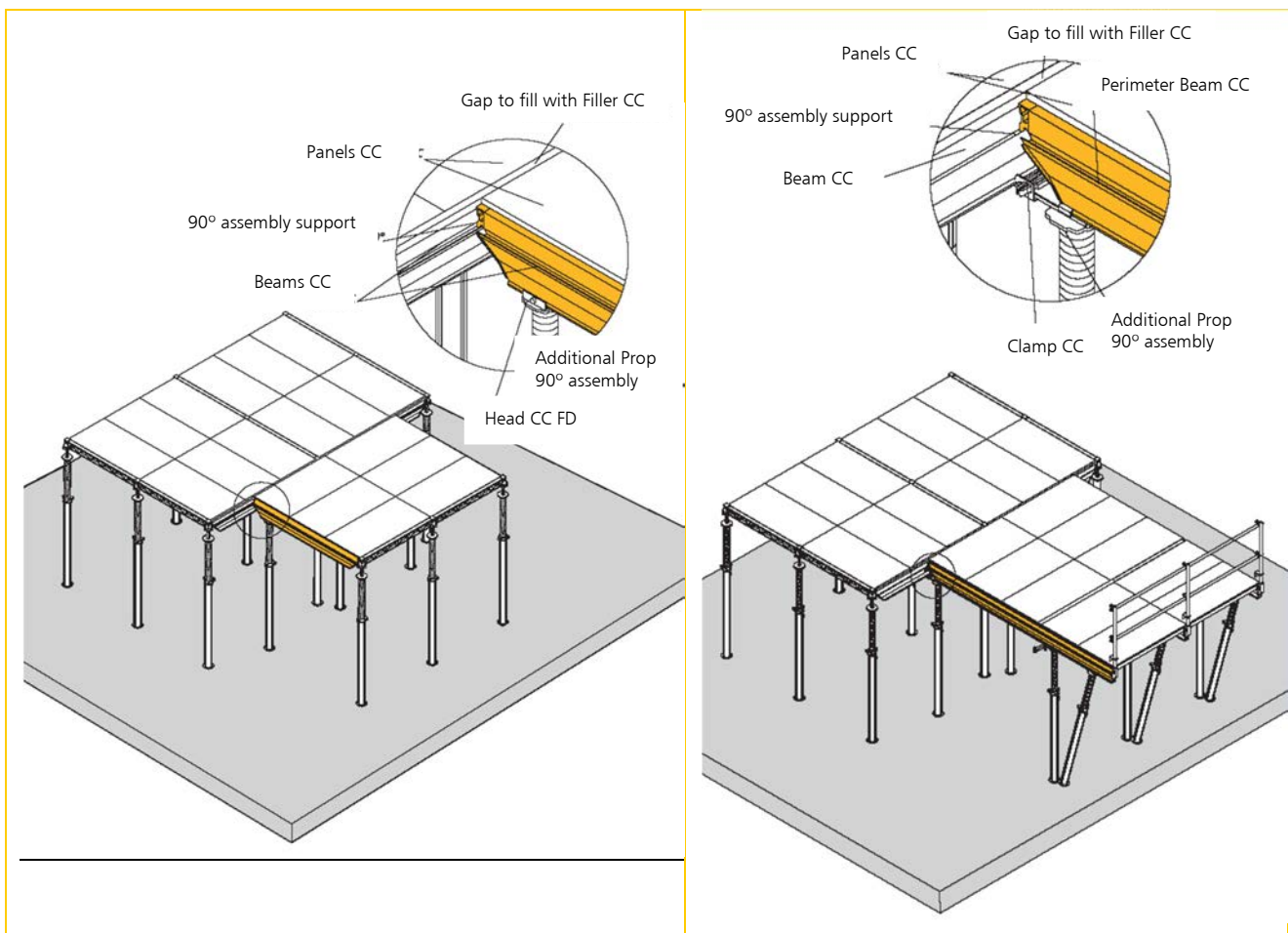
This solution consists in changing the formwork direction where it might be helpful. This option adds high flexibility to the system and eases infillings. The support channel of the Beam CC, Beam CC W and Perimeter Beam CC is also able to support Beams CC, Transversals CC TE, Transversals CC TR and Panels CC.

This particular part design optimises the formwork distribution for infillings on columns or openings in each area as well as for perimeter solutions.

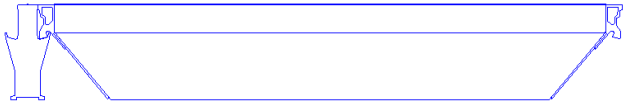
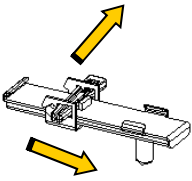
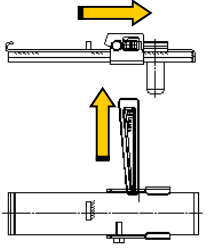
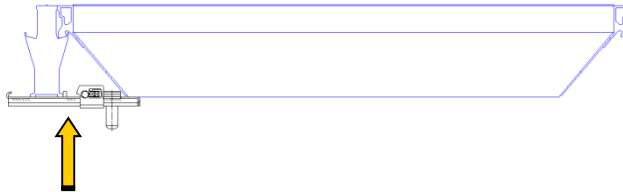
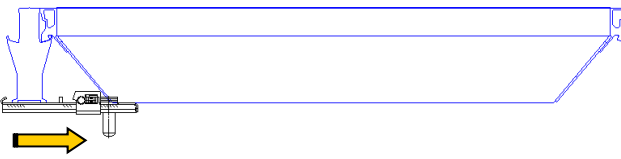
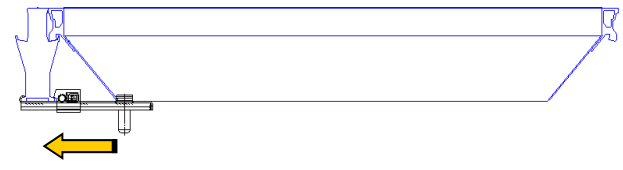
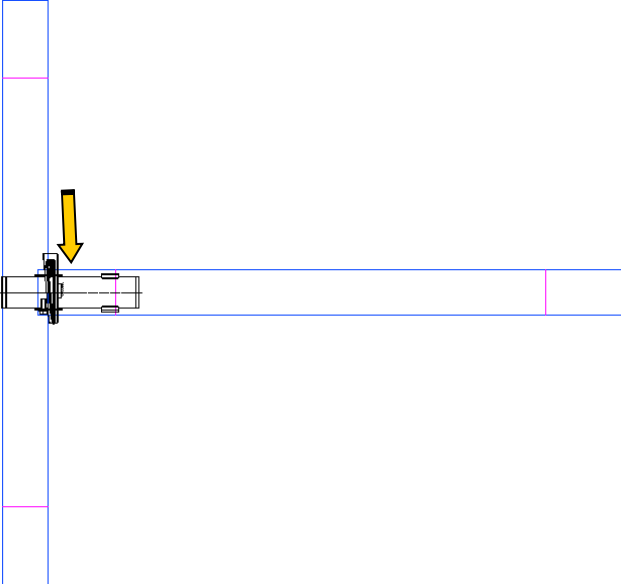
The 90° assembly of Beam on Beam leaves a 35 mm gap above the support Beam where the Filler CC with the corresponding length is placed.

For all 90° assemblies of Beam on Beam, it is necessary to place an additional Prop to sustain the perpendicular Beam. For this, the following is required:

- Head CC FD: For a 90° assembly in the basic grid.
- Clamp CC or Tie Piece CC LD: For a 90° assembly in the perimeter solution which moreover avoids the overturning of the Beam.



Clamp CC assembly in detail:

<p>1. Place the Beam CC at 90°.</p> 	<p>2. Pull out the Clamp CC wedge and take the mobile part to the maximum backward position (clamp open).</p>  
<p>3. Insert the Clamp CC in the gap below the perpendicular Beam (clamp open).</p> 	<p>4. Move the Clamp CC towards the perpendicular Beam until it hooks the main Beam on the one side and guides the perpendicular Beam into its rail on the other side (clamp open).</p> 
<p>5. Move the mobile part towards the main Beam fixing the perpendicular Beam (clamp open).</p> 	<p>6. Fasten the wedge (clamp closed).</p> 

4.2. INFILLINGS ON COLUMN

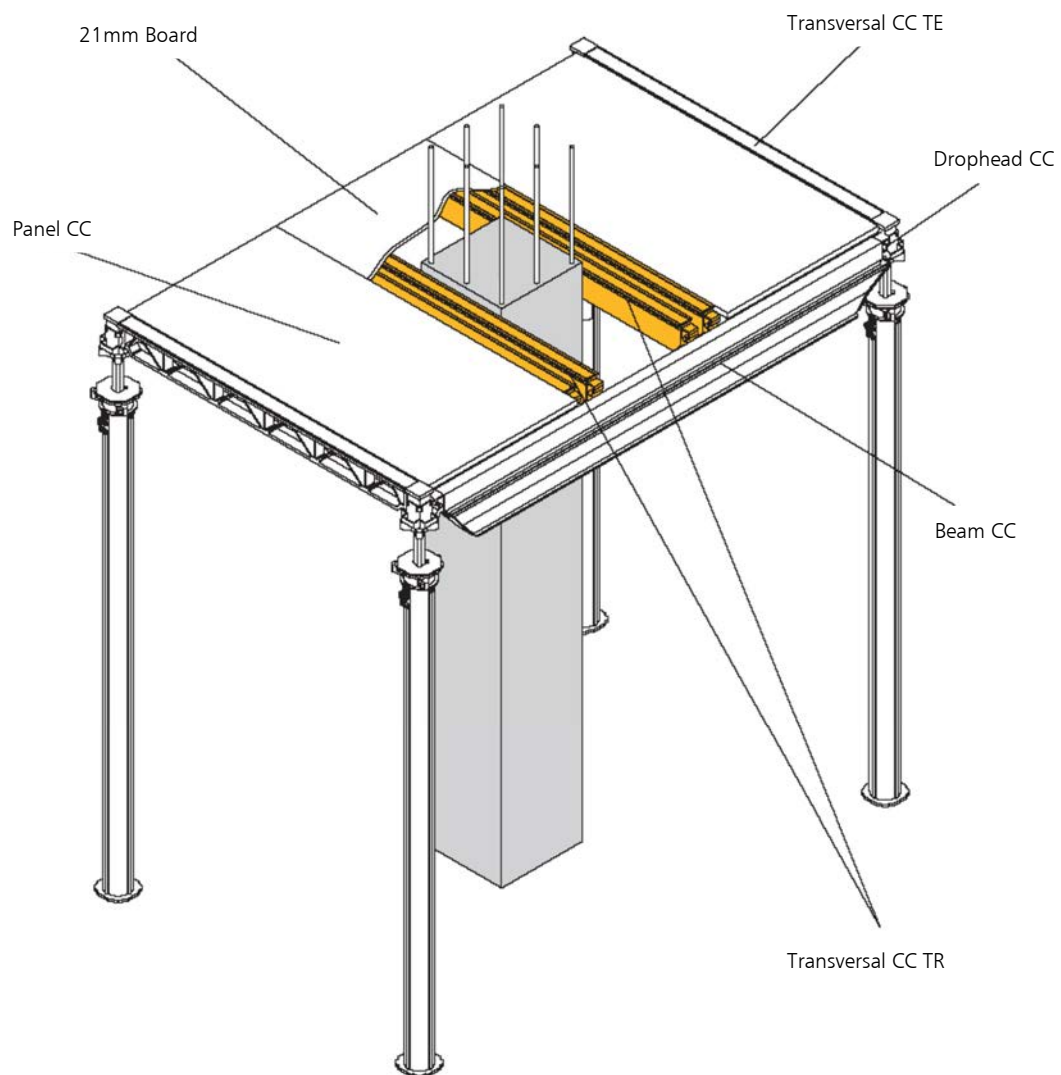
The best location of the column for an infilling on column solution is inside the basic grid, i.e. between Beams CC and Transversals CC TE. The Transversals CC TR are used to nail a board of 21 mm thickness on them.

In case of using in the infilling 27 mm thickness boards, Transversals CC TR 27 and Beams CC W 27 should be used.

Below, the most common solutions are described:

4.2.1. Column inside the basic grid

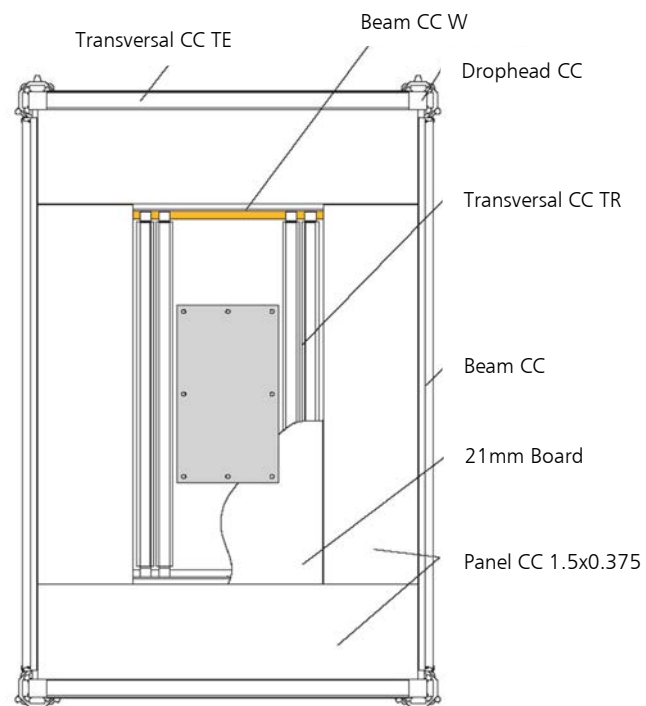
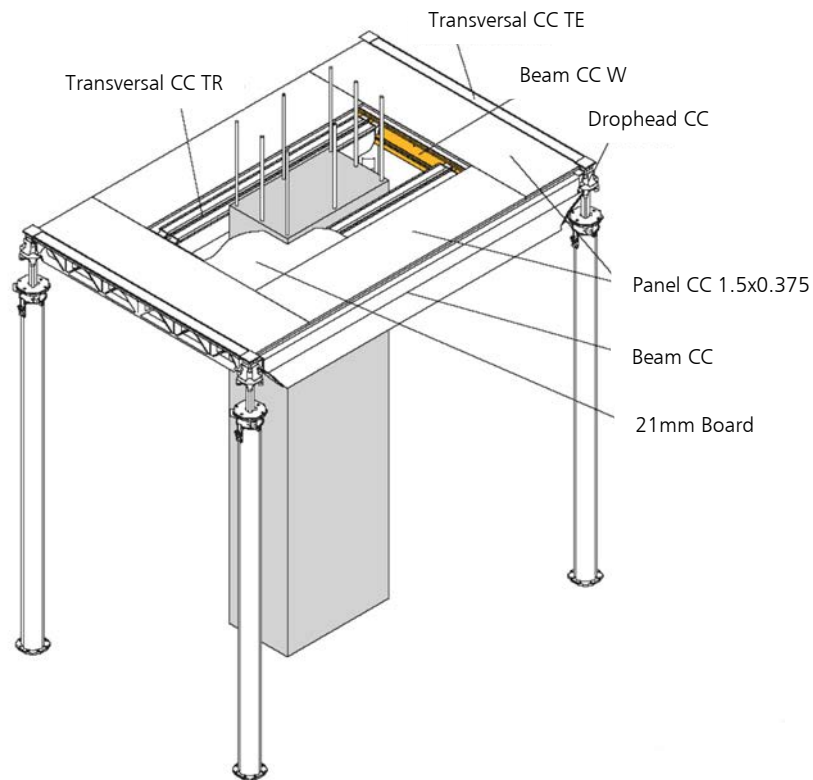
If the column has a width which permits to use Transversals CC TR for the infilling, those are hooked into the Beams CC and the remaining gap is filled with 21 mm board*.



*Note: In case of using 27 mm thickness board, Transversals CC TR 27 should be used.

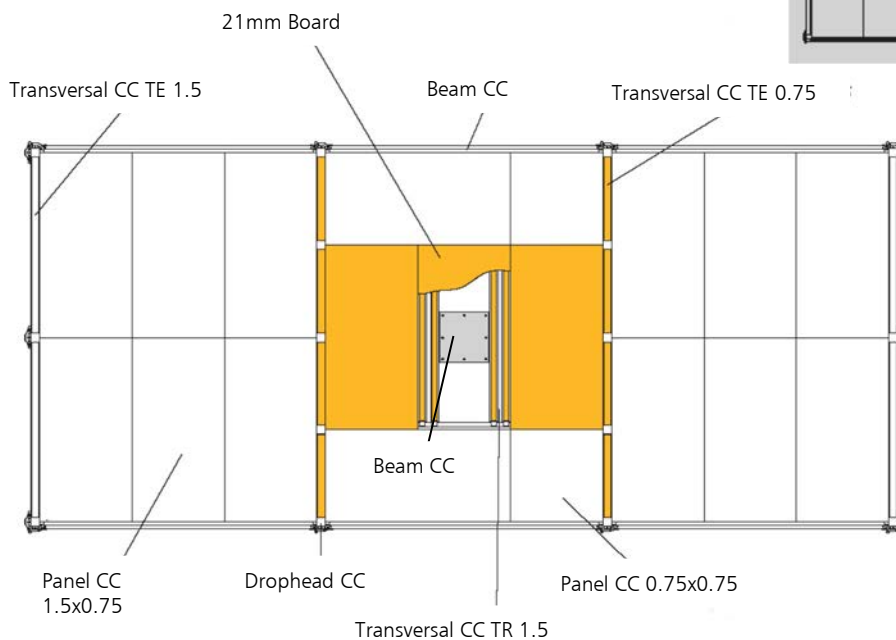
Depending on the column geometry, a collar can be made around the column for the infilling. In this case a Beam CC W is used to sustain the Transversals CC TR.

