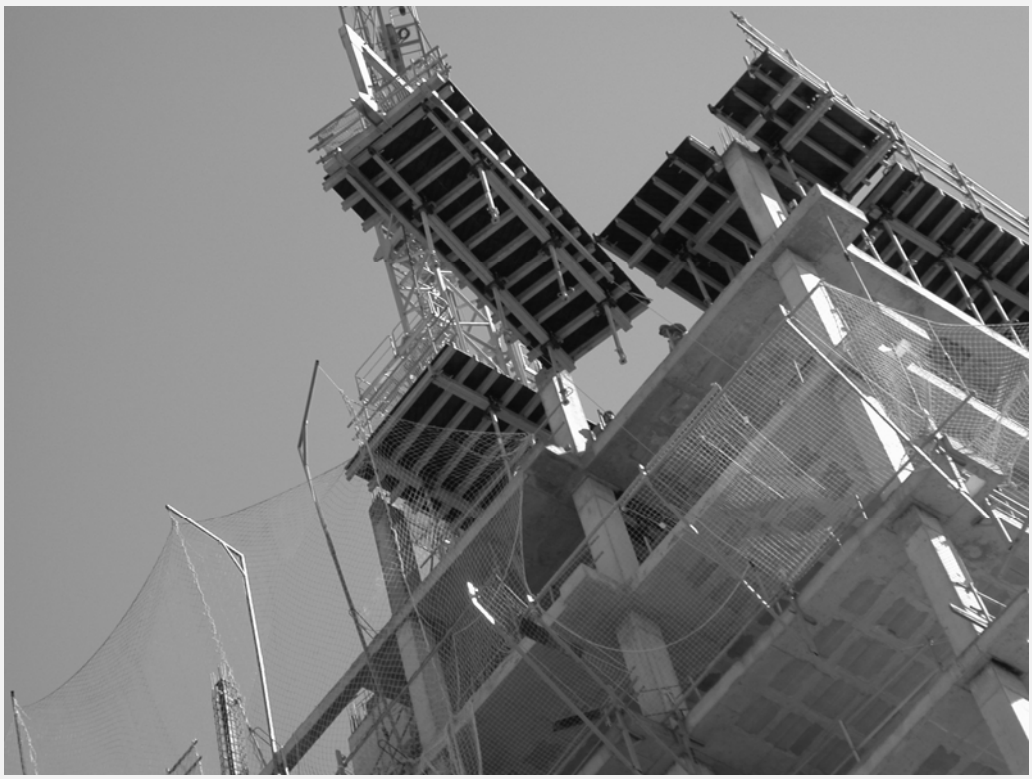
User's Guide

VR TABLES

E02FCK



ULMA

Construcción

IMPORTANT:

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

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

All of the indications regarding safety and operations contained in this documents, and the data on stress and loads should be respected. ULMA Construcción'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 items produced by our company only. Combining such equipment with other brands is not only dangerous without having made all corresponding verifications, it also voids any 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

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1. Product description

1.1. VR TABLES SYSTEM

Horizontal Slab formwork especially suitable for projects with:

- High number of repetitions.
- Large slab areas.
- Slab and columns repetitions on successive storeys.
- Sufficiently open façade.
- High performance requirements.
- High labour costs markets.
- High slab concrete surface requirement.

Safe and fast shifting system, that makes save time and money.

Only one table assembly and dismantling process during the whole jobsite.

High rotation jobsite planning improves formwork efficiency.

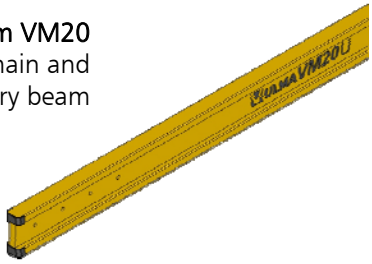
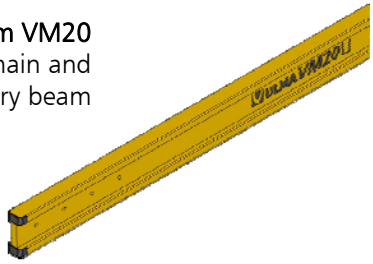
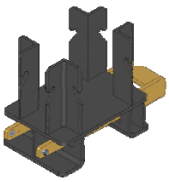
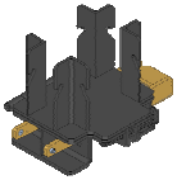
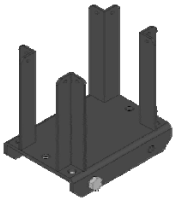
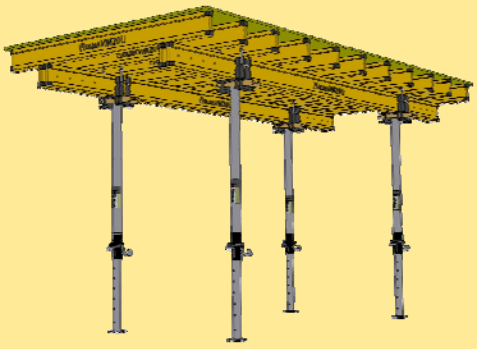
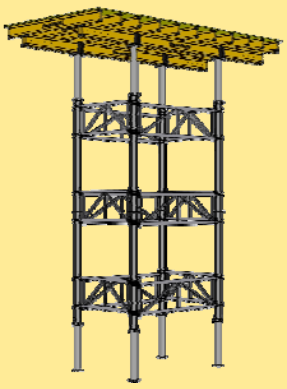
Safety elements incorporated in the tables, e.g. handrails and anchoring systems.

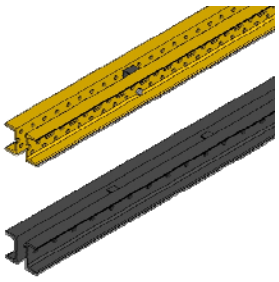
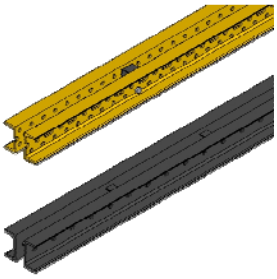
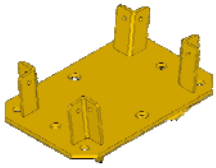
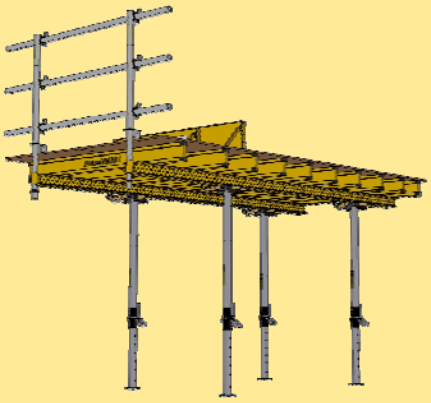
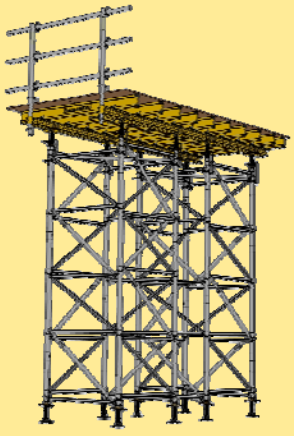
Easy to combine with other ULMA products, like ENKOFLEX and CC-4.

World Conference Center, Bonn (Germany).

1.2. SAME SYSTEM; DIFFERENT TABLES

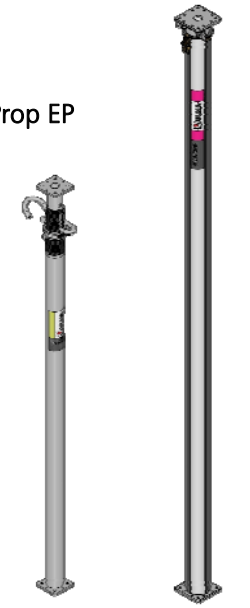
Few components for many different solutions.

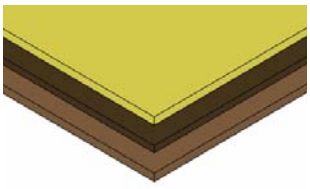
Horizontal slab formwork		
BEAMS	Timber Beam VM20 As main and secondary beam 	Timber Beam VM20 As main and secondary beam 
HEADS	 Head VR (2211012) Swivel Head VR (2211080) 	 Aluprop Head (2211095)
SUPPORTS	Props EP ALUPROP	ALUPROP Tower
BOARDS	3-layer sheet Phenolic plywood	3-layer sheet Phenolic plywood
TABLES VR		

Waler MK-120 Waler DU-120 As main beam 	Waler MK-120 Waler DU-120 As main beam 
 Head Waler VR (2211330) Latch VR (2211370) 	 Two-Way U-Head VM-DU (1906880)
Prop EP ALUPROP	T-60 Shoring
3-layer sheet Phenolic plywood	3-layer sheet Phenolic plywood
	

ALUPROP

Prop EP

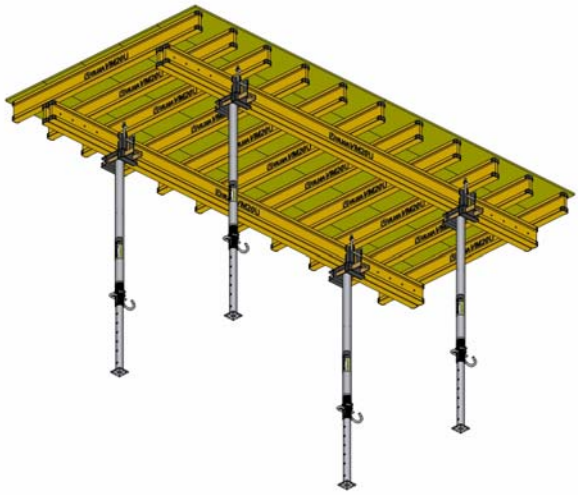




Shuttering surface

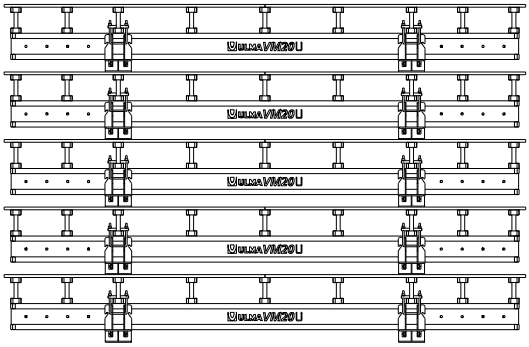
1.2.1. VR Table with timber beam VM20 as main beam.

Light, flexible and cost-effective system



VR Table with VM20 uses beams standard components:

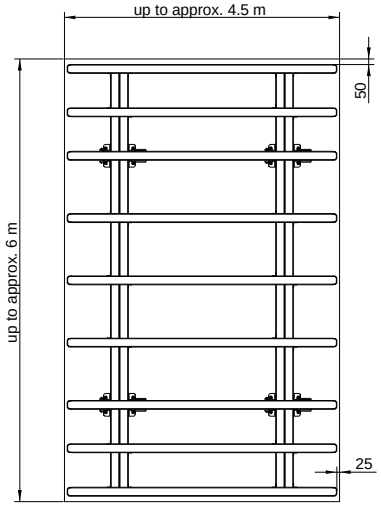
- VM20 as main and secondary beam.
- EP props supporting the horizontal structure.
- 3-layer sheet as shuttering surface.



Compact modules allow good stacking and transporting. Light design makes them easy to transfer and elevate in the jobsite.

Standard tables:

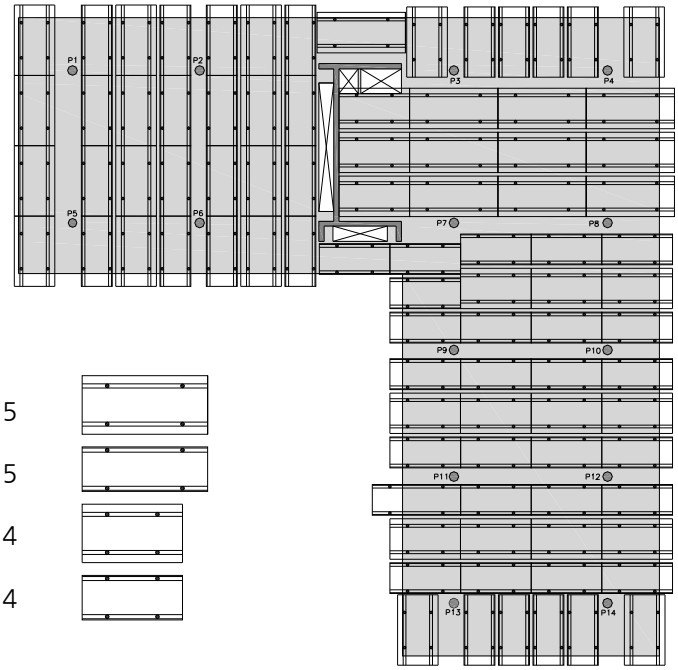
- Suitable system for rental market.
- Cost-effective especially for few number of uses (see 4.1).



Standard VR table with VM20

Hospital, Wüzburg (Germany)

Different standard VR Table modules are easy to combine, covering efficiently the required areas.



Standard VR Table:

T 2.5 x 5

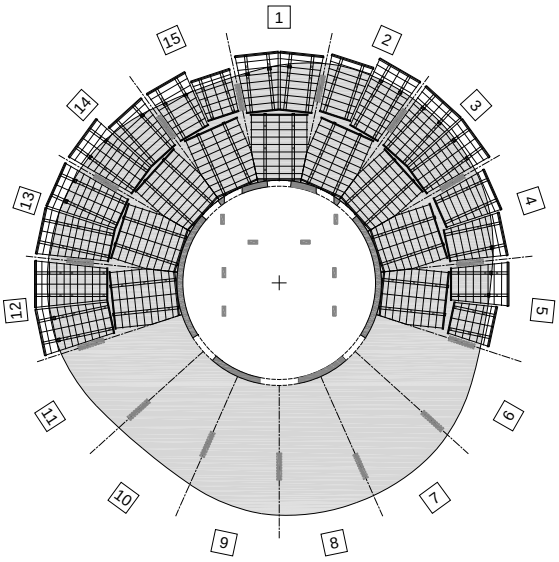
T 2.0 x 5

T 2.5 x 4

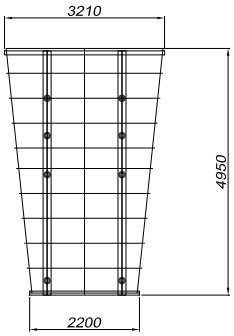
T 2.0 x 4

FIRA Hotel, Barcelona (Spain).

Special sizes are also possible under request. They provide an optimised solution minimising infilling areas.



Example:
Table type 1

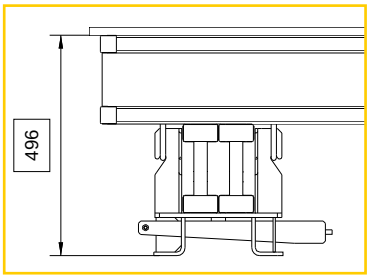


1.2.1.1. HEAD VR AND SWIVEL HEAD VR:

Heads for VR Table with VM20 as main beam:

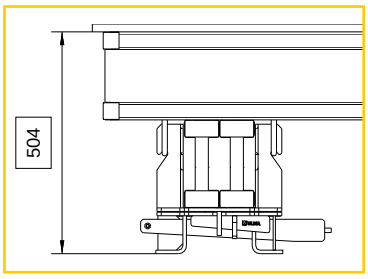
- Connect the horizontal shuttering structure and the props.
- Provide a stiff connection between timber beams and props.

Wedge type connection makes props fast and easy to fix and remove.

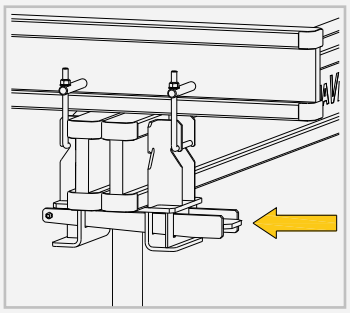


With Head VR (2211012)

The reduced overall height of the Table minimises the storage and transporting volume.

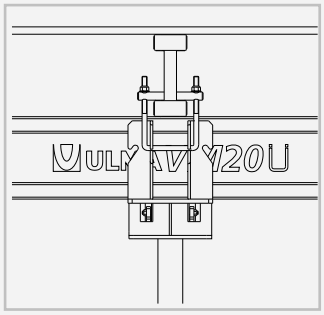


With Swivel Head VR (2211080)

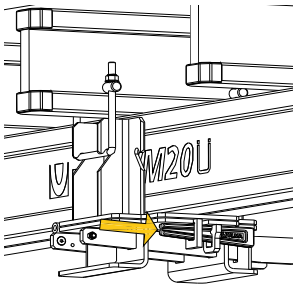


Head VR assembly

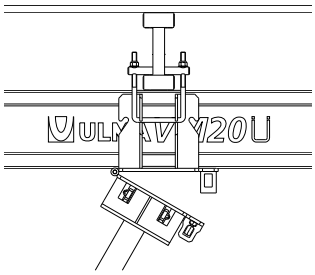
When props don't need to be folded, Head VR is the right choice.



Head VR

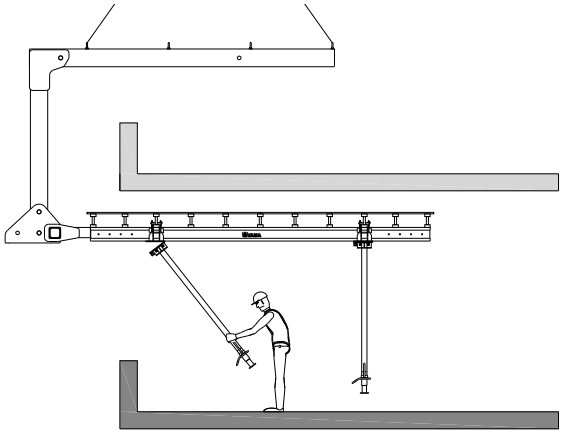


Release the wedge



Fold the prop

If prop folding is required, Swivel head VR is necessary.