Again, in order to reduce the use of infilling board, the following Panel CC sizes exist: 1.5 x 0.375 and 0.75 x 0.75.



Beam CC position coincides with column position

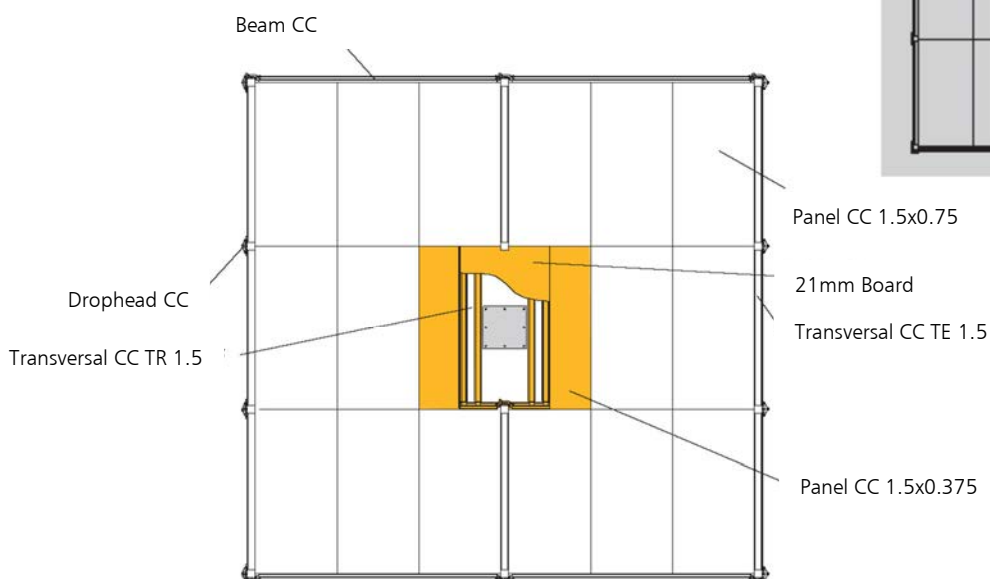
In this case the infilling on column is done with a local formwork offset as can be seen in the figure below:



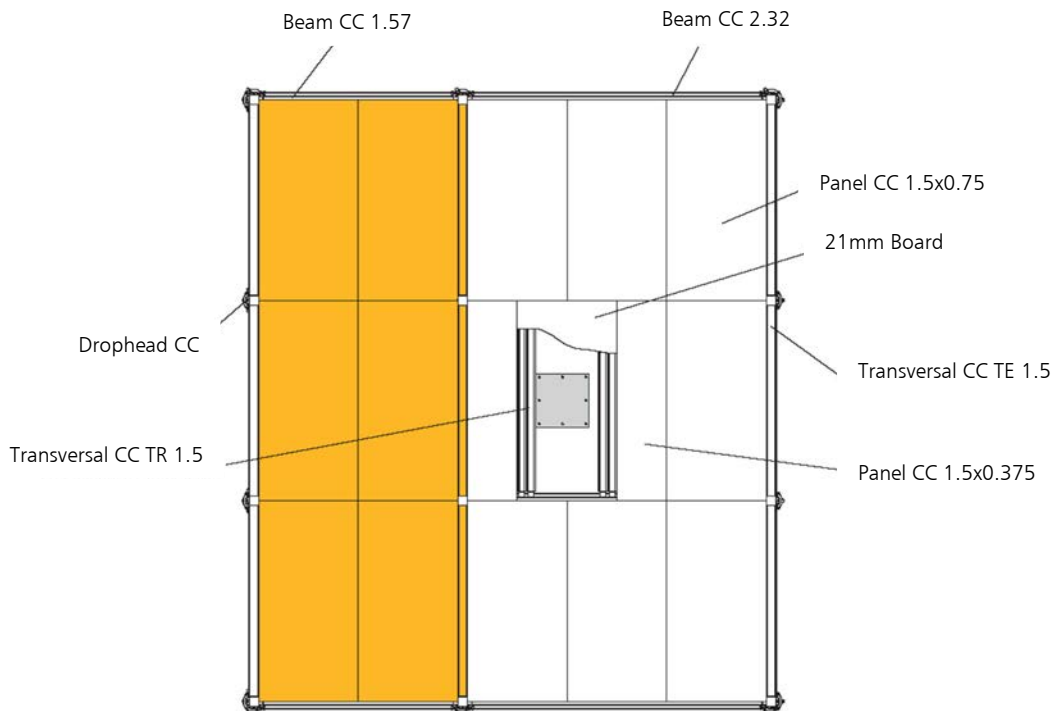
4.2.2. Transversal CC TE position coincides with column place

There are two alternative solutions:

No Transversal CC TE is used, and the formerly mentioned solution is adapted to cover the gap around the column.

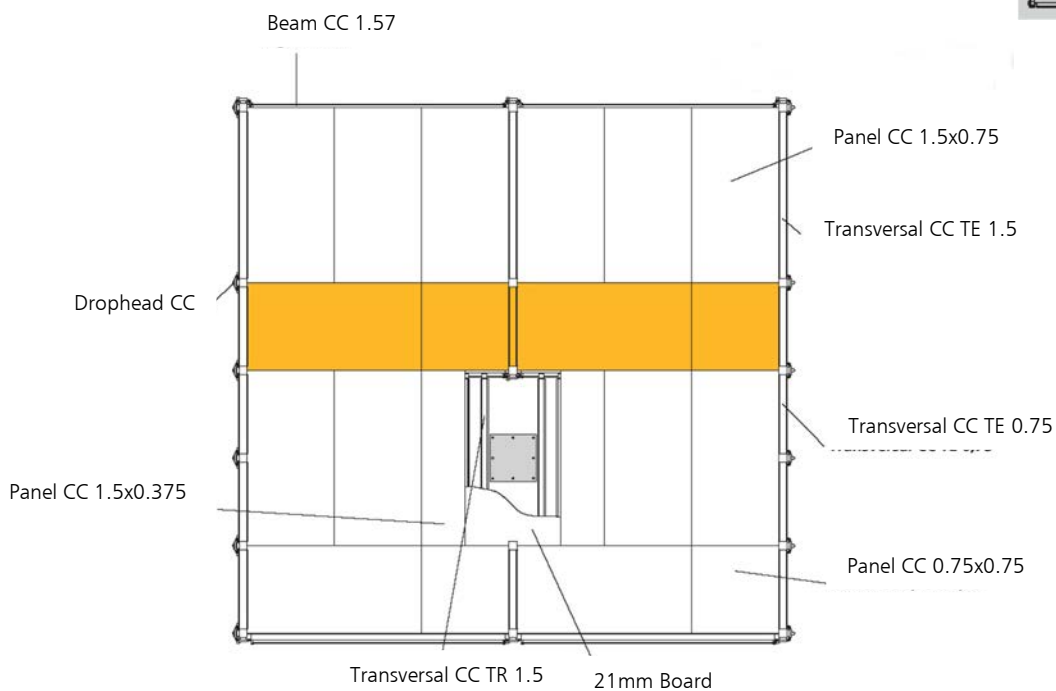
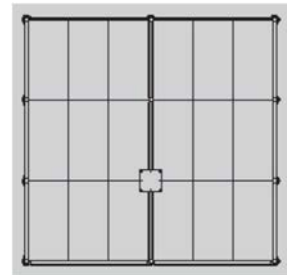


A smaller grid of 1.57 m is assembled, as can be seen in the figure, which implicates the entire lane to be of the same width.



Drophead CC position coincides with column position

The best solution is to avoid the column by changing the grid widths of the formwork around the column.



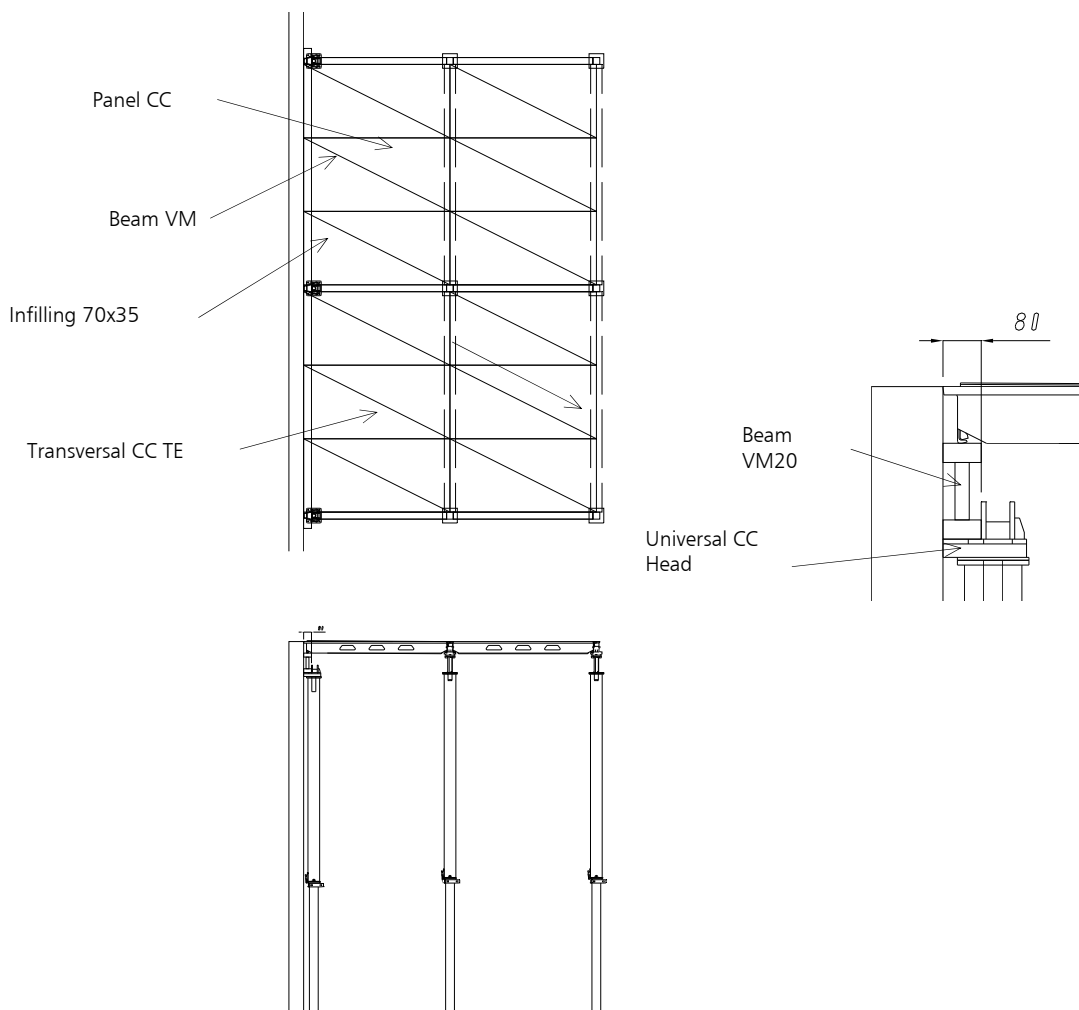
4.3. SOLUTIONS BETWEEN WALLS

4.3.1. Beam CC is parallel to a wall

4.3.1.1. Panel placing starts from a wall

4.3.1.1.1 With Beam VM and Universal CC Head

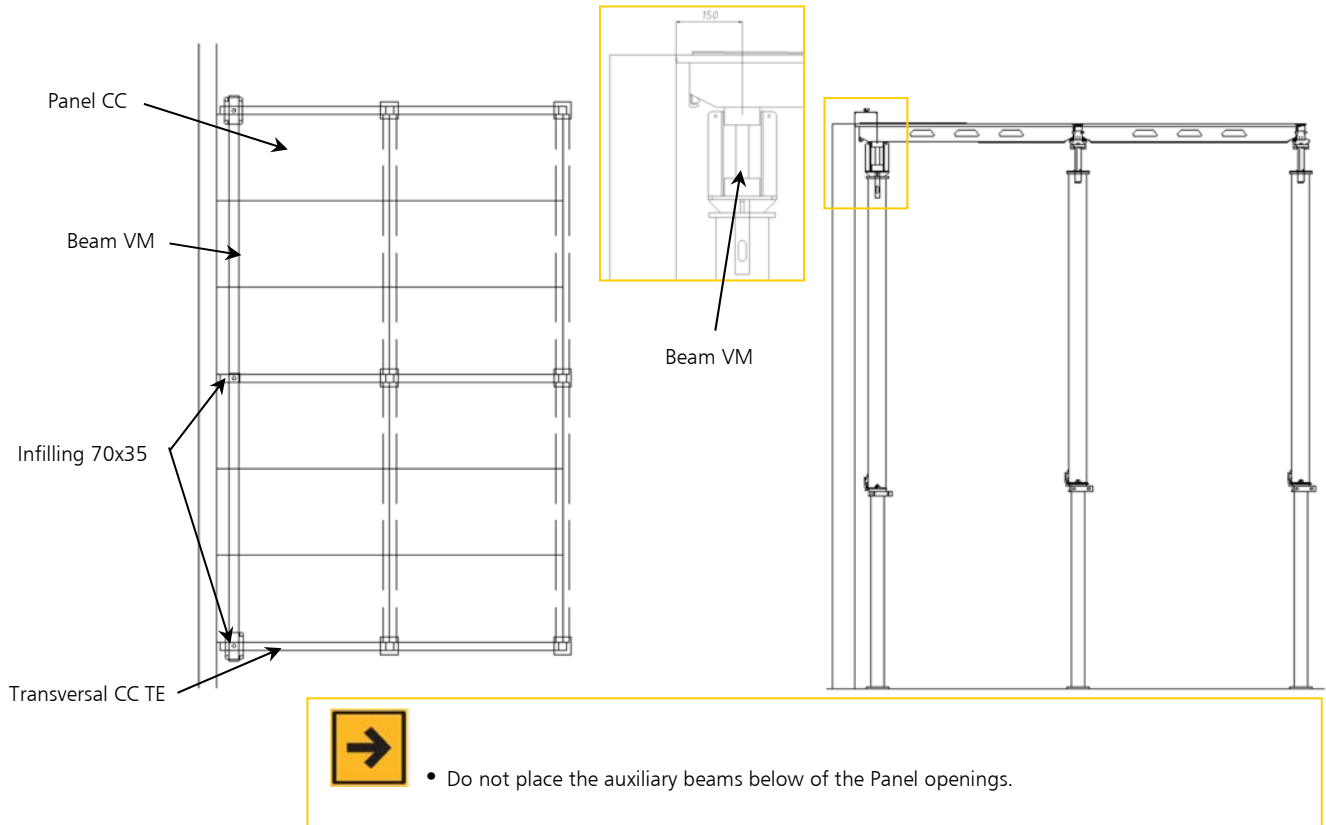
Is performed by placing Panels along the wall and supporting Panels and Transversals CC TE in an Auxiliary Beam (or Beam VM20 or Aluminium Beam) placed on their bottom part.



- Infilling to cover 70x35 at the end of the Transversal CC TE.
- Nail nails from the Universal CC Head to the VM Beam.

4.3.1.1.2 With Auxiliary Beam and Double Head VR under Panels and Transversals CC TE

The Panel placing starts directly from the wall, sustaining them and the Transversals by an auxiliary Beam (VM20 or Aluminium).



- Infilling to cover 70x35 at the end of the Transversals CC TE.

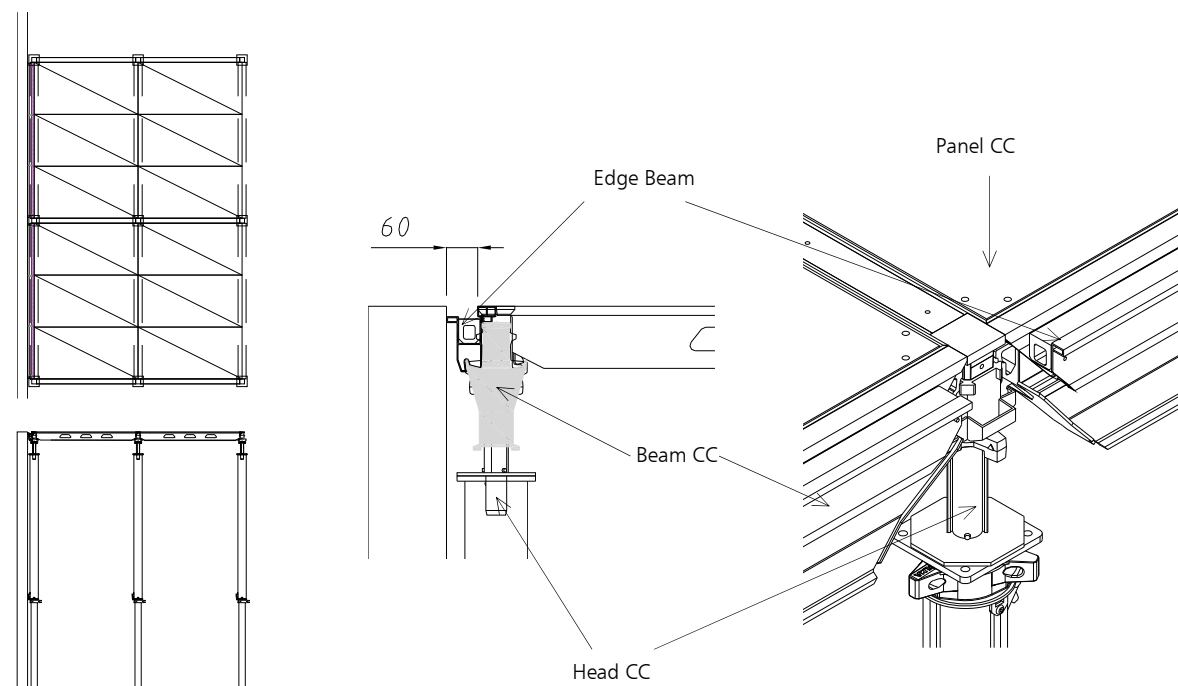
This solution can also be performed using the Universal CC Head shoring auxiliary Beam VM supporting Panels and Transversals CC TE or using the Universal CC Head supporting also the Panels and Transversals CC TE.

4.3.1.2. Infilling on wall

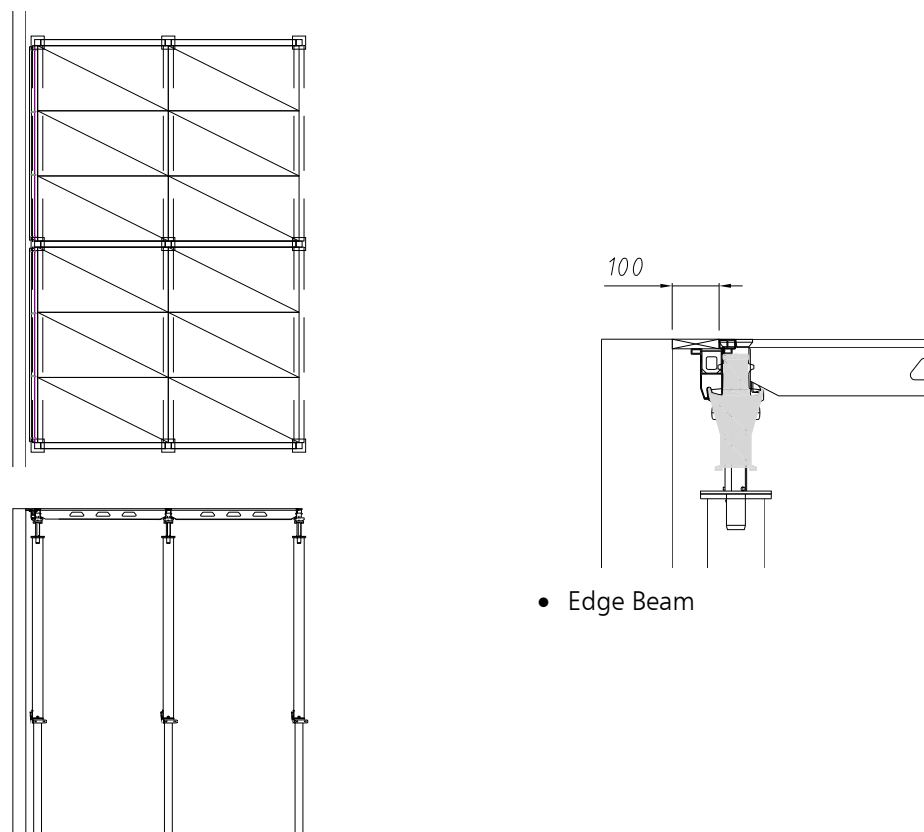
Get as close with the formwork to the wall as it gets to make the infilling on wall not wider than 0.8 m. It might be useful to change the formwork direction (90° assembly) to optimise the infilling. These solutions do also work for the case *Panel placing starts from a wall*.

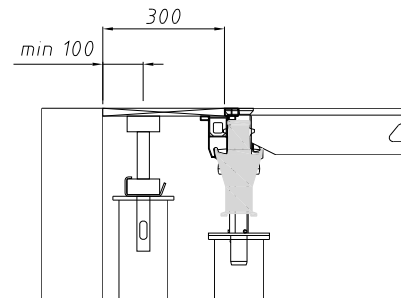
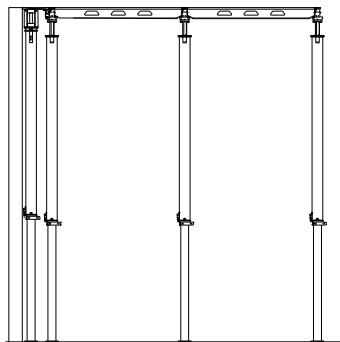
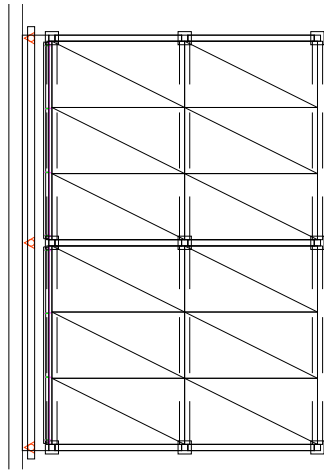
4.3.1.2.1 With Edge Beam

The Edge Beam placed on the CC Beam facilitates infilling on the wall providing a support to the board 21mm nailed on a nailing block. In case of using 27 mm thickness board, Edge Beam 27 should be used.

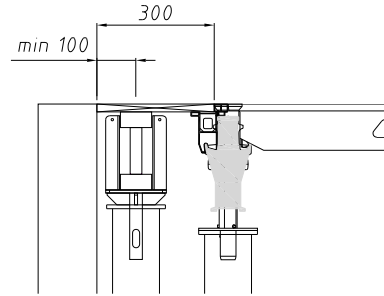


Using an Edge Beam, which is set into a lateral edge of the CC Beam, it is obtained the support of board to the wall infilling, which can be supported by one or two shoring beams and complete this infilling at the same level to the panels surface. Depending on the distance to the wall must be assembled, none, one or two rows of auxiliary beams that support the infilling on the side of the wall.

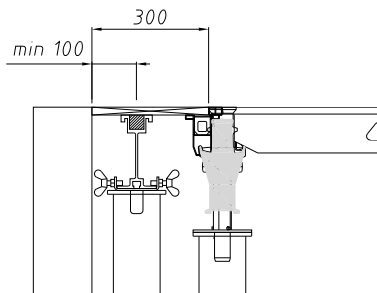




- Edge Beam, VM and Simple Head VR



- Edge Beam, VM and Double Head VR



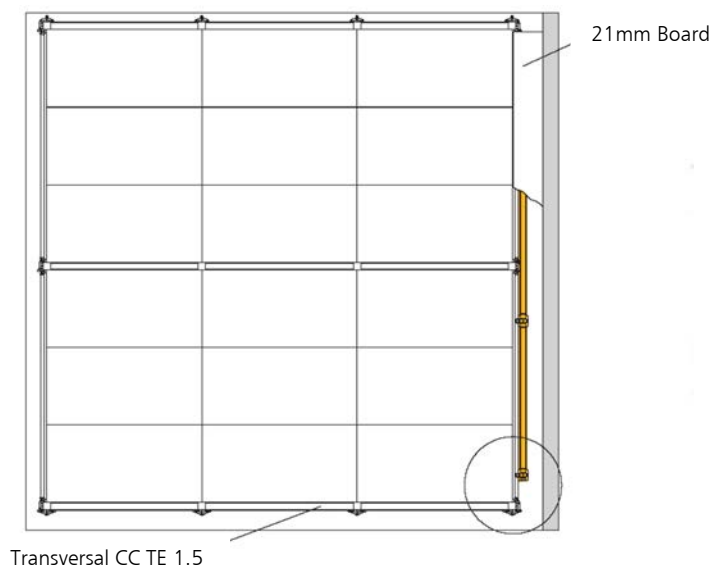
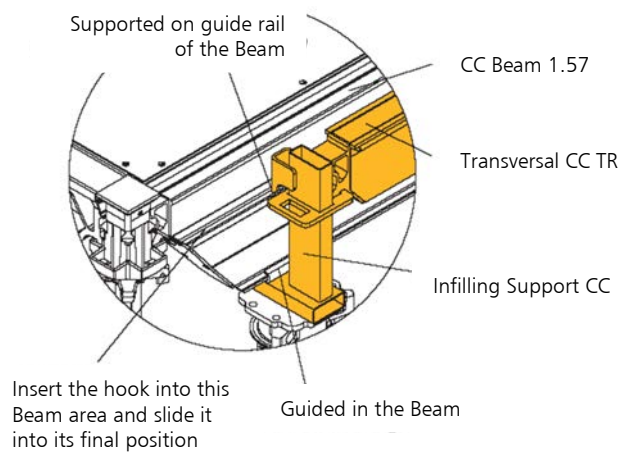
- Edge Beam, Alu Beam and CCFD Head

Also, if there are no Edge Beams, may be performed using the solutions of planks 84X40 mm., supported on the support side of CC Beam.

4.3.1.2.2 With Infilling Support CC

The Infilling Support CC placed on the Beam CC provides a support to place the Transversals CC TR parallel to the Beam. This way the infilling on wall is eased by giving a base to the 21 mm infilling board. In case of using 27 mm thickness board, the Infilling Support CC cannot be used.

Depending on the distance, it might be necessary to place a row of auxiliary beams which sustains the infilling board on the side of the wall.

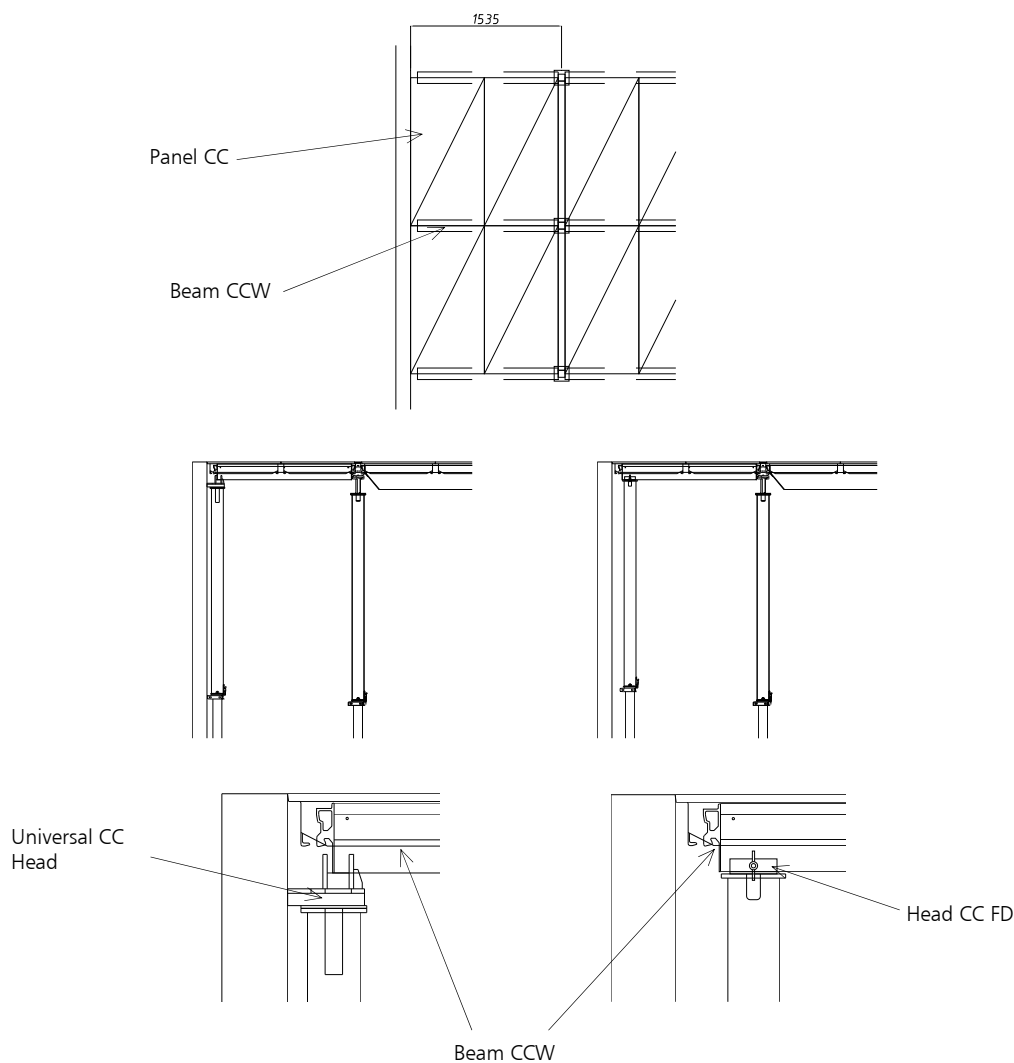


4.3.2. Beam CC perpendicular to a wall

4.3.2.1. Starting from a wall

4.3.2.1.1 With CCW Beam and Universal CC Head

When using the CCW Beam (1.5 m.) is not any infilling and the panels are fitted between the wall and the subsequent standard grids. The CCW Beam will be supported by an Universal CC Head or CC FD Head.

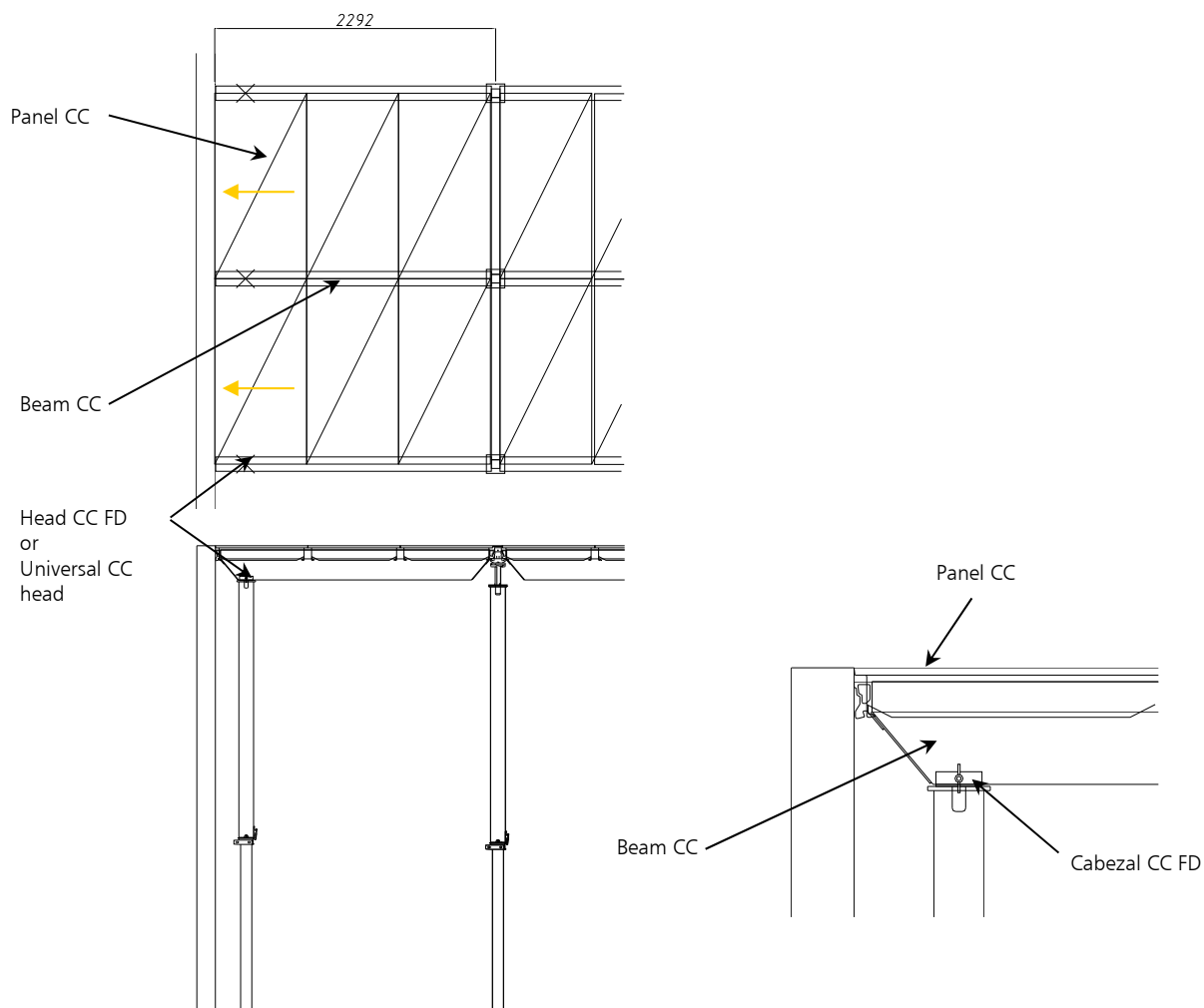


Instead of using the Universal CC Head it can be used a CC FD Head.

Ensure connection and support of Universal CC Head/ CC FD with Beam, using Tripods.

4.3.2.1.2 With CC Beam and Universal CC Head

The beginning from the wall in the perpendicular direction is possible done without any additional support beams. When using CC Beam, the head of it, will be in contact to the wall and it will move the first Panel to contact it against the wall. The following Panels will be placed against the first panel. In the area of the wall, the CC Beam will be supported with a Universal CC Head CC or CC FD Head.