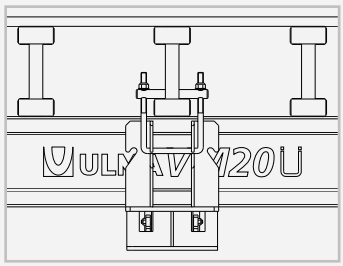


VR Table shifting with Hook VR.

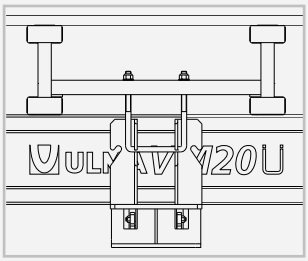
Overcoming or hanging beams when moving tables are easy with swivel Head VR.

All props must fold up in the same direction to avoid interferences.

Easy to optimise props distribution thanks to head fixing options:

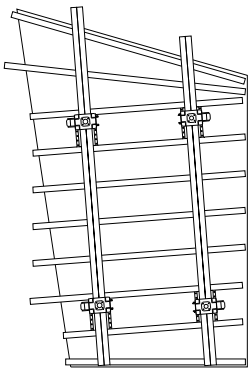


Head under drilled secondary beam with Narrow connection unit (2211008)



Head supported between 2 secondary beams with Frame Head VR (2211061)

Non-parallel main or secondary beam table configurations are possible.



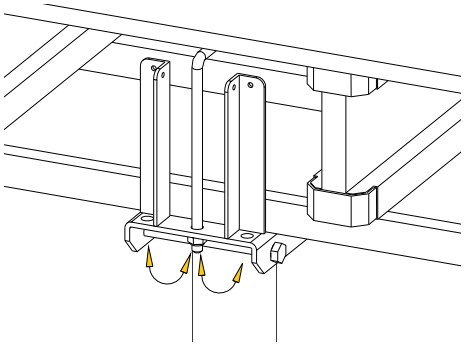
VR Table with non-parallel secondary beams

1.2.1.2. ALUPROP HEAD

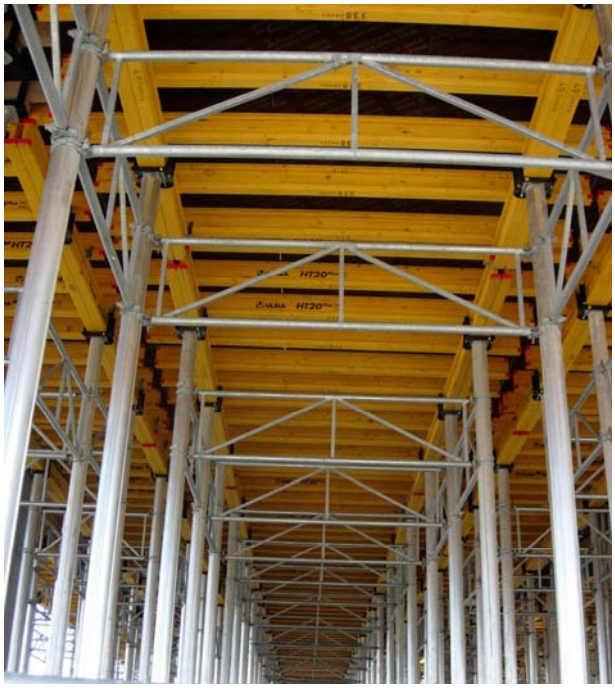
Head for VR Table with VM20 as main beam:

- Connect the horizontal shuttering structure and the ALUPROP Towers.
- Taller Tables can be erected with this head.

- Fast and simple connection between tower and VM20 Timber Beams.
- Rod thread's different positions avoid interferences with secondary Beam.



Rod thread connection.



VR Table with Aluprop Head

ALUPROP is designed to be used one on top of another, therefore reaching bigger heights.

ALUPROP Towers may always be braced with:

- Bracing frames.
- Fix or swivel bracing hooks with tubes.

For further information see ALUPROP User's Guide.

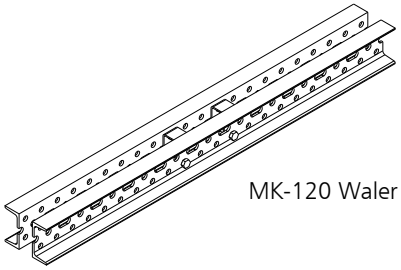
1.2.2. VR Table with Waler as main beam:

Customised solution system

Appropriate system for special site tables thanks to:

- Customised slab edge tables.
- Hanging beams solutions.
- High load-bearing table for thicker slabs.
- Large and rentable VR Tables.

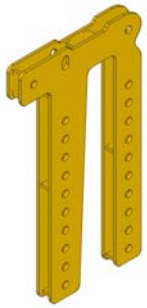
MK-120 Waler provides ULMA standard profile solution.



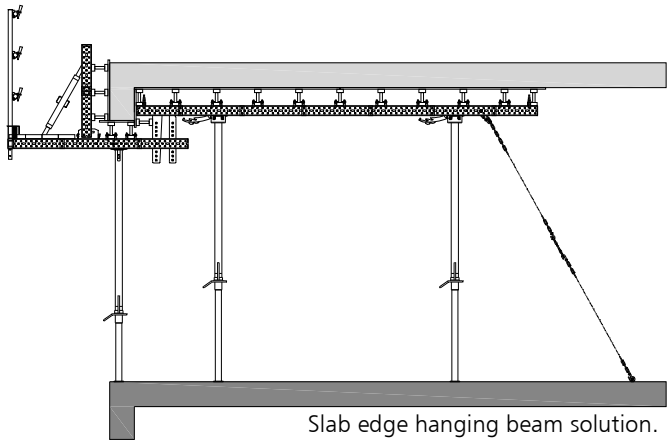
MK-120 Waler profile.

Large numbers of elements are available for VR Table with Waler:

- MK standard elements: connectors, push-pull props,…
- VR Table with Waler standard solutions: Head Waler VR, Hanging beam plate 60,…



Hanging beam plate 60.



Slab edge hanging beam solution.

Special table sizes and shapes minimise infilling areas and are highly adaptable to geometrical and structural constraints.

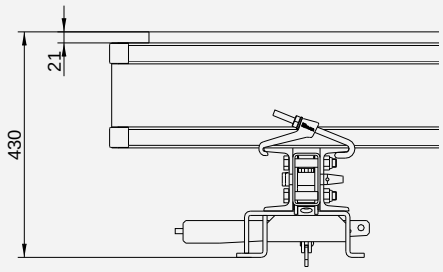
Standard tables are also available with Table VR Waler system (check your local ULMA branch standard sizes).

NOTE: VR Table with MK-120 Waler as main beam is totally compatible with DU-120 waler.

1.2.2.1. HEAD WALER VR AND LATCH VR

Head for VR Table with Waler as main beam:

- Connect the horizontal shuttering structure and the props.
- Latch VR converts Head into Swivel Head.



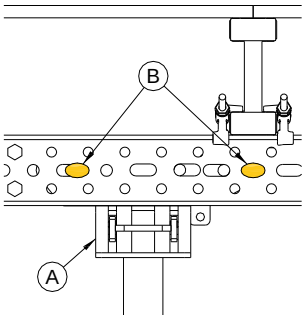
Head Waler VR.

The overall height of the table is minimised with the Head Waler VR.

Wedge type connection makes props fast and easy to fix and remove.

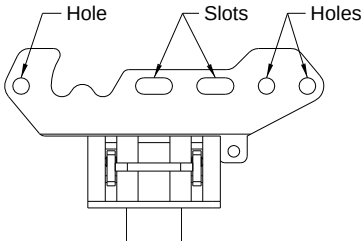
<u>Same Head, two different solutions</u>:

<u>OPTION 1</u>: Fixed Head Waler VR

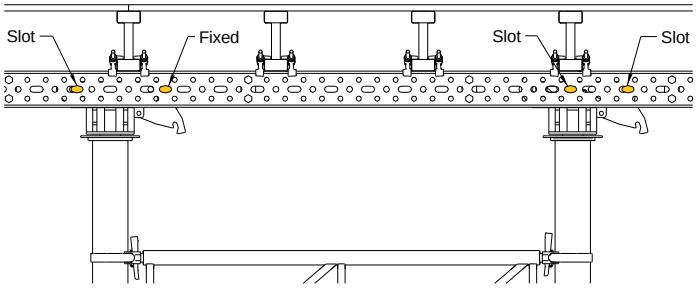


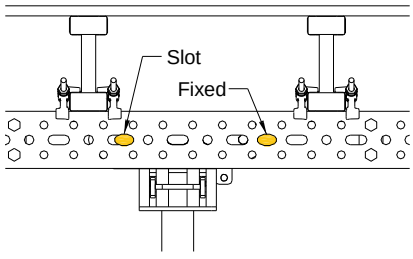
	QUANTITY	NAME	ITEM No.
A	1	HEAD WALER VR	2211310
B	2	PIN E20x70	0252070

Multi-fixing position head thanks to drilled plates.