4.3.2.2. Infilling on wall

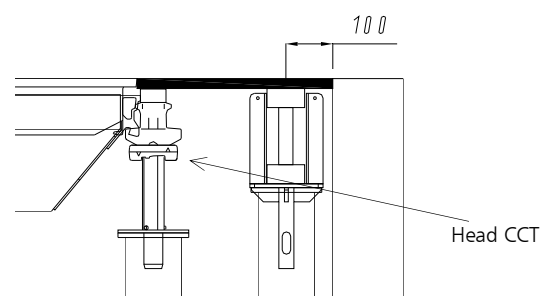
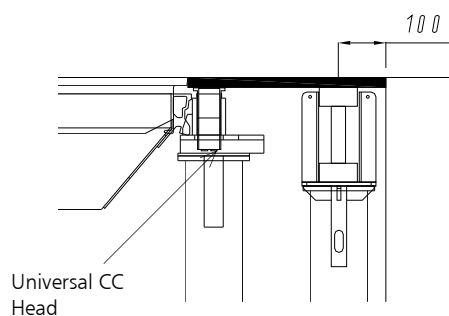
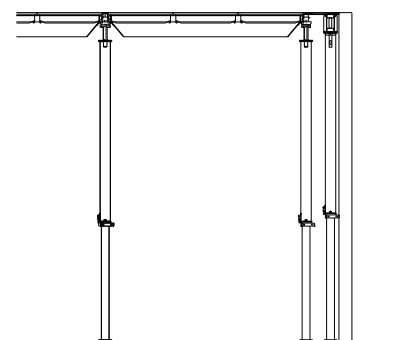
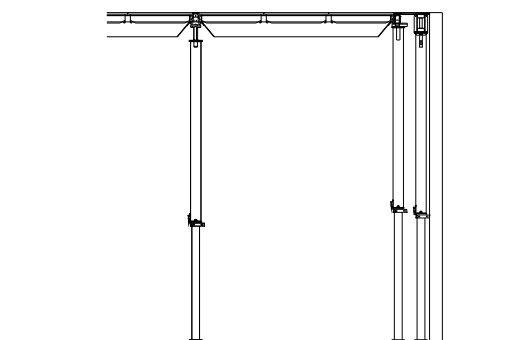
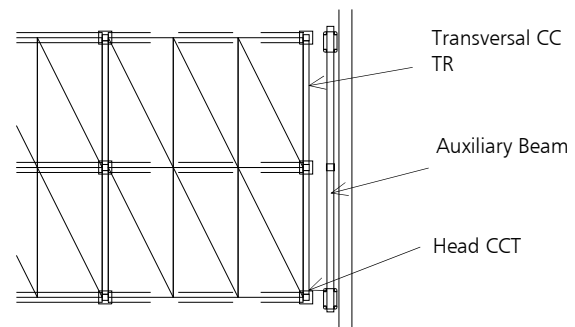
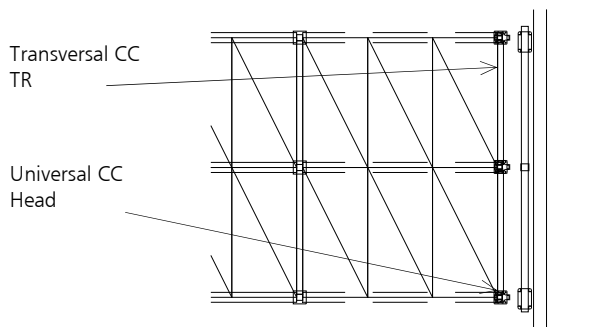
4.3.2.2.1 With Universal CC Head and Transversal CC TR

Similarly, it will be tried to bring the head the maximum to the wall. This requires combining the different lengths of CC Beam.

In the last grid near the wall, CC Heads are replaced by the Universal CC Heads or CCT Heads, and Transversals CC TE / TE ALU by Transversals CC TR in order to provide support for the infilling board of 21 mm. thickness. Depending on the distance it must place propped auxiliary beams that support the infilling board on the side of the wall.



In case of using 27 mm thickness board, Universal CC Heads can be used with Transversals CC TR 27. Under no circumstances CCT Heads could be used.



4.4. PERIMETER FORMWORK

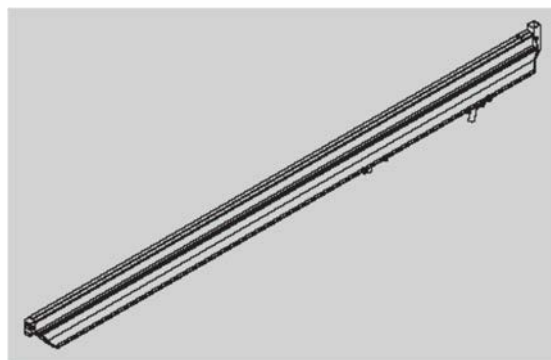
The perimeter formwork facilitates placing a stopend at the slab edge. It also provides a perimeter working area. The CC-4 system offers two options for the perimeter.

PERIMETER FORMWORK ERECTION		
	Solution with Perimeter Beam CC	In Beam direction
		Perpendicular to Beam direction
	Solution with Perimeter Clamp CC	In Beam direction
		Perpendicular to Beam direction
PERIMETER FORMWORK STRIPPING		
	Stripping with Perimeter Beam CC	
	Stripping with Perimeter Clamp CC	

4.4.1. Perimeter Formwork Erection

4.4.1.1. Solution with Perimeter Beam CC

The assembly of the Perimeter Beams CC can be done as well starting from the Dropheads CC (in direction of the Beams CC) as from the Beams CC (perpendicular to them). In both cases, the assembly only differs in the safety accessories used. This way, it is possible to cover the perimeter outline of the area with formwork.



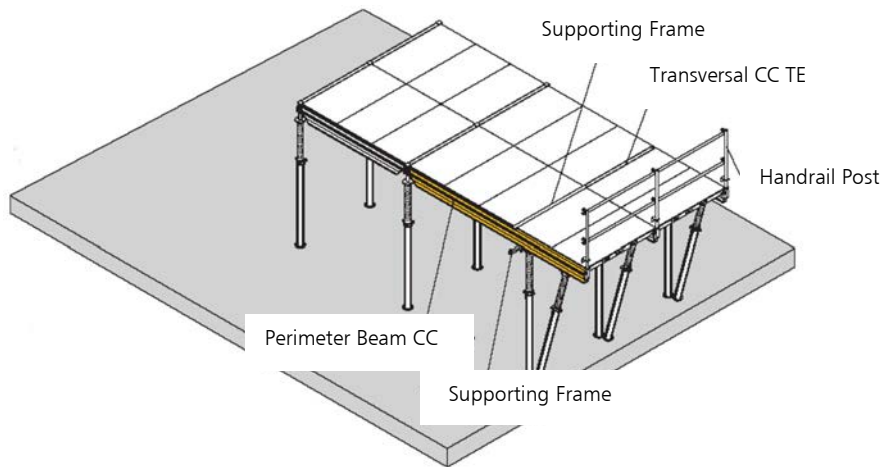
The Perimeter formwork with Perimeter Beam CC shall not project more than a Panel and a half from the slab edge, i.e. maximum 1.1 m.

Perimeter Beams CC in direction of the Beams CC

The Perimeter Beam CC hangs in the Dropheads CC of the last formwork line.

Each Beam CC gets an additional Prop placed in the mobile spigot next to the slab edge. The fixing of the Perimeter Beam CC to avoid its overturning can be done in two ways:

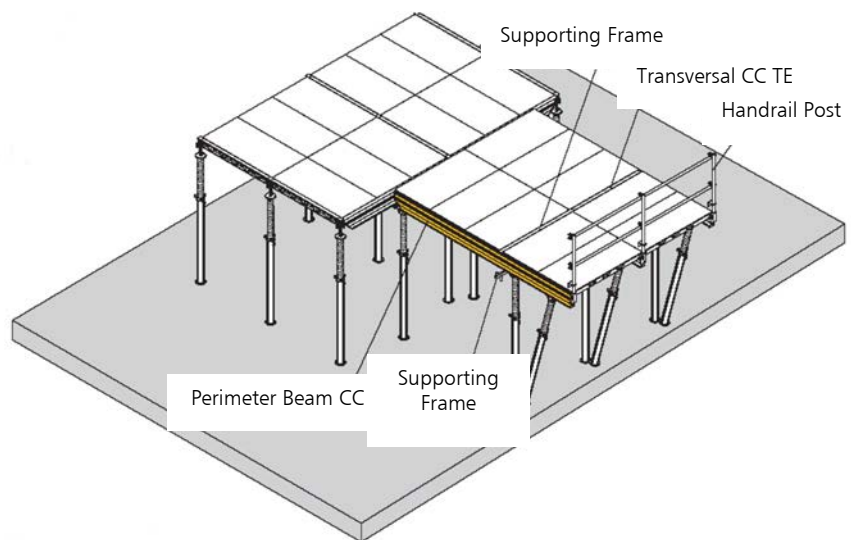
- Inclined Prop placed in the respective spigot and Fixing Hook CC placed in the Beam-Drophead connection.
- Tie Piece CC LD to fix the end of the Perimeter Beam CC to the slab with a chain or cable.



Perimeter Beams CC in perpendicular direction to the Beams CC

The Perimeter Beams CC are supported on a Beam CC of the last formwork line and occasionally on another Drophead CC. Each Beam CC gets an additional Prop placed in the mobile spigot next to the slab edge. The fixing of the Perimeter Beam CC to avoid its overturning can be done in two ways:

- Inclined Prop placed in the respective spigot and Clamp CC placed in the Beam-Beam joint or Fixing Hook CC placed in the Beam-Drophead connection.
- Tie Piece CC LD to fix the end of the Perimeter Beam CC to the slab with a chain or strap.



The Supporting Frame CC placed alternatively, assists the stripping and subsequent shoring of the perimeter area.

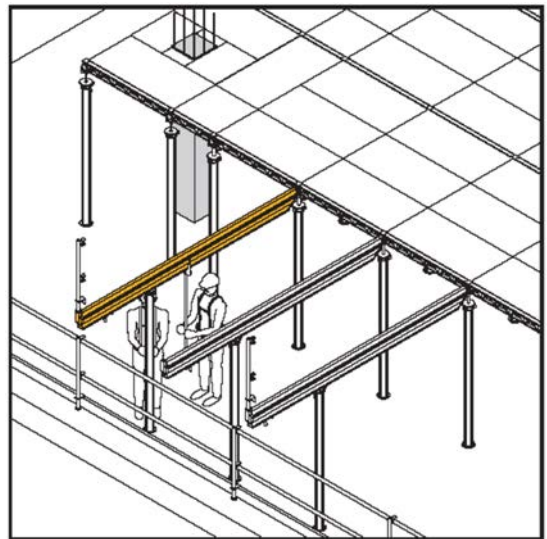


The perimeter protection is done by placing the Handrail Post into the socket at the end of the Perimeter Beam CC and with the respective tubes and Toe Boards.

a) Assembly with Perimeter Beam CC in direction of the Beams CC

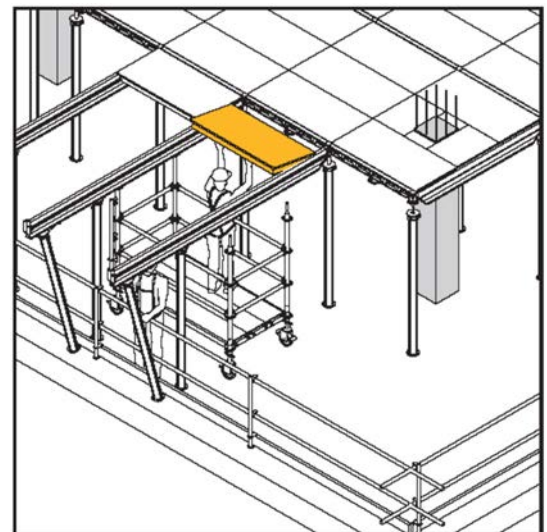
1. Placing of Perimeter Beam CC

- Place the Handrail Post in the Perimeter Beam CC.
- Hook the Perimeter Beam CC into the Drophead CC.
- Raise the Perimeter Beam CC.
- Insert the Prop into the mobile socket.
- Move the Prop 20 cm inside from the slab edge.



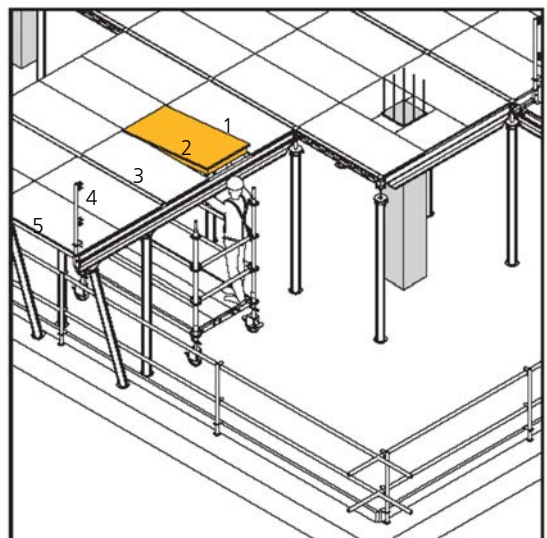
2. Placing of ties and levelling

- Place the Fixing Hook CC.
- Place the next Beam in the same way.
- Place the Panel CC no. 1.
- Level the assembly.
- Insert the inclined Prop into the respective spigot.



3. Placing of Panels CC

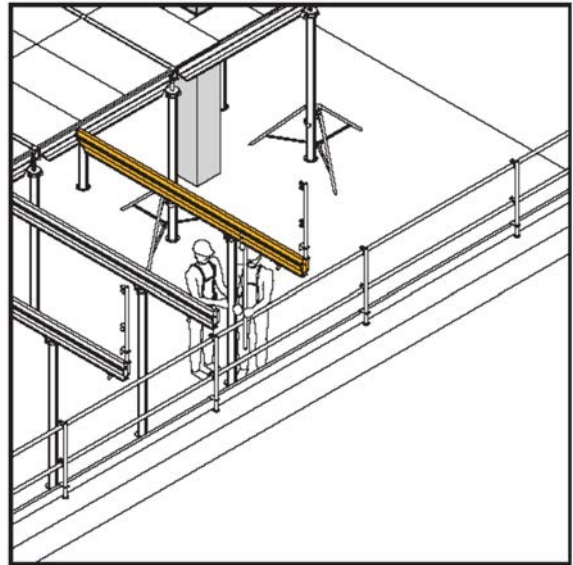
- Place the Panel CC no. 5 and slide it up to the end.
- Do the same with Panel CC no. 4.
- Place the Supporting Frame CC or alternatively the Transversal CC TE against the Panel no. 4.
- Place the Panels CC no. 3 and no. 2.



b) Assembly with Perimeter Beam CC in perpendicular direction to the Beams CC

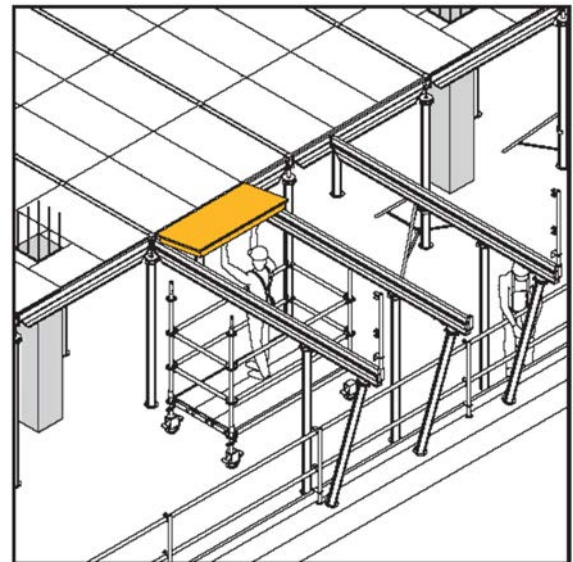
1. Placing of Perimeter Beam CC

- Place the Handrail Post in the Perimeter Beam CC.
- Raise the Perimeter Beam CC.
- Insert the Prop into the mobile socket.
- Move the Prop 20 cm away from the slab edge.



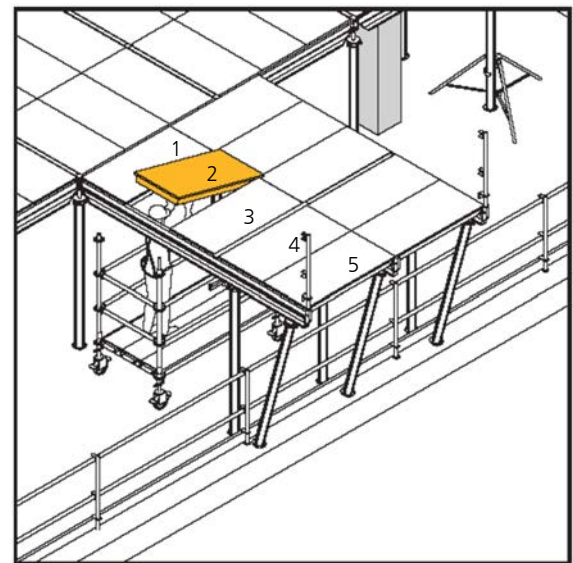
2. Placing of ties and levelling

- Place the Clamp CC, if the Perimeter Beam CC is supported on a Beam CC. If not, use the Tie Piece CC LD and tie the Perimeter Beam CC to the slab with cables.
- Place the Clamp CC where the BEAM CC is supported on a Drophead CC. Place the Panel CC no. 1.
- Place the Clamp CC in the second Perimeter Beam CC.
- Level the assembly.
- Place the inclined Prop.



3. Placing of Panels CC

- Place the Panel CC no. 5 and slide it up to the end.
- Do the same with Panel CC no. 4.
- Place the Supporting Frame CC or alternatively the Transversal CC TE against the Panel no. 4. Put the Panels CC no. 3 and no. 2.
- Place a reinforcement Prop into the Clamp CC or into the Tie Piece CC LD.



4.4.1.2. Solution with Perimeter Clamp CC

The Perimeter Clamp CC with the Beam CC is used as alternative to the Perimeter Beam CC.

As in the case of the Perimeter Beam CC, the assembly with the Perimeter Clamp CC can be done as well starting from the Dropheads CC (in direction of the Beams CC) as from the Beams CC (perpendicular to them).

The Perimeter Clamp CC is always assembled on a Beam CC.



Maximum distances from the slab edge:

- With Beam CC 2.32: 0.75 m
- With Beam CC 1.57: 0.5 m

Perimeter Clamps CC in direction of the Beams CC

The Beam CC with the Perimeter Clamp CC is hooked into the Drophead of the last formwork line, and supported on the reinforcement Prop and on the inclined Props placed in the Perimeter Clamp CC. The fixing to avoid the overturning of the Beam CC with the Perimeter Clamp CC can be done by the:

- Fixing Hook CC in the Beam-Drophead connection.
- Tie Piece CC LD to fix the end of the Perimeter Beam CC to the slab by means of cables.

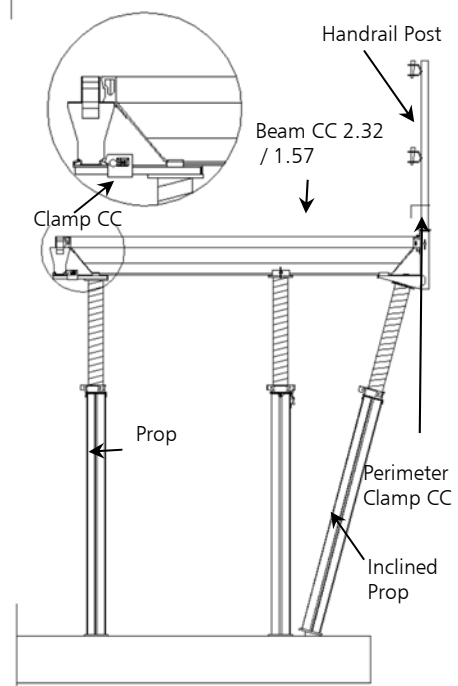
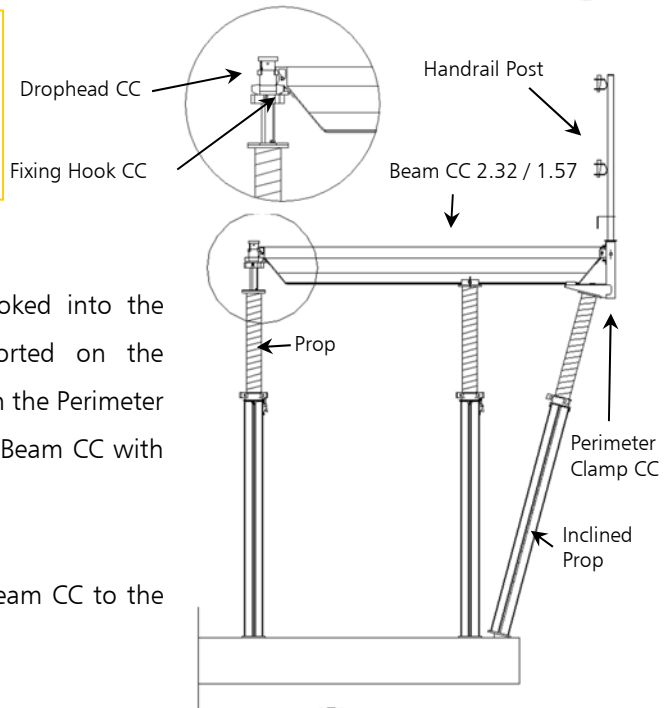
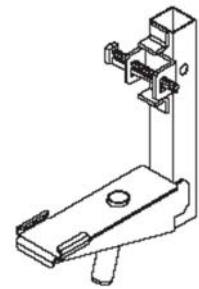
Perimeter Beams CC in perpendicular direction to the Beams CC

The Beam CC with Perimeter Clamp CC rests on a Beam CC of the last formwork line, and occasionally on a Drophead CC, on the reinforcement Prop and on the inclined Prop placed in the Perimeter Clamp CC. The fixing to avoid the overturning of the Beam CC with the Perimeter Clamp CC can be done by the:

- Clamp CC for the Beam-Beam joint and Fixing Hook CC for the Beam-Drophead joint.
- Tie Piece CC LD to fix the end of the Perimeter Beam CC to the slab by means of cables.



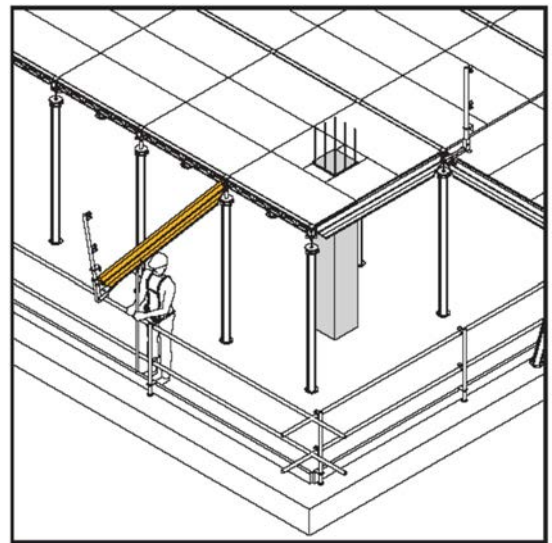
In both cases, the perimeter protection is done by placing the Handrail Post into the socket of the Perimeter Clamp CC and by the respective tubes and Toe Boards.



a) Assembly with Perimeter Clamp CC in direction of the Beams CC

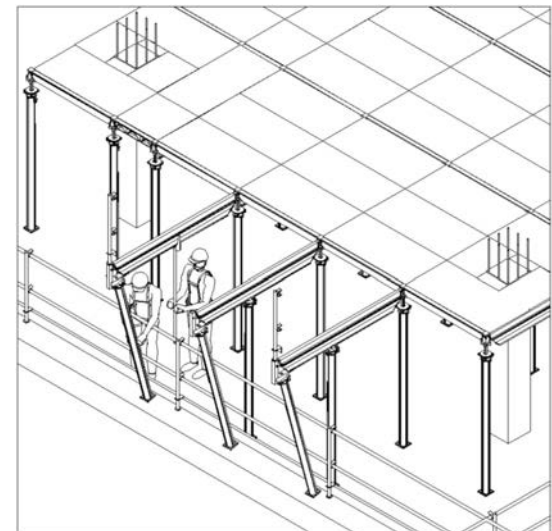
1. Placing of Perimeter Clamp CC

- Hook the Perimeter Beam CC into the Beam CC and insert the Handrail Post.
- Hook the whole set into the Drophead CC or on another Beam CC depending on the layout.
- Raise the whole set (Beam CC, Perimeter Clamp CC and Handrail Post).



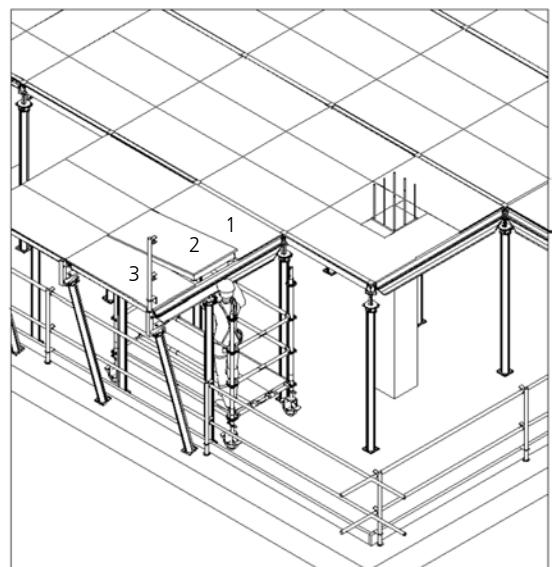
2. Placing of ties and levelling

- Place the Prop in the spigot of the Perimeter Clamp CC.
- Place the Clamp CC, if the Beam CC rests on another Beam CC, and the chamfer of the Clamp allows doing so. If not, use the Tie Piece CC LD and tie the whole set to the slab with cables.
- Where it is hooked into the Drophead, place the Fixing Hook CC.
- Place the next Beam.



3. Placing of Panels CC

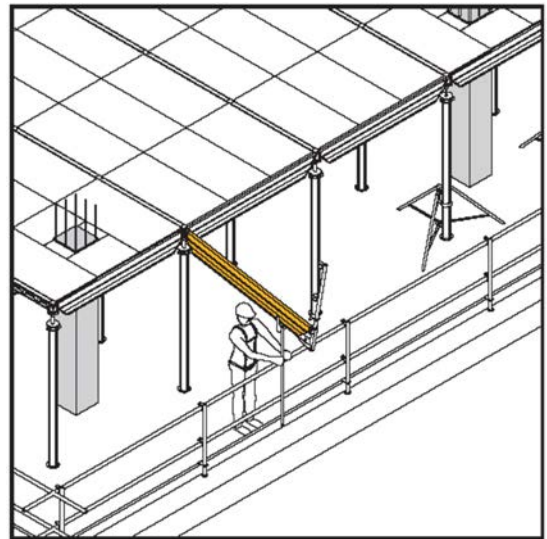
- Place the Panel CC no. 1.
- Place the Clamp CC on the second Beam.
- Level the system.
- Place the Panel CC no. 3 and slide it up to the end.
- Place the Panel CC no. 2.



b) Assembly with Perimeter Clamp CC in perpendicular direction to the Beams CC

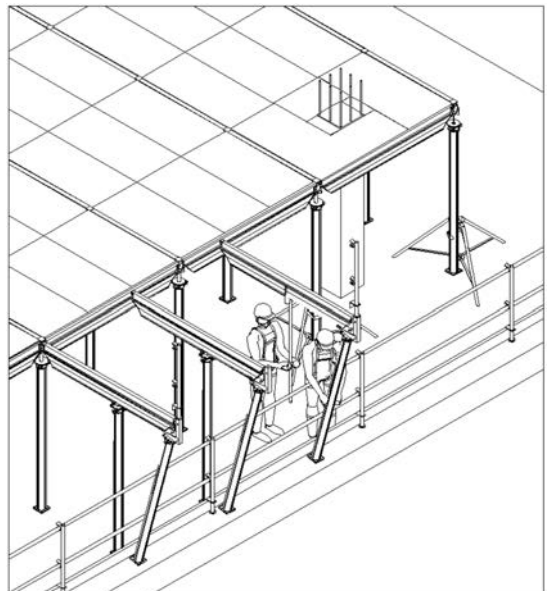
1. Placing of Perimeter Clamp CC

- Hook the Perimeter Clamp CC into the Beam CC and insert the Handrail Post.
- Hook the whole set into the Drophead CC or on another Beam CC depending on the layout.
- Raise the whole set (Beam CC, Perimeter Clamp CC and Handrail Post).



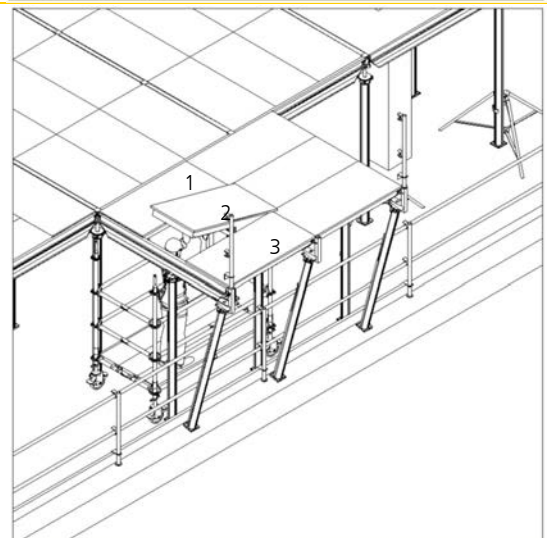
2. Placing of ties

- Place the Prop in the hook of the Perimeter Clamp CC.
 - Place the Clamp CC, if the Beam CC rests on another Beam CC, and the chamfer of the Clamp allows doing so.
- If not, use the Tie Piece CC LD and tie the whole set to the slab with cables.
- Where it is hooked into the Drophead, place the Fixing Hook CC. Place the next Beam.



3. Placing and levelling of Panels CC

- Place the Panel CC no. 1.
- Place the Clamp CC on the second Beam.
- Level the system.
- Place the Panel CC no. 3 and slide it up to the end.
- Place the Panel CC no. 2.

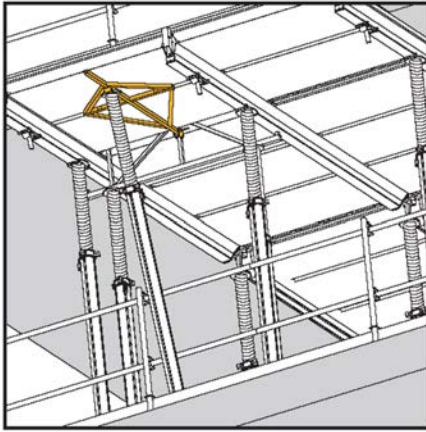


4.4.2. Perimeter Formwork Stripping

4.4.2.1. Stripping with Perimeter Beam CC

Perimeter stripping, parallel as well as perpendicular to the Beams CC

1. Placing of Stripping Tool

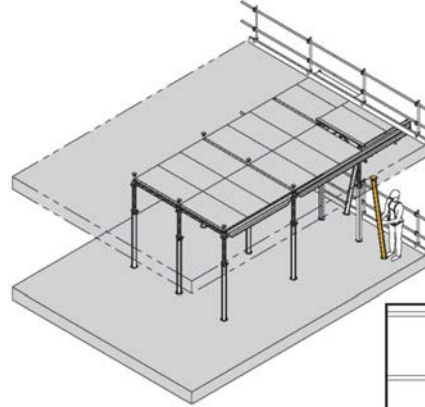


Remove the inclined Prop from the perimeter beam and shore the Supporting Frame CC, leaving it as remaining element.

Place the Striking Tool CC in the Supporting Frame CC and hook it into the Panel.

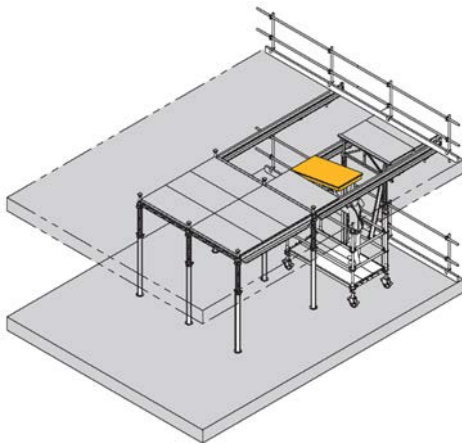
Put a Prop into the Striking Tool CC.

2. Release of Drophead CC wedge



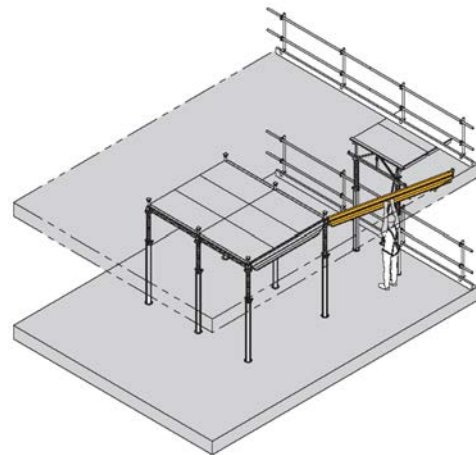
- Loosen the Props which sustain the Perimeter Beams.
- Release the Dropheads CC
- Remove the Props from the mobile spigot of the Perimeter Beams.
- The Perimeter Beam remains sustained by the Supporting Frames CC.

3. Recovery of some of the Panels CC



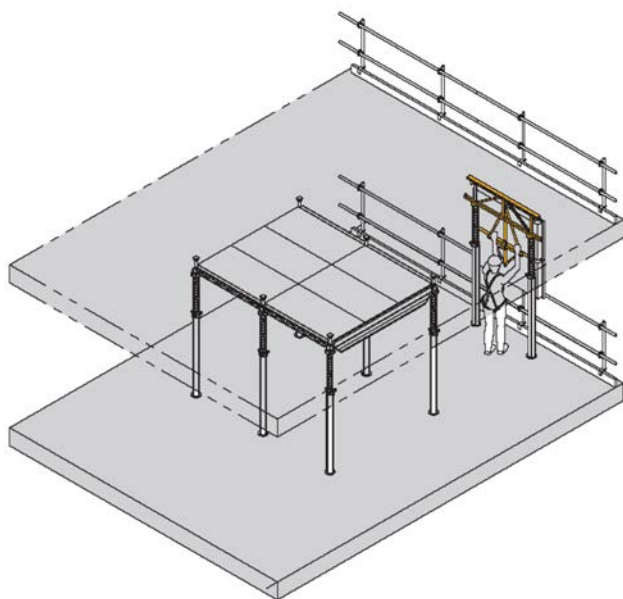
- In the grids with Supporting Frame CC, remove all Panels starting from the Supporting Frame CC towards the slab centre. In all other grids remove all Panels, maintaining the Fixing Hook CC and the Clamp CC.
- Slide the Panels CC no. 4 and no. 5 towards the grids where there are no Supporting Frames CC.

4. Recovery of ties and Perimeter Beams



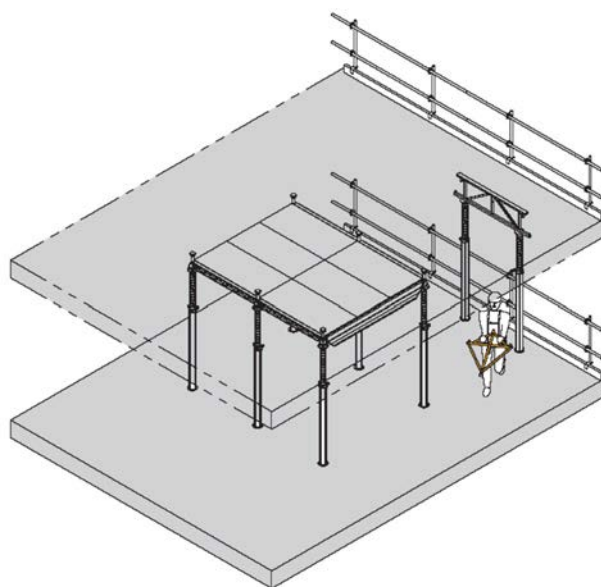
- Remove the Fixing Hook CC (from the Perimeter Beams in direction to the Beams CC) and the Clamp CC (from the Perimeter Beams perpendicular to the Beams CC). Remove the Perimeter Beams.