For ALUPROP Towers at least one fixed connection (one pin through two holes) is required.



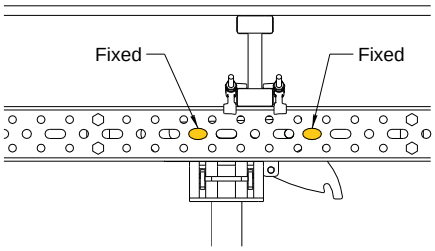


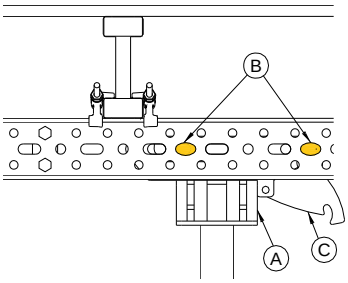
For single props also one fixed connection per prop is required (one pin through two holes).

OPTION 2: Swivel Head Waler VR.

Working position:

The latch VR locks the prop perpendicular to the main beam.

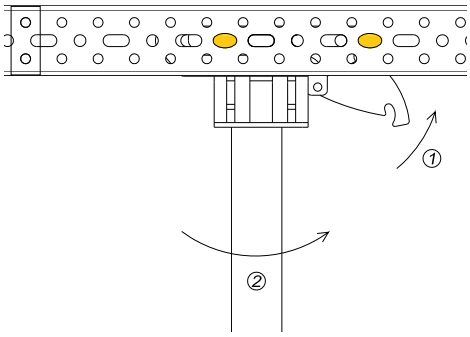




	QUANTITY	NAME	ITEM No.
A	1	HEAD WALER VR	2211310
B	2	PIN E20x70	0252070
C	1	LATCH VR	2211370

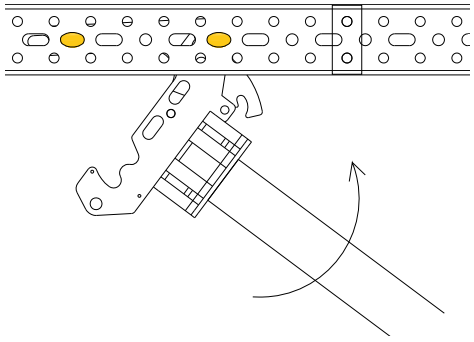
Folded position:

1



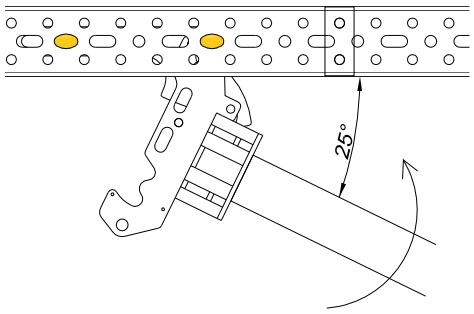
Lift the latch (1) to release the prop (2).

2



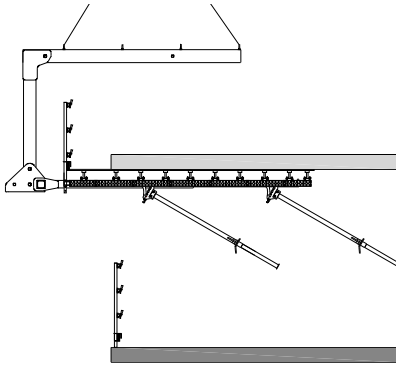
Fold the prop up. The head guides the latch

3



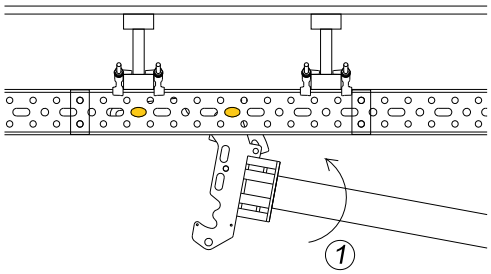
Continue folding the prop until 25° locking position.

4



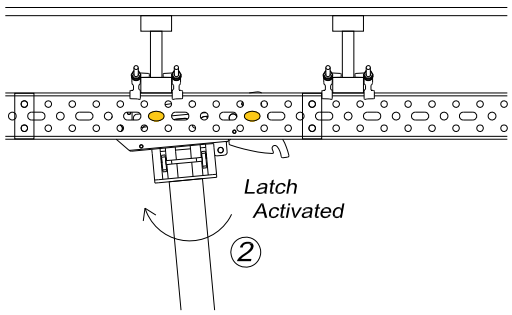
The props are safely fixed for Tables shifting.

5



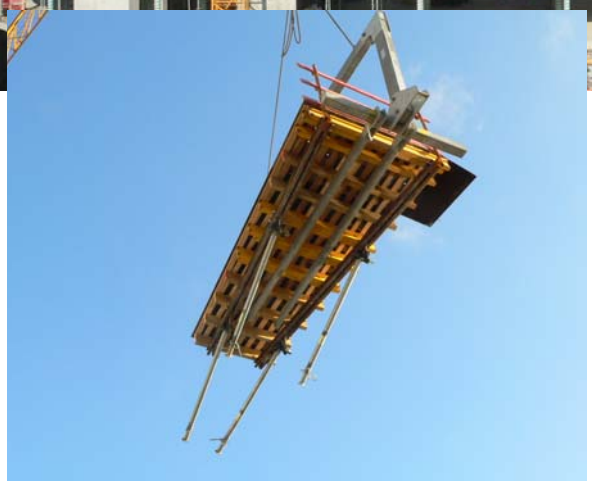
Latch locking position is cancelled folding up the prop (1).

6



Automatically unfold (2) the prop to the Working position.

Süwag HQ, Frankfurt (Germany).



VR Table lifting with Head Waler VR.

Easy and safe swivel head VR system: one man is enough to fold and unfold the prop.

1.2.3. Maximum heights with VR Tables

1.2.3.1. PROP EP: UP TO 5.35 m

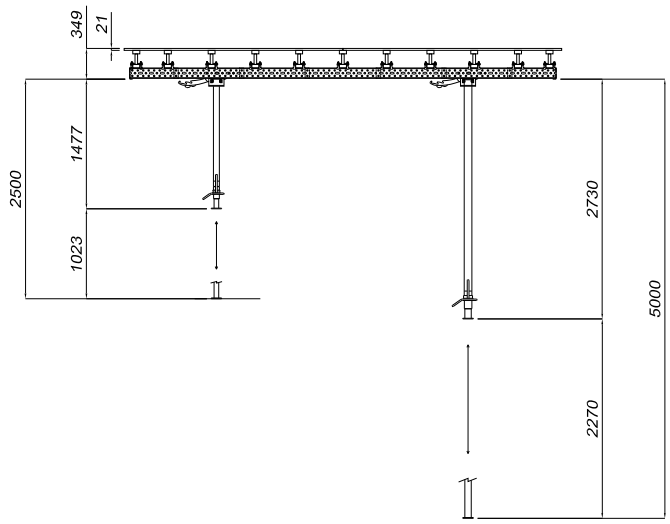
VR Table heads are specifically designed for EP props. Large range of EP props available.

EP Props have a higher load bearing capacities when connected to the Heads (see 5.2).

NAME	ITEM No.	L_min	L_Max	TABLES HEIGHT RANGE
C25	2200048	1477	2500	1826 – 2849
C+D30	2200000	1722	3000	2071 – 3349
C+E30	2200023	1722	3000	2071 – 3349
C+D35	2200068	1974	3500	2323 – 3849
C+D40	2200012	2222	4000	2571 – 4349
C+E40	2200033	2222	4000	2571 – 4349
C+D45	2200084	2477	4500	2826 – 4849
C+D50	2200057	2730	5000	3079 – 5349

dimensions in mm.

VR Table with waler thickness: **349 mm** (21 mm plywood).
For VR Table with VM20 beam see 1.3.



Stability must be assured in both longitudinal and transversal directions, especially for tall tables.

VR Tables temporary longitudinal stabilization.

VR Table with universal tripods

Recommendation:

Additional support (*Universal tripod, 2220090*) or prop bracings (*Prop bracing clamp, 2170526*) are recommended for the first tables in a new area to be cast.

1.2.3.2. FOR HEIGHTS OVER 5.35 m

With ALUPROP:

Up to 6.35 m: with ALUPROP single prop

- *With Head VR*, an adaptor is required. Two options:
  - Adaptor with Pin (Bracing necessary).
  - Adaptor with Screw.

Adapter with Pin (2211100)

Adapter with Screw (2211090)

- *With ALUPROP Head:* a specific Head for tables to be used with ALUPROP.

Adaptors make possible to combine different supports (EP Props and ALUPROP) with Head VR in the same Table.

VR Table with ALUPROP single prop.

With the Adaptor with pin and ALUPROP Head bracing is necessary (with Bracing frames or tubes). Not for the Adaptor with Screw thanks to the stiff head connection.

For VR Tables over 5.35 m height, SPT Truck Adaptor (2211330) is required for the movement.

Up to 12 m: with ALUPROP Towers

Same head options are available to ALUPROP Towers solution.

Check always ALUPROP Towers load capacity.

For further information see ALUPROP User's guide.

VR Table with ALUPROP Tower.

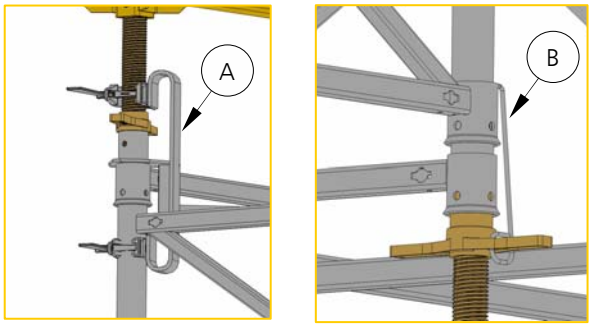
Recommendation:

VR Table stability must be checked in both longitudinal and transversal directions, especially for tall tables.

With T-60

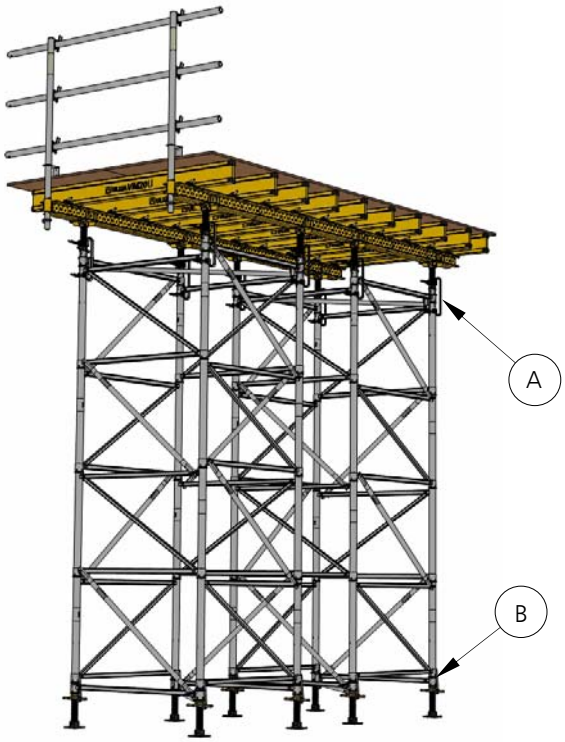
Up to 12 m height with T-60 shoring towers.

Two-Way U Head VM-DU (1906880) connects the shoring tower and the horizontal shuttering structure.



	NAME	ITEM No.
A	JACK-FRAME CONNECTION	1906210
B	TOWER MOVEMENT HOOK	1906165

Tower movement hook (1906165) and Jack-Frame connection (1906210) are necessary for table movement.



VR Table with T-60 tower shoring.

Stability of the Table must be checked in both longitudinal and transversal directions.

For towers higher than 6 m, bracing is required. For further information see T-60 User's guide.

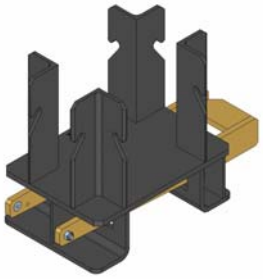
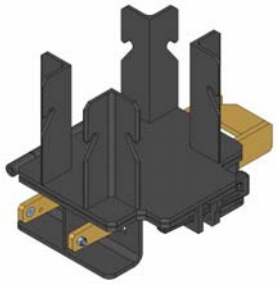
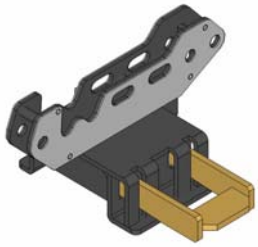
1.3. SUMMARY TABLE.

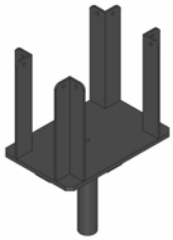
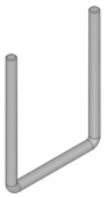
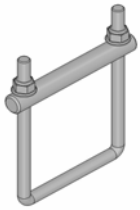
TABLE VR SYSTEM

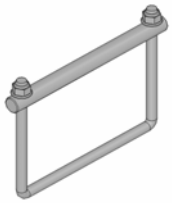
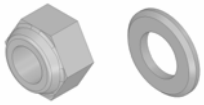
	VM20 / Waler	Support			
		Prop EP	Aluprop		T-60
			Prop	Tower	
	Storage height (21 mm plywood)	431 mm			
		349 mm			
	Height ranges (mm)	1908 - 5431	2041 - 6431	up to 12000	up to 12000
		1826 - 5349	1959 - 6349	up to 12000	up to 12000
Heads	Head VR (2211012)	Yes	Adaptor W/Screw	Adaptor W/Pin Adaptor W/Screw	No
		No	No	No	No
	Swivel Head VR (2211080)	Yes	Adaptor W/Screw	No	No
		No	No	No	No
	Head Waler VR (2211320)	No	No	No	No
		Yes	Adaptor W/Screw	Adaptor W/Pin Adaptor W/Screw	No
	Aluprop head (2211095)	No	No	Yes	No
		No	No	No	No
	Two-Way U-Head VM-DU (1906880)	No	No	No	Yes
		No	No	No	Yes

2. Components and accessories

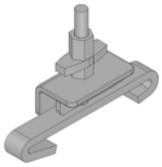
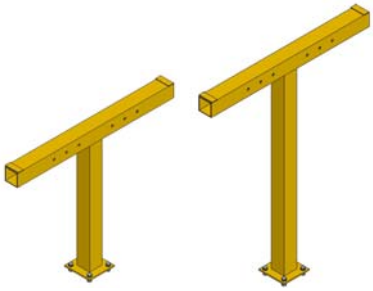
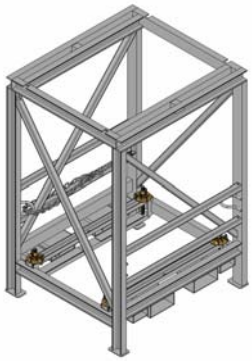
2.1. GRAPHIC DESCRIPTION

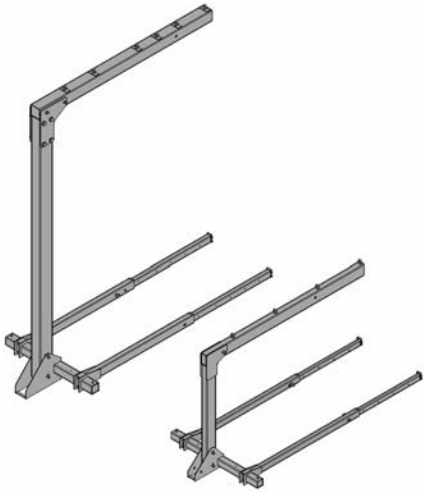
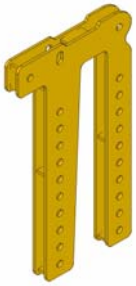
Item No.	Weight kg.	Name
		HEADS
2211012	15.5	HEAD VR  Black painted steel
2211080	20.5	SWIVEL HEAD VR  Black painted steel
2211310	11.2	HEAD WALER VR  Black painted steel
2211370	2.1	LATCH VR Bichromate finished steel
2211095	4.4	ALUPROP HEAD Black painted steel

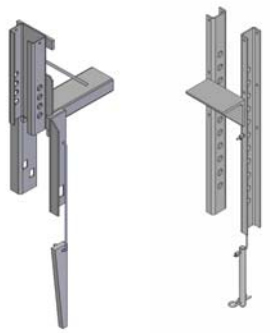
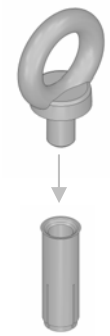
Item No.	Weight kg.	Name
2211000	0.87	SIMPLE HEAD VR Black painted steel
2211003	4.7	DOUBLE HEAD VR  Black painted steel
2211300	3.1	SIMPLE HEAD WALER Black painted steel
2211061	3	FRAME HEAD VR Black painted steel
2211010	0.4	NARROW BEAM STRAP  Cinc coated steel
2211008	0.81	NARROW VR CONNECTION UNIT  Cinc coated steel