5. Turning of Striking Tool CC



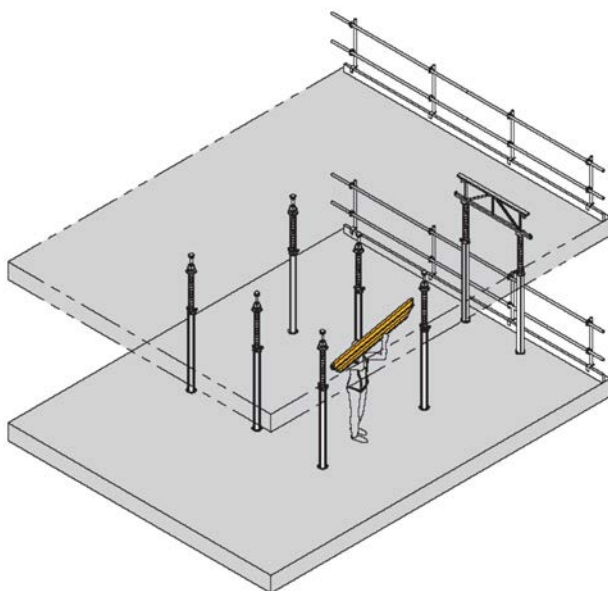
- Turn the Striking Tool CC and let the external Panels descend from the grid with Supporting Frame CC.

6. Recovery of Striking Tool CC



- Remove the panels from the Striking Tool CC as well as the actual tool, leaving the Supporting Frame CC as remaining element.

7. Recovery of Panels, Transversals and Beams CC



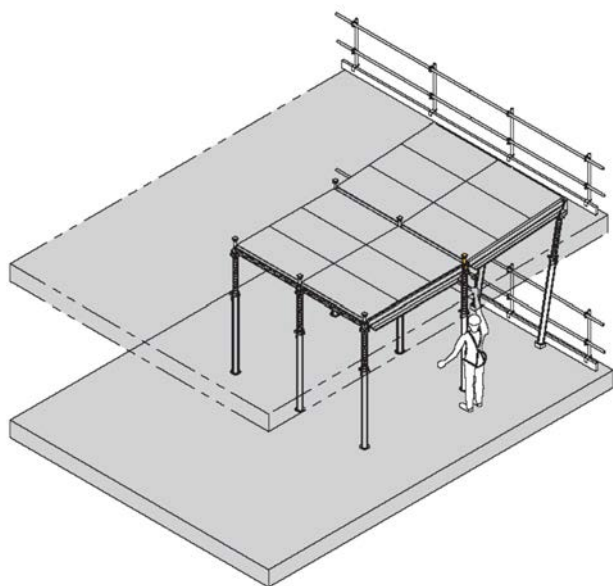
- Remove the Panels, Transversals and Beams CC, leaving the Dropheads and Props as remaining elements.

8. Recovery of the remaining material

Remove the remaining material when it is not needed any more to sustain the slab.

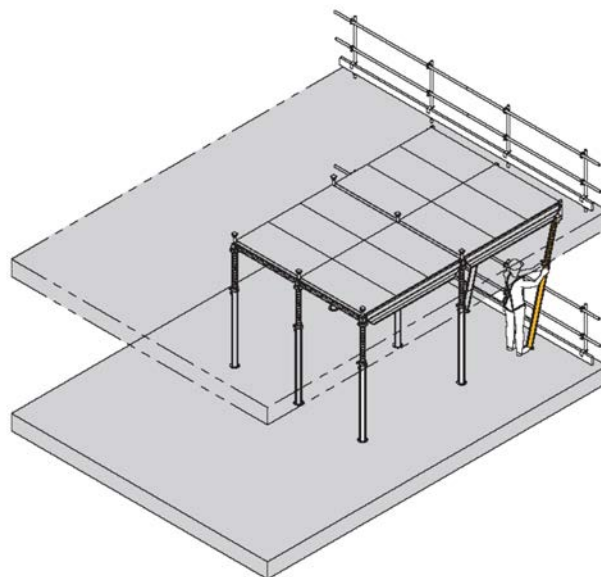
4.4.2.2. Perimeter stripping with Perimeter Clamp, parallel as well as perpendicular to the Beams CC.

1. Release of Drophead CC wedge



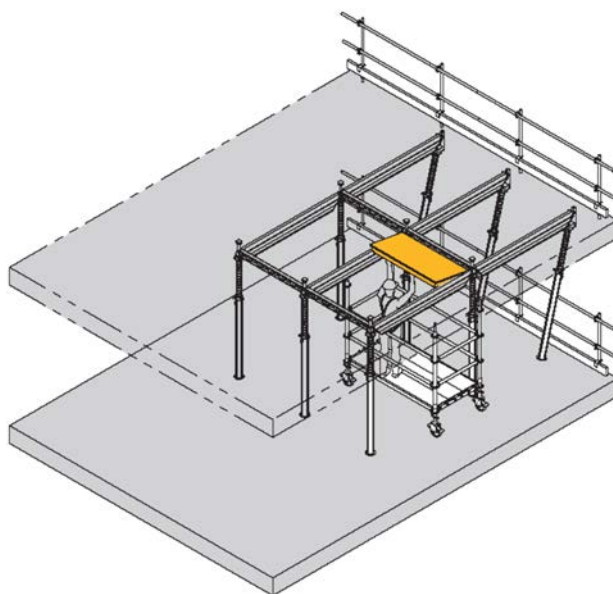
- Release the Dropheads row-wise.

2. Stripping of Beam CC



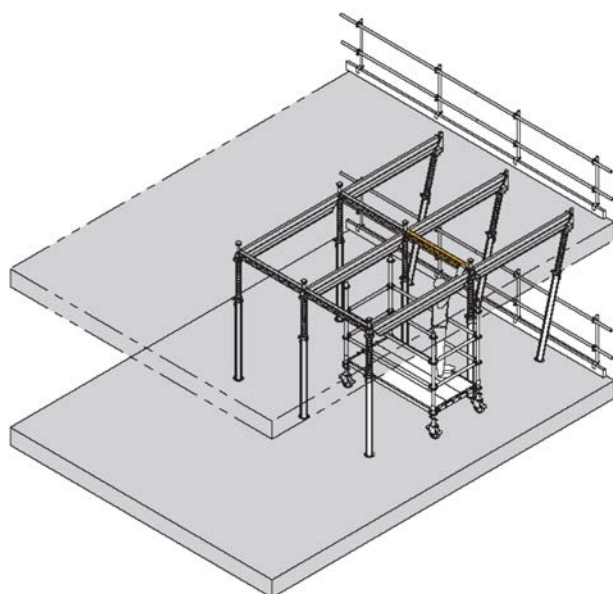
- Turn the nut of the inclined Prop until the Beam reaches a horizontal position.

3. Recovery of Panels CC



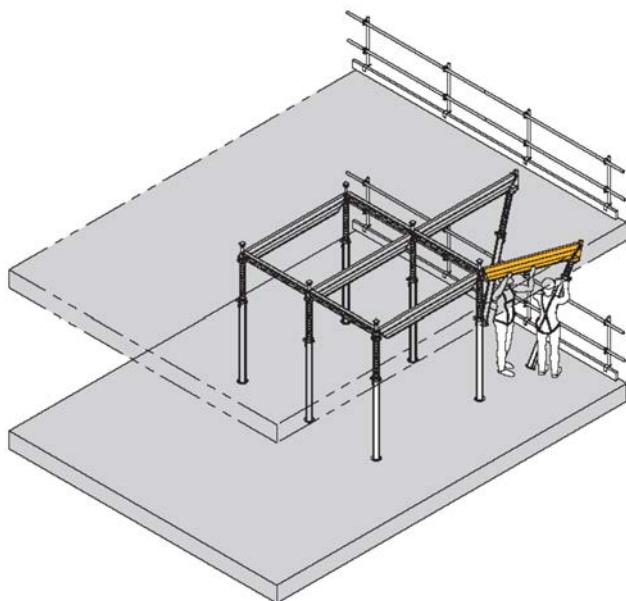
- Remove the Panels.

4. Recovery of ties



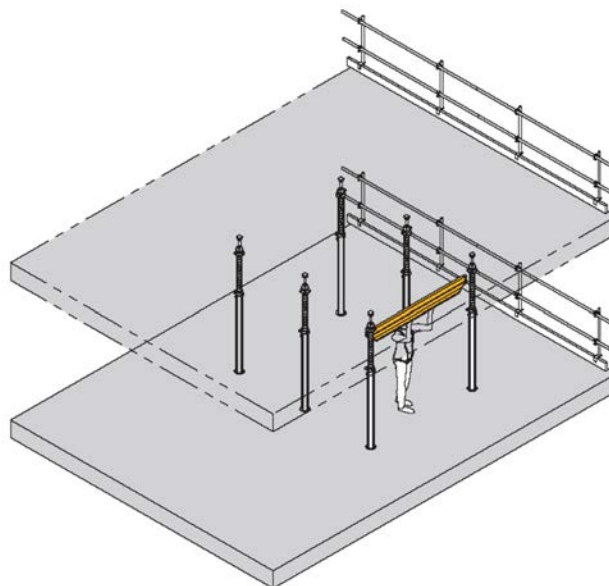
- Remove the Fixing Hook CC (when Beams are parallel to the Beams CC) and the Clamps CC (when Beams are perpendicular to the Beams CC).

5. Recovery of Beams



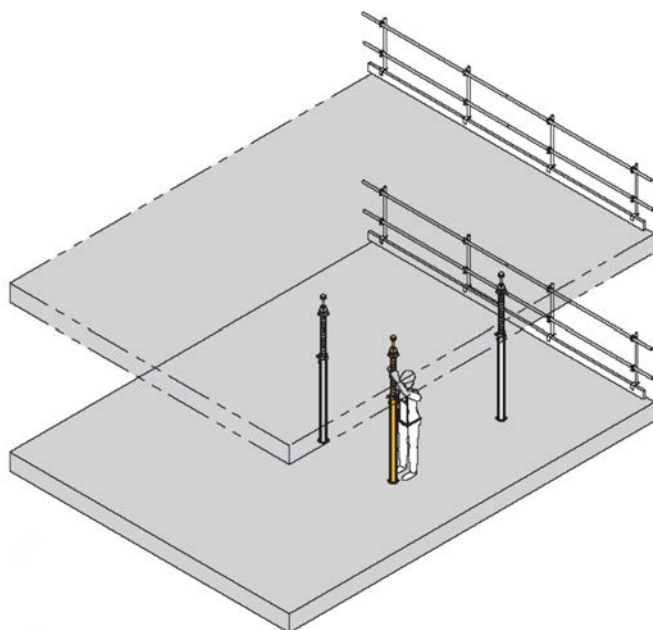
- Let the Beams descend assisted by the inclined Prop.

6. Recovery of Beams and Transversals



- Remove the Beams and Transversals.
- In the perimeter area, there is no remaining material left.
- Outside this area, Dropheads and Props remain.

7. Recovery of the remaining material



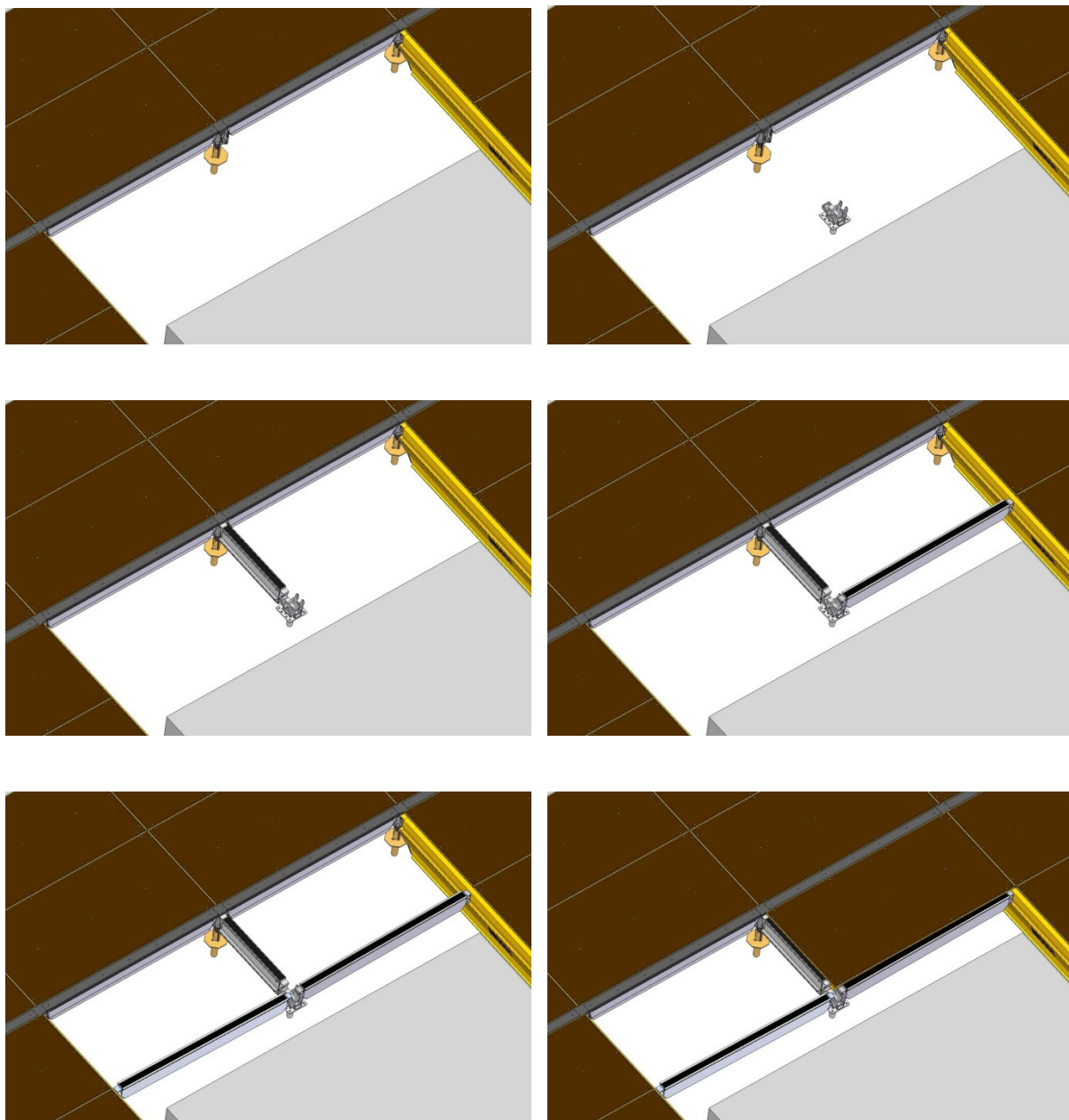
FORMWORK STRIKING: Depending on construction deadlines, formwork layout, slab thickness and free height, whenever the slab is able to bear the forces to which it is subjected, the shoring can be removed starting with the Props at the centre of the spans towards the columns.

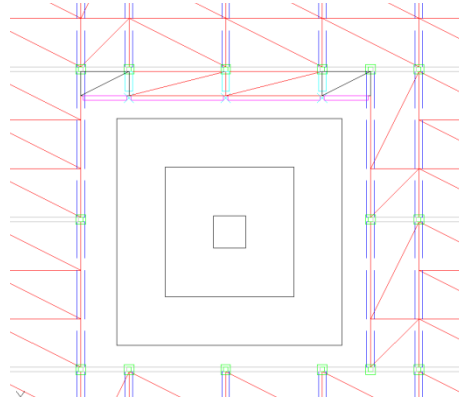
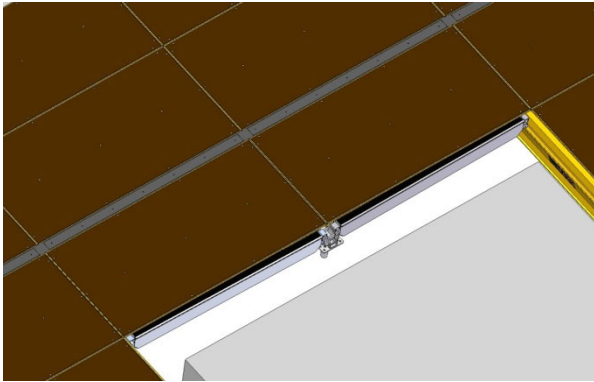
Remove the remaining material whenever the slab is ready to bear the loads.

4.5. APPROACHING IN DROP PANELS

To minimize the use of the infilling board in the perimeter zone of the drop panels (capitals) this solution of "Approaching in drop panels" is enclosed in this document.

The properly assembly procedure of this solution, which include the use of Universal CC Heads, Transversals CC TR, CCW Beams, Panels and Edge Beams, would be the following one:





4.6. RAMPS

This application is designed with the CC Head (1870060) as the main part. The inclination is achieved in one direction of the inclined ramp. The maximum inclinations that can be achieved for this solution are the following ones:

SUMMARY SLOPE SLAB SOLUTIONS:

Inclination until	Prop	CC Head
5°	All	Allowed turn for the maximum slope between head-prop
7,5°	EP except C25 and C+D30	
10°	AP	The looseness between head-prop does not allow it -> Tilt props

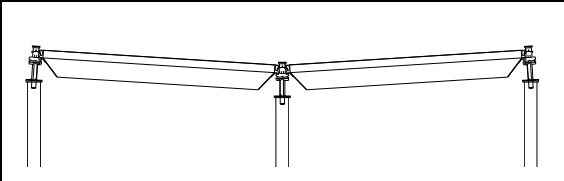
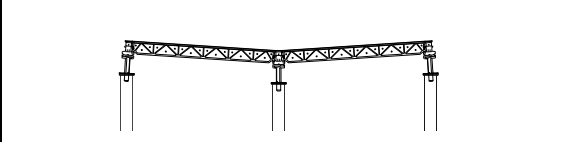
For more details please see the Project Design Guide of CC-4 System.