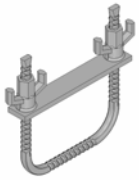
Item No.	Weight kg.	Name
2211005	1	WIDE VR CONNECTION UNIT  Cinc coated steel
2211102	0.6	ROD THREAD Bichromate finished steel
9056900 9033000	0.018 0.006	NUT M12 DIN985-8 CINC COATED WASHER B13 DIN125 ST ZINC COATED  Cinc coated steel
1861627 9370571	0.166 0.008	PIN 16x100 COTTER PIN R/3 Cinc coated steel
		BEAMS
		VM20: Main and Secondary beams
1940191	7.25	TIMBER BEAM VM 20/1.45
1940172	9.5	TIMBER BEAM VM 20/1.9
1940197	10.75	TIMBER BEAM VM 20/2.15
1950129	12.25	TIMBER BEAM VM 20/2.45
1940196	13.25	TIMBER BEAM VM 20/2.65
1940144	14.5	TIMBER BEAM VM 20/2.9
1950130	16.5	TIMBER BEAM VM 20/3.3
1940146	18	TIMBER BEAM VM 20/3.6
1950112	19.5	TIMBER BEAM VM 20/3.9
1940178	22.5	TIMBER BEAM VM 20/4.5
1950113	24.5	TIMBER BEAM VM 20/4.9
1940149	29.5	TIMBER BEAM VM 20/5.9 Melamine yellow coated

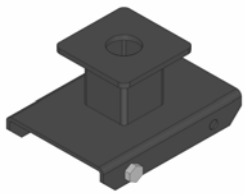
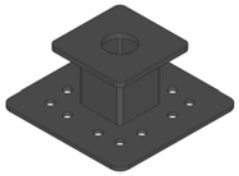
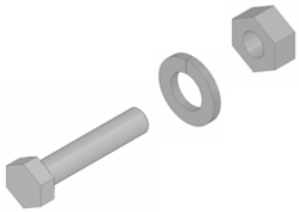
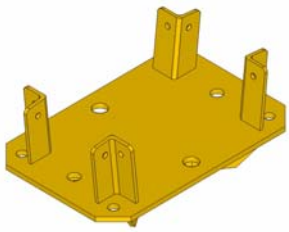
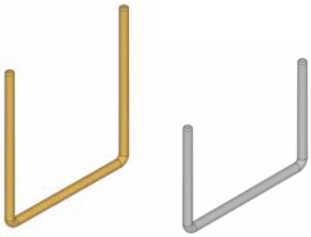
Item No.	Weight kg.	Name
		WALER MK-120: Main beam
1990209	29.4	WALER MK-120/1.125
1990213	41.8	WALER MK-120/1.625
1990217	54.3	WALER MK-120/2.125
1990219	60.5	WALER MK-120/2.375
1990221	68.2	WALER MK-120/2.625
1990225	80.7	WALER MK-120/3.125
1990229	93.4	WALER MK-120/3.625
1990233	107.2	WALER MK-120/4.125
1990237	119.6	WALER MK-120/4.625
1990239	125.8	WALER MK-120/4.875
1990245	146.1	WALER MK-120/5.625 Yellow painted steel
		WALER DU-120: Main beam
0111100	26.5	WALER DU-120/1
0111150	39.7	WALER DU-120/1.5
0111200	53	WALER DU-120/2
0111250	66	WALER DU-120/2.5
0111300	79	WALER DU-120/3
0111350	93	WALER DU-120/3.5
0111400	106	WALER DU-120/4
0111450	119	WALER DU-120/4.5
0111500	133	WALER DU-120/5
0111600	159	WALER DU-120/6 Black painted steel
1960350	1.4	WALER-VM20 CLAMP Bichromate finished steel
1960375	0.81	WALER-VM20 CLAMP 2T Bichromate finished and cinc coated steel

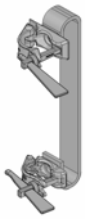
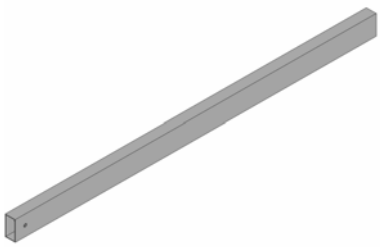
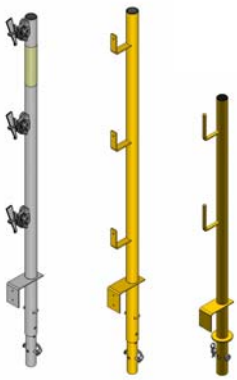
Item No.	Weight kg.	Name
1960345	1.3	WALER-VM20 ANGULAR CLAMP  Cinc coated steel
0252070 0250000	0.28 0.029	PIN E20X70 COTTER PIN R/5 Cinc coated steel and bichromate finished steel
		ACCESORIES
2211031	431	TROLLEY VR Yellow painted steel
2211560 2211569	34.8 42	EXTENSION 1 EXTENSION 1,5  Yellow painted steel
2211330	250	SPT TRUCK ADAPTOR  Hot dip galvanized

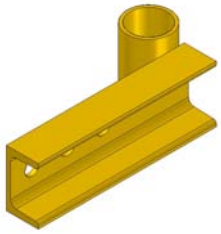
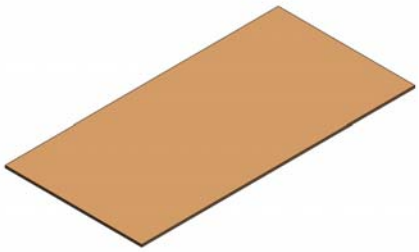
Item No.	Weight kg.	Name
2211625	252	LATERAL TROLLEY VR Yellow painted steel
2211150 2211030	1450 770	HOOK VR 600/450 HOOK VR  Hot dip galvanized
2211190	5.1	LIFTING HOOK VR Black painted steel
2211360	17.5	HANGING BEAM PLATE 60  Yellow painted steel

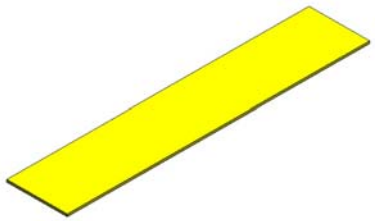
Item No.	Weight kg.	Name
2211670	6.7	VM20 HANGING BEAM SUPPORT
2211660	4.6	HANGING BEAM SUPPLEMENT
		
		Hot dip galvanized
2211051	2.9	FORK VR
		Hot dip galvanized
2211270	6.3	CHAIN VR
		Cinc coated steel
9165400	0.3	EYEBOLT SCREW M16
9850530	0.1	HKD HILTI PLUG M16
		
		Cinc coated steel

Item No.	Weight kg.	Name
		SHORING SYSTEM
		PROPS EP
2200048	14.7	EP C25
2200000	16.6	EP C+D30
2200068	21.3	EP C+D35
2200012	23.7	EP C+D40
2200084	29.1	EP C+D45
2200057	31.7	EP C+D50
2200023	19	EP C+E30
2200033	26.4	EP C+E40
		Hot dip galvanized
2220090	11.2	UNIVERSAL TRIPOD
		Hot dip galvanized
2170526	2.3	PROP BRACING CLAMP
		
		Hot dip galvanized
		ALUPROP
2220010	17.6	ALUPROP 1.65-2.8
2220020	21.6	ALUPROP 2.2-3.7
2220030	25.4	ALUPROP 3.3-4.8
2220040	29.6	ALUPROP 4.5-6.0
		Aluminium

Item No.	Weight kg.	Name
2211100	4.2	ADAPTER W/PIN ALUPROP  Black painted steel
2211090	3.1	ALUPROP ADAPTER W/SCREW  Black painted steel
9521592 9000001 0241000	0.044 0.001 0.01	HEXAGONAL SCREW M10x50 DIN933 8.8 SPRING WASHER B10 DIN127 NUT M10 DIN 934 5.6  Cinc coated steel
		T-60
1906880	3.5	TWO-WAY U-HEAD VM-DU  Yellow painted steel
2211102 2211103	0.6 0.446	ROD THREAD WALER ROD THREAD  Bichromate finished and cinc coated steel
1906200	0.12	SCREW JACK HOLDER Cinc coated steel

Item No.	Weight kg.	Name
1906570 9370571	0.06 0.01	PIN D10X90 COTTER PIN R/3 Bichromate finished and cinc coated steel
1906210	3.5	JACK-FRAME CONNECTION  Cinc coated steel
1906165	5.4	TOWER MOVEMENT HOOK Hot dip galvanized
1906163 1906164	13.8 18.4	MOVEMENT HOOK TUBE 1.8 MOVEMENT HOOK TUBE 2.4  Hot dip galvanized
		SAFETY ELEMENTS
2211156 2211185 1902210	9.6 8.1 3.4	SAFETY HANDRAIL 1.50 SAFETY HANDRAIL 1.5 WOOD SAFETY HANDRAIL POST  Hot dip galvanized and yellow painted steel

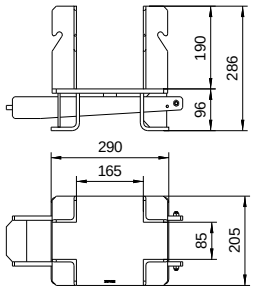
Item No.	Weight kg.	Name
2211240	6	CLAMP HANDRAIL 1m Bichromate finished steel
2211165	6.9	VM HANDRAIL SUPPORT Yellow painted steel
1861122 7238001	0.39 0.22	PANEL BOLT HEXAGONAL NUT 15 Cinc coated steel
0121004	2,9	HANDRAIL SOCKET D50  Yellow painted steel
		PLYWOOD
1940151 1940155 1940166 1940198	44.6 38.2 40.7 34.9	PLYWOOD 1.25X2.5X0.021 BIRCH PLYWOOD 1.25x2.5x0.018 BIRCH PLYWOOD 1.25x2.5x0.021 BETO PLYWOOD 1.25x2.5x0.018 BETO  Phenolic coated