4.7. TWO WAY SLOPE SLABS: MOUNTAIN AND VALLEYS

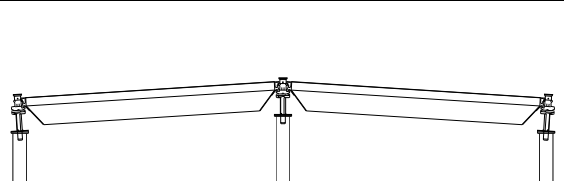
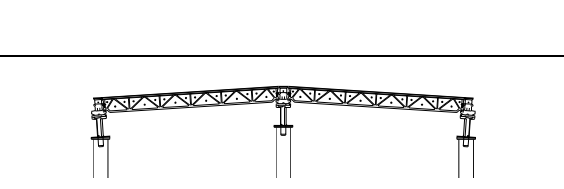
This application is designed with the Slope CC Head (1870440) as the main part. The inclinations are achieved in two directions of the slab. The maximum inclinations that can be achieved for this solution are the following ones:

SUMMARY OF CHANGING SLOPE SOLUTIONS:

▪ V Configuration:

			Maximum Inclination (°)	
			CC Head	Slope CC Head
	CC BEAM	AP	175	170
		EP	175	
	TRANSVERSAL CC TE/ TE ALU	AP	174	174
		EP	174	

▪ Reversed V (roofing) configuration:

			Maximum Inclination (°)	
			CC Head	Slope CC Head
	CC BEAM	AP	170	170
		EP (Rest)	170	
		C25 y C+D30	165	
	TRANSVERSAL CC TE/ TE ALU	AP	170	170
		EP	170	

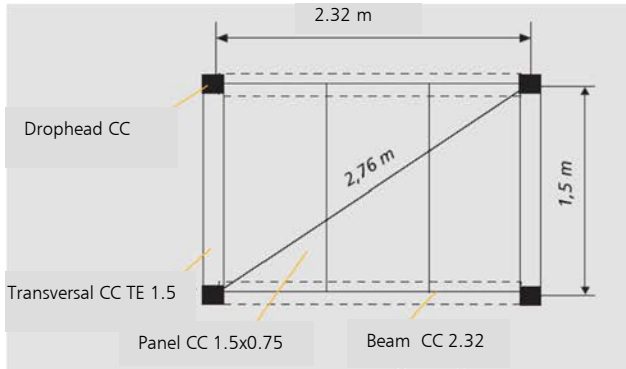
- Main advantages of configurations with Slope CC Head:
 - More stable solutions: Not inclined Heads. Safety. It is no needed to introduce the wood wedges.

For more details, please contact the technical department of ULMA.

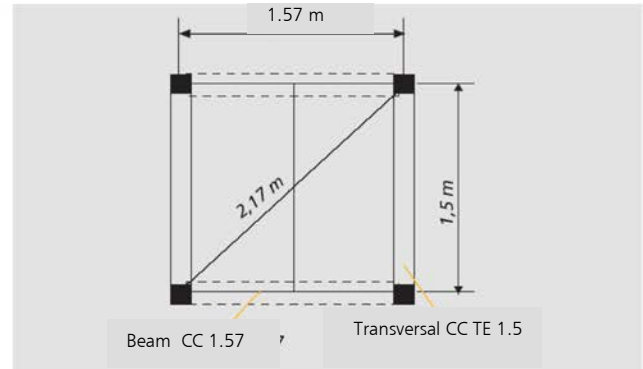
5. Features

5.1. GRIDS

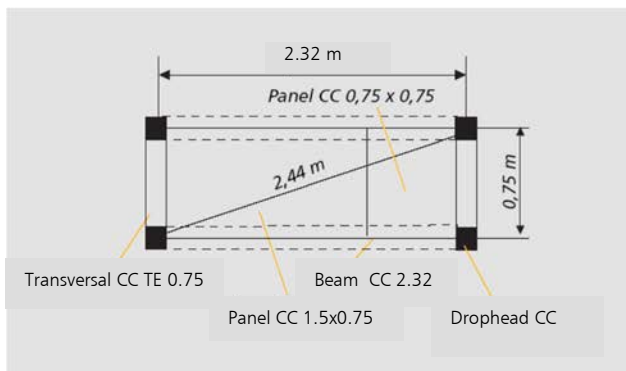
The following grid sizes can be assembled with the CC-4 Panel System:



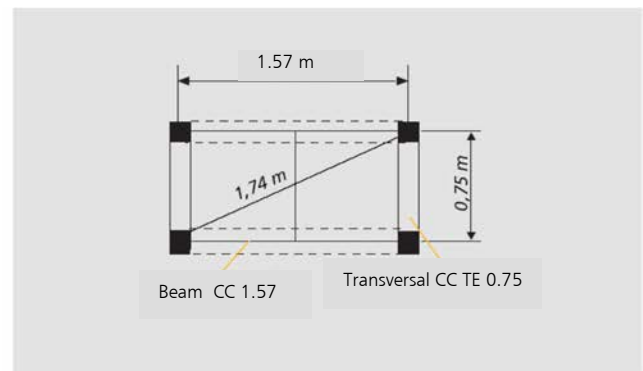
Grid 2.32x1.5



Grid 1.57x1.5



Grid 2.32x0.75



Grid 1.57x0.75

The maximum slab thickness which can be obtained with each grid depends on the dimensions of this grid and the required quality of the finishing. The sum of the corresponding deflections of the Beam and the Panel type used has to be less than the maximum deflection tolerance desired.

Additionally, the loads transmitted to each one of the parts must not exceed their working load. Finally, the shoring capacity has to be verified depending on the Prop type used and the free height.

FLATNESS TOLERANCES

The maximum flatness deflections for the surface type according to the DIN 18202 standard:

DISTANCE BETWEEN POINTS	GROUP 5	GROUP 6	GROUP 7
0.5 m	7	3	2
1 m	10	5	3
1.5 m	11	6	4
2 m	12	7	5

Maximum deflection (mm) according to DIN 18202

The deflections of the different Beams and Panels indicate the concrete finishing group which can be obtained for each slab thickness.

GROUP 5: Non surface-finished walls and unplastered ceilings.

GROUP 6: Surface-finished walls and unplastered ceilings.

GROUP 7: Same as group 6 but complying with more stringent requirements.

5.2. MAXIMUM SLAB THICKNESS

The following maximum slab thickness can be obtained with the different grids:

GRIDS (m)	MAXIMUM SLAB THICKNESS (cm)
2.32 x 1.5	40
1.57 x 1.5	60
2.32 x 0.75	90
1.57 x 0.75	90

Maximum slabs "CC-4 Panel"

5.3. LOADS TRANSFERRED TO THE PROP

The following table shows the loads transferred to the Props for each slab thickness and grid type. The calculation of these loads is based on the standard EN 12812:

Slab thickness (cm)	GRIDS			
	BEAM 2.32		BEAM 1.57	
	GRID 1.5 m	GRID 0.75m	GRID 1.5 m	GRID 0.75m
	PROP LOAD (kN)	PROP LOAD (kN)	PROP LOAD (kN)	PROP LOAD (kN)
5	9.60	4.80	6.50	3.20
10	13.90	7.00	9.40	4.70
15	18.30	9.10	12.40	6.20
20	22.60	11.30	15.30	7.70
25	27.00	13.50	18.30	9.10
30	31.30	15.70	21.20	10.60
35	36.10	18.10	24.40	12.20
40	40.90	20.40	27.70	13.80
45		22.80	30.90	15.50
50		25.20	34.10	17.10
55		27.60	37.40	18.70
60		30.00	40.60	20.30
65		32.40		21.90
70		34.80		23.60
75		37.00		25.00
80		39.20		26.50
85		41.30		28.00
90		43.50		29.40

To place a reinforcement of beams or grids, see the CC-4 Reinforced Manual.



Special attention has to be paid to the load borne by the remaining Prop when removing the additional Prop (reinforced prop or grid). It is necessary to verify this. *



The Props must be used correctly, i.e. respecting the load limits, plumbing them to the ground and with stable support.

5.4. WORKING LOADS - EP PROP WITH CC-4

The following table shows the working loads for the EP Props used with the CC-4 formwork system, according to the calculation by EN 1065.



Inner tube down, ALWAYS with the Drophead bolted to the Prop.

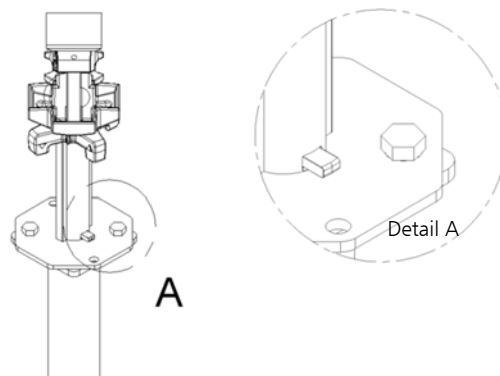


For more information, see User Guide EP Prop.

Shoring	EP C25		EP C+D30		EP C+D35		EP C+D40	
Inner tube	Up	Down	Up	Down	Up	Down	Up	Down
h (m)	1.48 m - 2.50 m		1.72 m - 3.00 m		1.98 m - 3.50 m		2.22 m - 4.00 m	
5								
4.9								
4.8								
4.7								
4.6								
4.5								
4.4								
4.3								
4.2								
4.1								
4							23.20	27.10
3.9							24.90	29.30
3.8							26.70	31.70
3.7							28.50	34.30
3.6							30.50	37.20
3.5					29.80	34.70	32.60	40.50
3.4					32.30	38.10	35.00	43.05
3.3					34.90	41.90	37.60	43.05
3.2					37.70	43.05	40.50	43.05
3.1					40.80	43.05	42.30	43.05
3			23.30	28.20	43.05	43.05	43.05	43.05
2.9			25.30	31.30	43.05	43.05	43.05	43.05
2.8			27.50	34.80	43.05	43.05	43.05	43.05
2.7			29.90	38.90	43.05	43.05	43.05	43.05
2.6			32.50	43.05	43.05	43.05	43.05	43.05
2.5	32.30	36.30	34.20	43.05	43.05	43.05	43.05	43.05
2.4	35.80	41.10	35.50	43.05	43.05	43.05	43.05	43.05
2.3	37.80	43.05	37.10	43.05	43.05	43.05	43.05	43.05
2.2	39.10	43.05	39.20	43.05	43.05	43.05		
2.1	40.20	43.05	42.20	43.05	43.05	43.05		
2	41.70	43.05	43.05	43.05	43.05	43.05		
1.9	43.05	43.05	43.05	43.05				
1.8	43.05	43.05	43.05	43.05				
1.7	43.05	43.05						
1.6	43.05	43.05						
1.5	43.05	43.05						

Shoring	EP C+D45		EP C+D50		EP C+E30		EP C+E40	
Inner tube	Up	Down	Up	Down	Up	Down	Up	Down
h (m)	2.48 m - 4.50 m		2.73 m - 5.00 m		1.72 m - 3.00 m		2.22 m - 4.00 m	
5			23.70	26.40				
4.9			25.10	28.40				
4.8			26.60	30.30				
4.7			28.10	32.20				
4.6			29.70	34.30				
4.5	28.90	32.60	31.40	36.60				
4.4	30.80	35.00	33.20	39.10				
4.3	32.80	37.60	35.20	41.90				
4.2	35.00	40.30	37.40	43.05				
4.1	37.20	43.05	39.80	43.05				
4	39.70	43.05	42.40	43.05			36.00	40.50
3.9	42.40	43.05	43.05	43.05			38.80	43.05
3.8	43.05	43.05	43.05	43.05			41.80	43.05
3.7	43.05	43.05	43.05	43.05			43.05	43.05
3.6	43.05	43.05	43.05	43.05			43.05	43.05
3.5	43.05	43.05	43.05	43.05			43.05	43.05
3.4	43.05	43.05	43.05	43.05			43.05	43.05
3.3	43.05	43.05	43.05	43.05			43.05	43.05
3.2	43.05	43.05	43.05	43.05			43.05	43.05
3.1	43.05	43.05	43.05	43.05			43.05	43.05
3	43.05	43.05	43.05	43.05	39.70	43.05	43.05	43.05
2.9	43.05	43.05	43.05	43.05	43.05	43.05	43.05	43.05
2.8	43.05	43.05	43.05	43.05	43.05	43.05	43.05	43.05
2.7	43.05	43.05			43.05	43.05	43.05	43.05
2.6	43.05	43.05			43.05	43.05	43.05	43.05
2.5	43.05	43.05			43.05	43.05	43.05	43.05
2.4					43.05	43.05	43.05	43.05
2.3					43.05	43.05	43.05	43.05
2.2					43.05	43.05		
2.1					43.05	43.05		
2					43.05	43.05		
1.9					43.05	43.05		
1.8					43.05	43.05		
1.7								
1.6								
1.5								


Whenever the EP Prop is used upside down, the Drophead needs to be bolted to the EP Prop: With Bolt M12x30 (9169600) and Nut M12 (9054900).




5.5. WORKING LOADS - ALUPROP WITH CC-4

The following table shows the working loads (kN) of the ALUPROP depending on the height. The most appropriate Prop for each case is chosen depending on the load to which it is subjected and the free height.

Shoring	ALUPROP 1.65-2.8		ALUPROP 2.2-3.7		ALUPROP 3.3-4.8		ALUPROP 4.5-6.0	
Inner tube	Up	Down	Up	Down	Up	Down	Up	Down
h (m)	1.65 m - 2.80 m		2.20 m - 3.70 m		3.30 m - 4.80 m		4.50 m - 6.00 m	
6							23.90	26.10
5.9							25.90	27.50
5.8							27.80	28.80
5.7							29.80	30.20
5.6							31.70	31.60
5.5							33.60	33.00
5.4							35.50	34.40
5.3							37.40	35.80
5.2							39.20	37.20
5.1							41.10	38.60
5							42.90	40.00
4.9							44.80	41.40
4.8					38.90	41.40	46.60	42.80
4.7					41.30	43.70	48.40	44.20
4.6					43.80	46.10	50.10	45.70
4.5					46.40	48.40	51.90	47.10
4.4					49.20	50.70		
4.3					52.10	53.00		
4.2					55.20	55.30		
4.1					58.40	57.60		
4					61.80	59.90		
3.9					65.30	62.20		
3.8					69.00	64.40		
3.7			55.70	61.80	72.80	66.70		
3.6			60.20	64.30	76.80	68.90		
3.5			64.80	66.90	80.90	71.20		
3.4			69.50	69.70	85.20	73.40		
3.3			74.30	72.60	89.60	75.70		
3.2			79.10	75.70				
3.1			84.10	79.00				
3			89.10	82.40				
2.9			94.20	86.00				
2.8	86.30	83.10	99.40	89.70				
2.7	92.40	87.40	104.70	93.60				
2.6	98.50	91.40	110.10	97.70				
2.5	104.40	94.80	115.50	101.90				
2.4	110.30	97.90	121.00	106.30				
2.3	116.10	100.50	126.70	110.80				
2.2	121.70	102.70	132.40	115.50				
2.1	127.30	104.40						
2	132.80	105.70						
1.9	138.20	106.60						
1.8	143.40	106.90						
1.7	148.60	106.90						
1.65	151.20	106.90						



For more information, see User's Guide ALUPROP.



The Props can be used both ways, with the inner tube up or down, but it has to be taken into account that the load bearing capacity is different in both cases.

6. Conditions of Use

6.1. GENERAL SAFETY ADVICES

- It is recommended to strictly follow the instructions of the project plan.
- The general instructions of the manufacturer must be followed.
- Internal safety standards must be fulfilled.

6.1.1. Personal and collective protective equipment

- The personal protective equipments should comprise at least protective helmet, safety footwear, protective gloves and tool holder belt. Additionally, it is useful to incorporate an anti-fall harness with lifeline.
- If necessary, goggles or protective masks, hearing protection, breathing masks, reflective jackets and any other required item to fulfil the health and safety guidelines on the building site should be used.
- The safety handrail, the mobile tower, the nets under formwork and the perimeter scaffolding are means of collective protection equipment.

6.1.2. General aspects

- Openings shall be protected by covers, handrails, nets or mesh to prevent falls from different level.
- Statutory handrails are provided with the lateral formwork or perimeter scaffolding.
- 15 cm Toe Boards are used with the handrails.
- Check the formwork parts and safety items. Replace them whenever necessary. Check:
 - That the parts have no dents which have diminished their section.

- That they are not bent.
- That their fixings are correctly working and efficient.
- For wood or plastic parts the following is to confirm:
 - That there are no dents, cracks or knot holes which might diminish their strength.
 - That they are correctly fixed to their supports.
 - Replace them whenever necessary.
- To access the formwork, statutory ladders, mobile towers or pedestrian bridges shall be used.
- Working on mobile scaffolding towers only when brakes put on. Do not move the towers while the worker is still standing on it.
- For the assembly and dismantling of the perimeter formwork, strictly obey the specific procedures.
- The working area is to be kept clean and tidy at all times. Leave the material organised and stacked. Do not leave the material untidily lying about on the formwork or on the ground.
- Do not leave any part half-assembled or half-dismantled.
- Once assembled, brace the structure correctly.
- Working with wind speeds of more than 60 km/h is strictly forbidden.
- 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.
- The statutory auxiliary equipment for lifting has to be appropriate to bear the loads to lift and must be checked before each use and discarded, if it is not working properly.
- Use adequate anchors for lifting as well as certified slings and lifting hooks.