Item No.	Weight kg.	Name
2211029 2211028 2211027	14.7 11.8 8.8	3-PLY SHEET 2500x500x21 3-PLY SHEET 2000x500x21 3-PLY SHEET 1500x500x21  Melamine yellow coated
		SCREWS
9370901 9371436	0.01 0.014	SCREW 5x50 DIN7505-A C SCREW 6x80 DIN 7505-A Bichromate finished steel

2.2. ELEMENTS DESCRIPTION

2.2.1. Heads

2.2.1.1. HEAD VR



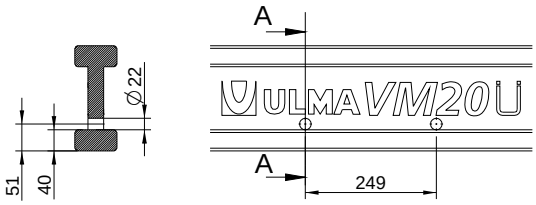
Head VR

For VR Table with VM20 as main beam:

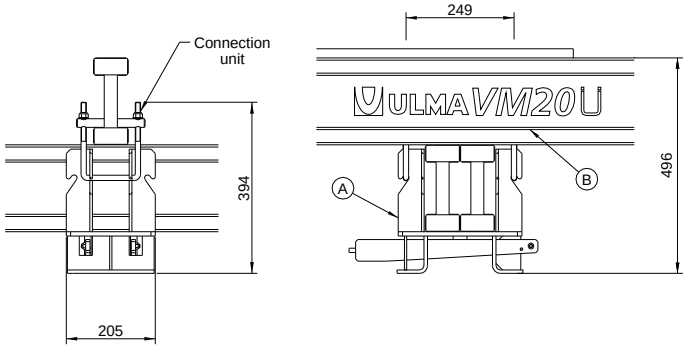
- Connect the horizontal shuttering structure and the EP props.
- Also ALUPROP can be assembled with Adaptors.

1- Connection units:

- Always under a secondary beam.
- Drilled holes in the beam are required.

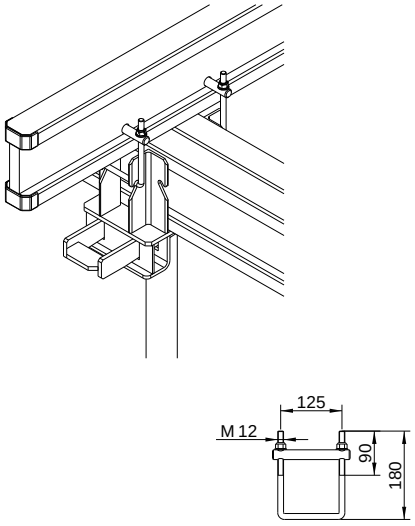


Drilled holes distances (in mm)

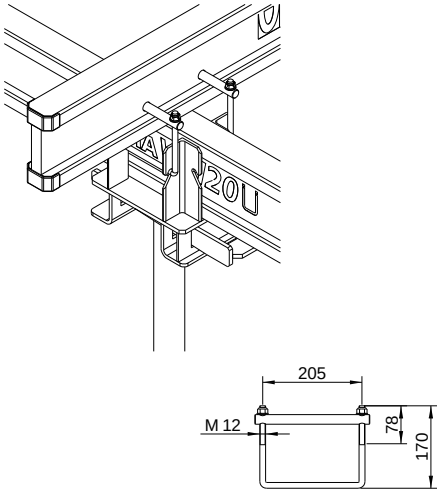


	QUANTITY	NAME	ITEM No.
A	1	HEAD VR	2211012
B	2	NARROW VR CONNECTION UNIT	2211008

Two different connection units: the narrow one for double VM20 main beams and the wide one for single ones.



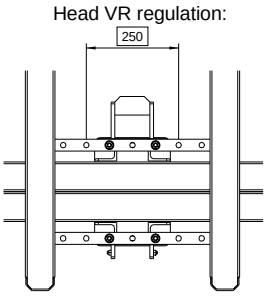
Narrow beam connection unit
for double VM20 main beam



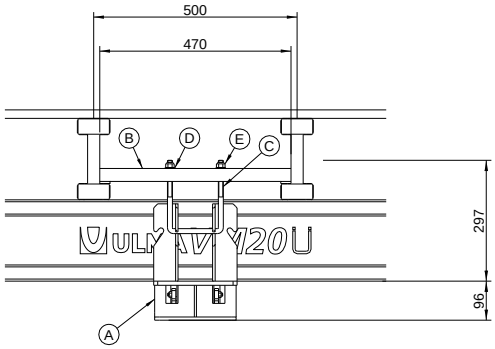
Wide beam connection unit
for single VM20 main beam

2- Frame Head:

- Connect two secondary beams spaced 500 mm.
- Possible frame adjustment: 250mm.

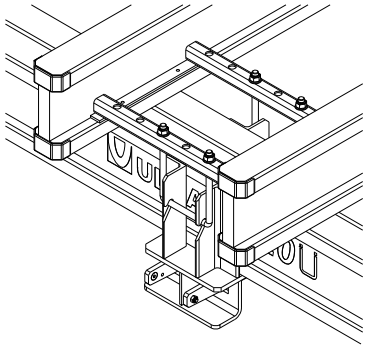


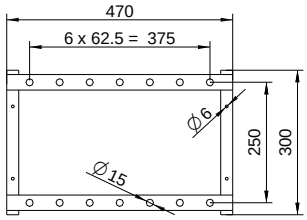
Total adjustment 250 mm



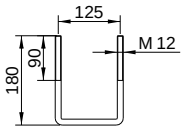
	QUANTITY	NAME	ITEM No.
A	1	HEAD VR	2211012
B	1	FRAME HEAD VR	2211061
C	2	NARROW BEAM STRAP	2211010
D	4	WASHER B13 DIN 125ST ZINC COATED	9033000
E	4	NUT M12 DIN 985-8 CINC COATED	9056900

Frame Head connection:





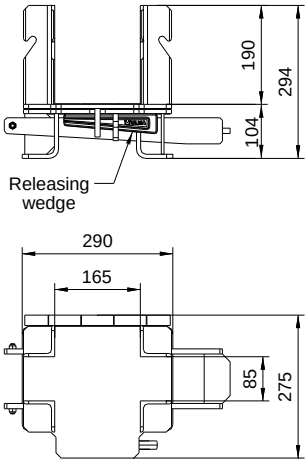
Frame head VR.

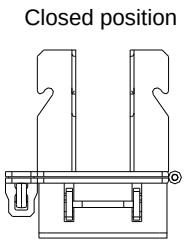


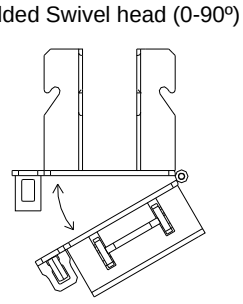
Narrow beam strap.

2.2.1.2. SWIVEL HEAD VR

Functionally like Head VR, but allow prop swivelling.





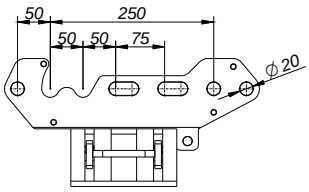


Easy handling wedge to switch from fixed to swivelled position.

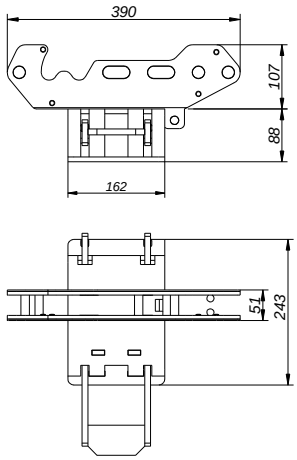
2.2.1.3. HEAD WALER VR

For VR Table with waler as main beam:

- Connect the horizontal shuttering structure and EP Props.
- Designed for MK-120 waler. For DU-120 remove riveted plates.
- Item No. for DU-120 Head: 2211410: Head Waler VR DU120.



Head waler VR (2211310)

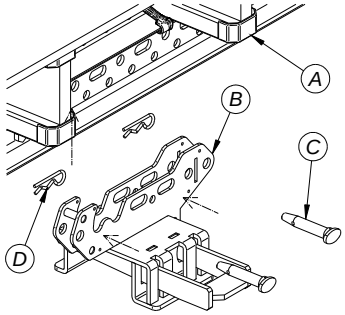


Multiple fixing support position along the walers, thanks to holes and slots design.

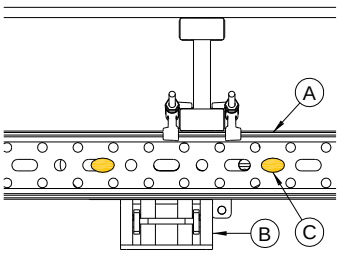
Two possible assemblies:

1- Fixed head assembly:

- At least one head's hole must fit in with a waler's hole, fixed with a pin.