- Slings attached to the material are to be fastened properly during shipment.
- No crossing below suspended loads, not even in the machinery working areas.
- Demarcate and prevent pedestrian traffic below the working areas.
- 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 signaller who is communicating with the crane operator by means of a previously agreed sign code.
- Use of tool holder belt with pockets for small parts.
- Release of Drophead with safety gloves only.
- Provide the team with mechanical means for lifting.
- Walk on marked areas only.
- Train manual handling of loads.
- When handling bulky parts, adopt comfortable and secure postures.
- The manual handling of loads should be done in good body postures.
- Once the erection is finished, the formwork assembly shall be checked.

6.1.3. Handling and maintenance conditions

- A safe erection of both the grid and the Panels or board is assured by using mobile towers, nets under formwork or lifelines.
- The Props shall be used correctly, i.e. respecting their load limits, plumbing them to the ground and with stable support.
- For the installation of the handrail at the basic grid, it is necessary to place the handrail support.

The socket comes incorporated in the perimeter solution.

- In perimeter areas, the parts which prevent from overturning, Fixing Hook CC and Clamp CC, must be placed.
- Every time a Beam CC is placed perpendicular to another, it is necessary to reinforce the perpendicular Beam CC with a Prop.
- The Panels CC and the Beams CC are delivered in specific pallets. The Dropheads and small accessories are delivered in boxes. Any other parts are delivered in standard pallets or metal boxes. The pallets and boxes are indispensable for the delivery to the building site as well as for material movements on site.
- To assure a proper assembly, the following is necessary to check between uses.
 - Clean Panel sides and contact areas.
 - Clean hooks and guide rails of the Beams.
 - Clean Beam and Transversal holders of Dropheads.
- The Panels are cleaned after each use with a cloth or a brush coated with some release agent. Wire brushes are not suitable for cleaning as they are damaging the fenolic film on the board.
- It is recommended to avoid nailing or screwing on the shuttering face of the Panels.



The formwork parts should not be thrown down to the ground during their assembly, handling and dismantling in order to avoid damages.

6.1.4. Concrete pouring

- Before pouring, the following must be checked:
 - The correct formwork erection according to the approved layout.
 - The correct fastening of the Dropheads.
 - Placing of reinforcement Props where required, e.g. for 90° assembly.
 - Formwork levelling.
 - The shuttering face is impregnated with release agent.
 - Eventually, Plastic Handrail Supports are placed along the perimeter of the freshly poured slab to later place the handrail post onto the slab.
- During vibration, the vibrator must not get in contact with the formwork, otherwise the calculated loads and live loads for the slab might be exceeded.
- Avoid improper material stocks as well as accumulations and abrupt concrete pouring.
- It is recommended to pour in layers in cases in which the maximum permissible thickness for the used grid might get exceeded.
- The sudden emptying of the concreting bucket on the formwork is to be avoided. Pouring has to be done from heights which do not cause strong shaking of the CC-4 formwork.
- The stripping is done when the concrete strength is sufficiently high.
- Before starting any dismantling operation, the state of the formwork has to be checked.
- The horizontal loads which the temporary construction equipment is able to bear are defined in the standard EN 12812:2004 *Falsework. Performance requirements and general design* (section 8.2.2.2), and are quantified as 1% of the

vertical loads, Q1 and Q2, being Q1 the permanent load and Q2 the variable vertical load.

In the same section, it is assumed that those loads are transmitted to the structure through formwork parts which attached to the structure restrict the horizontal movement of the formwork.

Additionally, the standard mentions in a note that this effect is due to actions such as those caused by pumped concrete pouring.

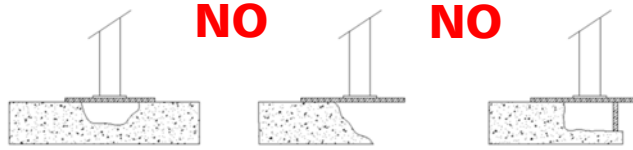
Therefore, the CC-4 formwork is designed to take into account the transmission of horizontal loads to its structure.

The horizontal load is transmitted from one part to another until it is absorbed by a rigid part of the concrete structure, such as a column, a wall, etc. In the case that there are no fixed points in the structure where to tie to, it is necessary to use a self-standing shoring with its required fixations.

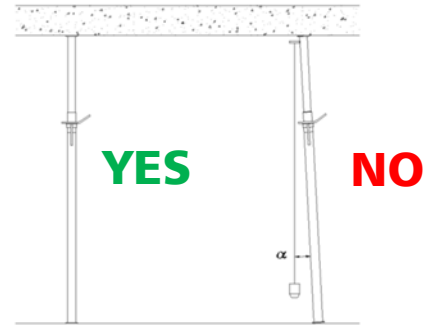
6.1.5. Safety instructions



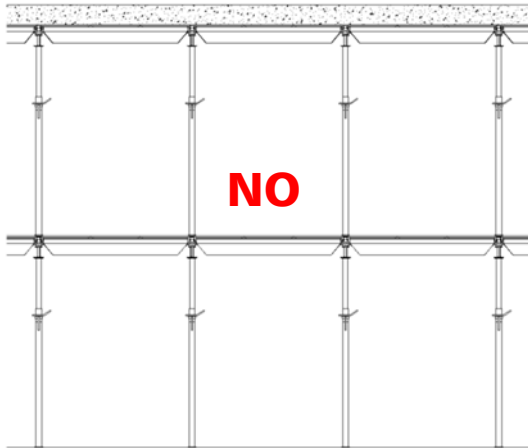
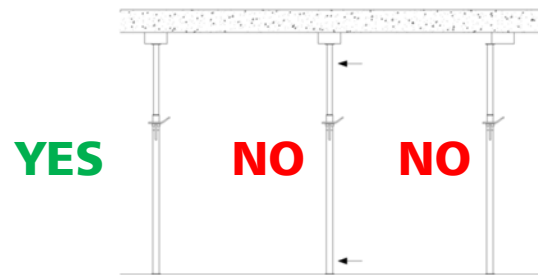
The Prop's base support should be horizontal, solid and able to evenly distribute the maximum imposed loads



The Prop must be plumb.



The application of the load imposed on the Prop must be vertical and centred. The formwork must be correctly restrained against lateral movement.



Double layering of decks is not permitted. The Props must be used between support and load. Do not put a Prop directly on top of another, as it might cause the collapse of the structure due to effective loss of load bearing capacity.



Do not dismantle the Prop nor replace Prop parts by others strange to the product.



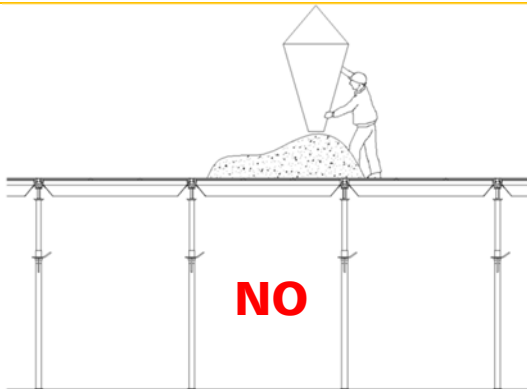
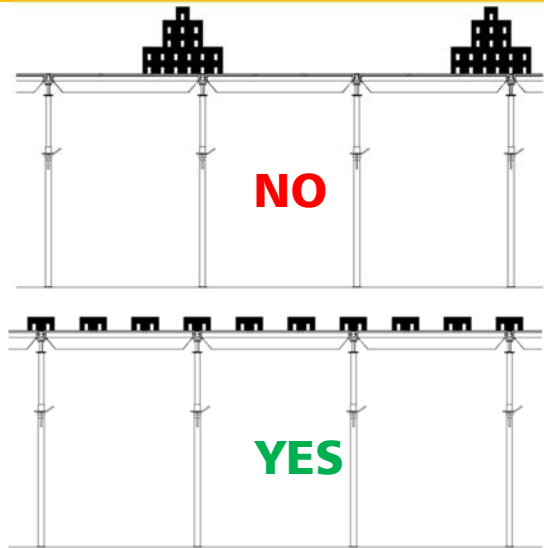
Do not hit the Prop base to strip the formwork.

Additional to this safety notices, it is advised to take preventive measures such as:

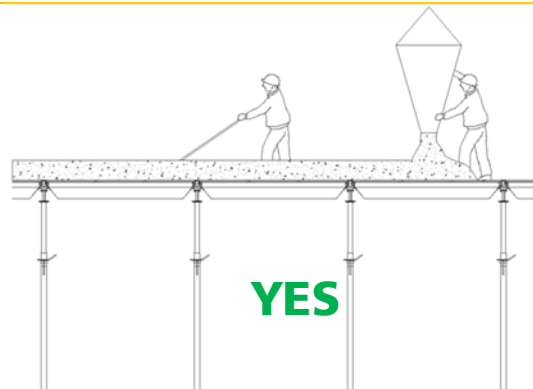
- Do not use damaged Props, with torn holes or weldings, nor with signs of deep corrosion.
- Do not overlap nor add or weld strange parts to the Prop to extend it.



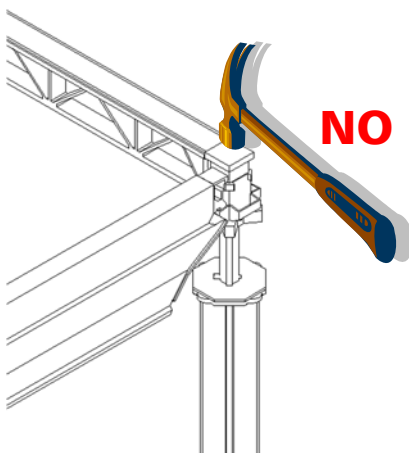
Do not stock material/equipment on the formwork/deck generating point loads; use load distribution boards or dunnage whenever possible. Always assure uniform load distribution.



Place the concrete in layers of uniform thickness and vibrate continuously to prevent piling.



Do not leave objects fall on, nor jump on the formwork panels.



Do not strike the beam CC hooks aswell the drophead supports during system assembly or stripping.

6.2. STORAGE

When placing pallets of CC-4 panels, beams and system accessories on top of the formwork, place planks or dunnage under the pallets to distribute imposed loads.

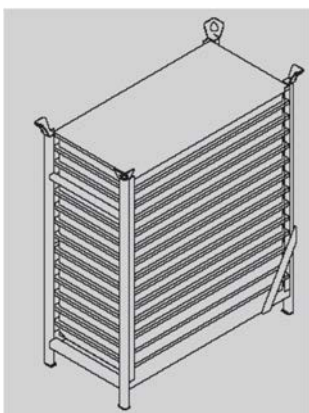
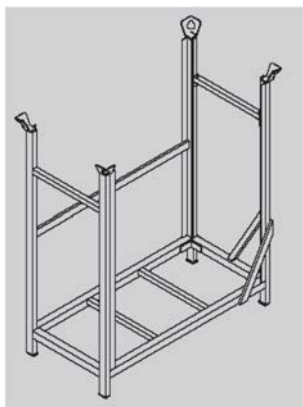
6.2.1. Panel Pallet CC

The Panels CC should be stacked in the Panel Pallet CC.

The Pallet can accommodate:

- 14 Panels CC 1.5 x 0.75
- 28 Panels CC 0.75 x 0.75
- 28 Panels CC 1.5 x 0.375

It can be moved by crane or forklift and piled up to the height of two pallets. It facilitates the beams' delivery and transport on the building site as well as their erection and later dismantling.

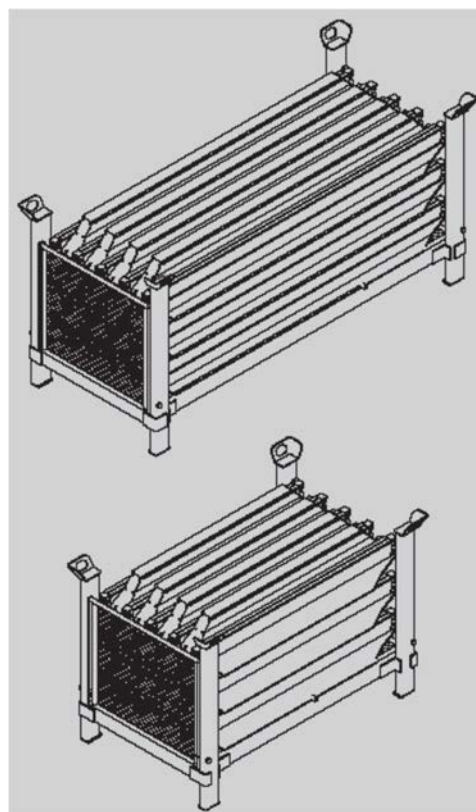


6.2.2. Beam Pallet CC

As for the Panels, the transportation of the Beams CC requires a particular pallet to reduce the risk of their damage as well as to prevent them from sliding and falling.

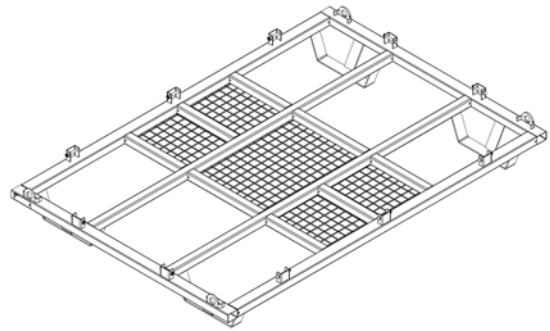
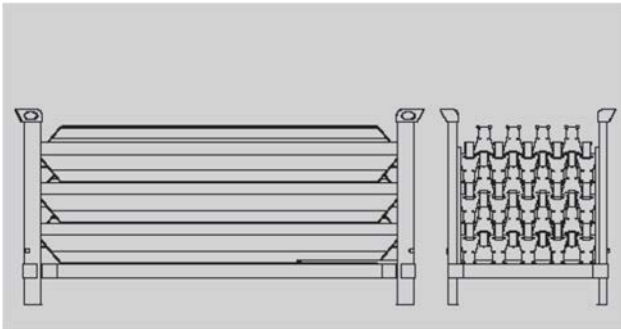
It can be moved by crane or forklift and piled up to the height of three pallets. It facilitates the beams' delivery and transport on the building site as well as their erection and posterior dismantling.

There are two pallet sizes available according to the two Beam CC sizes.



Both pallet sizes have a folding door on each side, which prevents the Beams from slipping sideways out of the Pallet. At the same time, the doors ease the filling and emptying of the pallet.

In both pallets 27 Beams CC can be piled. To achieve this number, special attention should be paid to the Beams' distribution in the pallet.



6.2.3. Maxi Pallet CC Panels

The MAXI PALLET CC PANELS is used for stacking CC-4 panels:

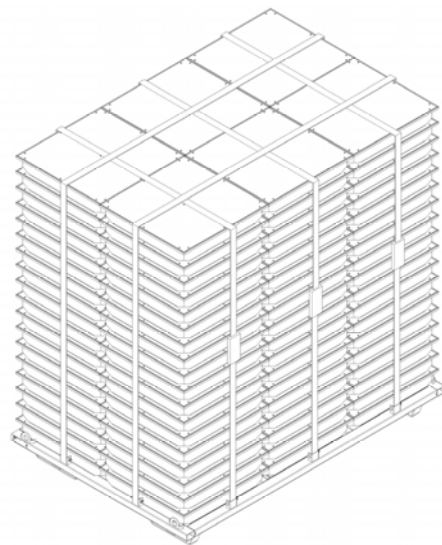
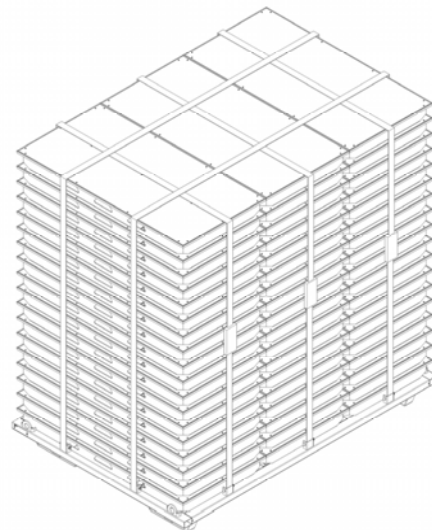
- 1.5x0.75 Panels: 54 panels in 3 columns of 18 units.
- 0.75x0.75 Panels: 108 panels in 3 columns of 36 units.

For stacking panels, the pallet incorporates five tie slings that allows to clamp the panels on all 4 sides of the pallet.

The pallet incorporates 4 lifting eyes to lift the panels (chain maximum load of 500 Kg.).

Each Maxi Pallet CC can be optionally supplied with 2 pc. 1870285, Steel Sling Maxi Pallet, which are fixed to the mentioned lifting eyes.

For more information see the Instructions for use of Maxi Pallet CC.

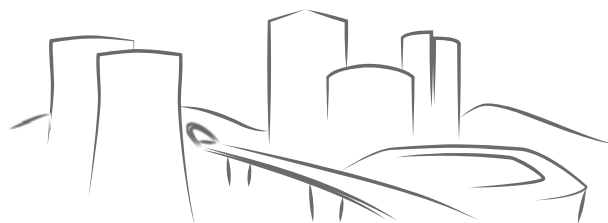


7. Legal references

- 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 EU 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)

Standards:

- **EN 13374:2013** Temporary edge protection systems. Product specification, test methods
- **EN 12812:2008** Falsework. Performance requirements and general design. German version EN 12812:2008.
- **EN 1065:98** Adjustable telescopic steel props - Product specifications, design and assessment by calculation and tests; German version EN 1065:1998
- **DIN 18202:86** Tolerances in building construction - Structures
- **EN 74-2** Couplers, spigot pins and baseplates for use in falsework and scaffolds - Part 2: Special couplers - Requirements and test procedures; German version EN 74-2:2008



From the beginning of your projects



ULMA C y E, S. Coop.
Ps. Otadui, 3 - P.O.Box 13
20560 Oñati, Spain
T. +34 943 034 90
F. +34 943 034 92

07E080ENM

►► www.ulmaconstruction.com