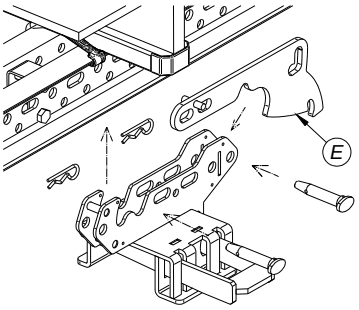
Head waler VR assembly



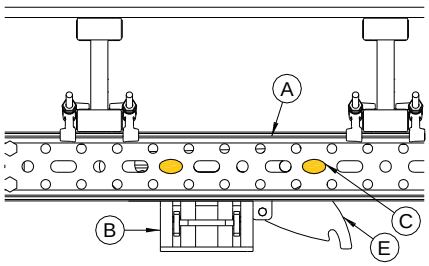
	QUANTITY	NAME	ITEM No.
A	1	MK-120	-
B	1	HEAD WALER VR	2211310
C	2	PIN E20x70	0252070
D	2	COTTER PIN R/5	0250000

2- Swivel head assembly:

- Latch VR is necessary to get a swivel head.



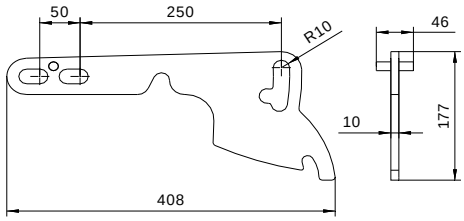
Head waler VR and Latch VR assembly



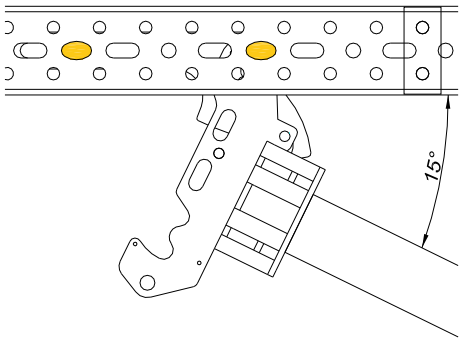
	QUANTITY	NAME	ITEM No.
E	1	LATCH VR	2211370

2.2.1.4. LATCH VR

- Convert the HEAD WALER VR in a Swivel Head.
- Fix the head in working position; releasing the latch, Head waler VR can swivel.



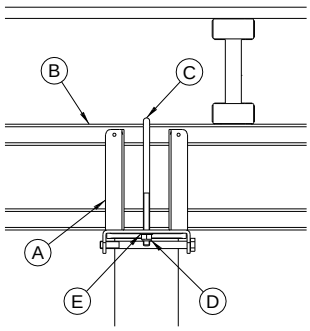
Latch VR

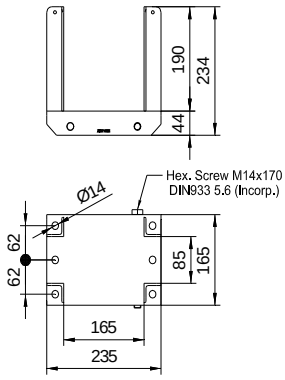


Swivel positions: 15º.
Self lock and release activation by means of the prop fold up.

2.2.1.5. ALUPROP HEAD

- Fix the VR Table with VM20 as main beam ALUPROP.
- ALUPROP props must be always braced.

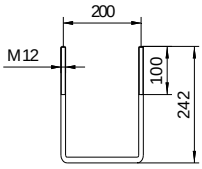




Aluprop head

	QUANTITY	NAME	ITEM No.
A	1	ALUPROP HEAD	2211095
B	-	DOUBLE VM20 TIMBER BEAMS	-
C	1	ROD THREAD	2211102
D	2	NUT M12 DIN985-8 CINC COATED	9056900
E	2	WASHER B13 DIN125 ST ZINC COATED	9033000

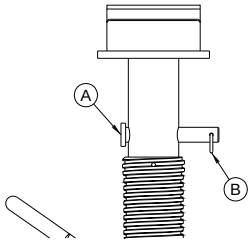
Rod thread:



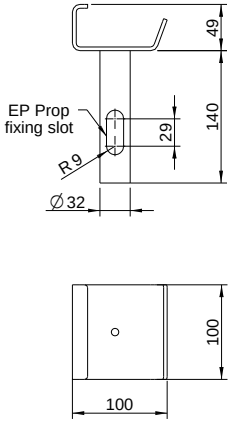
- Easy to adapt the ALUPROP tower and the horizontal shuttering structure avoiding any interference, thanks to ALUPROP head's different assembly positions.

2.2.1.6. SIMPLE HEAD VR

- Additional single VM20 timber beam support for helps shuttering infilling areas.
- The open profile helps fixing and removing the assembly prop-head without loosening the prop's nut.



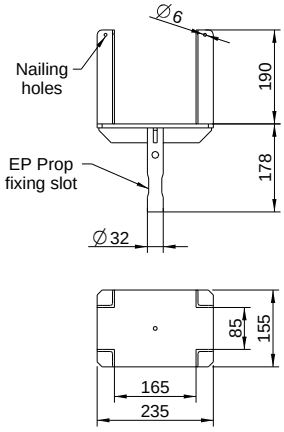
	QUANTITY	NAME	ITEM No.
A	1	PIN 16x100	1861627
B	1	COTTER PIN R/3	9370571



Simple head VR.

2.2.1.7. DOUBLE HEAD VR

- Additional single or Double VM20 timber beam support for helps forming infilling areas.

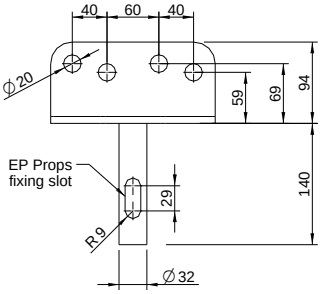


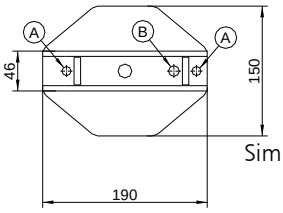
Double head VR.

2.2.1.8. SIMPLE HEAD WALER

- Additional waler beam support.
- Available for DU-120, MK-120 and DU-100.
- Drilled holes in the head (A, B) to fix the head to props base plates:

	PROP	NAME	ITME No.
A	EP Prop	HEX. SCREW M12x30 DIN933	9169600
B	ALUPROP	HEX. SCREW M10x50 DIN 933 8.8	9521592



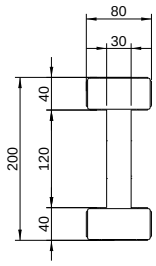


Simple head waler.

2.2.2. Beams

2.2.2.1. VM20 TIMBER BEAM

- According to European Standard EN13377.
- Timber beams can be used as main or secondary beam.

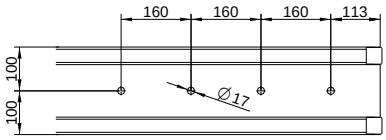


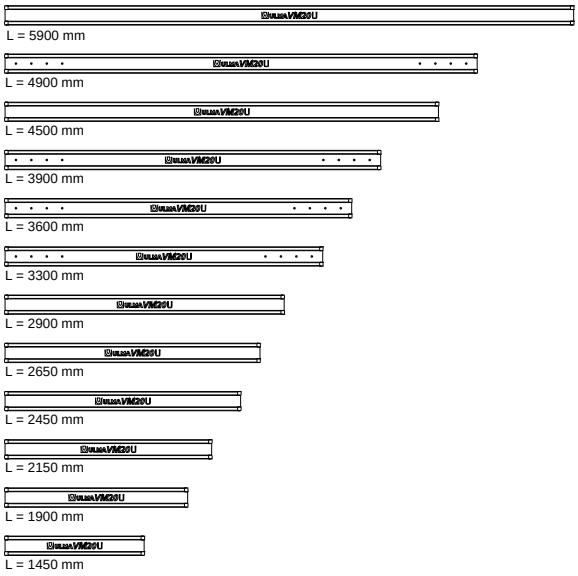
VM20 beam cross section.

Technical properties:

- Permissible shear force Q = 11 kN.
- Permissible bending M = 5 kNm.
- Stiffness EI = 450 kNm^2.

- Pre-drilled beams available: 4.9 m, 3.9 m, 3.6 m and 3.3 m.

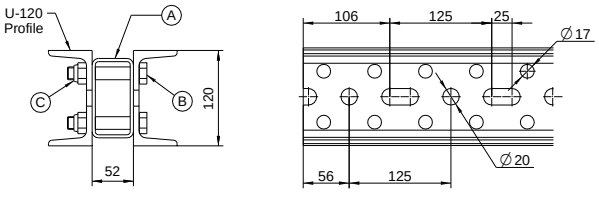




➢ Wide range of Standard Beam lengths.
➢ Special lengths up to 12 m available.

2.2.2.2. WALER: MK-120

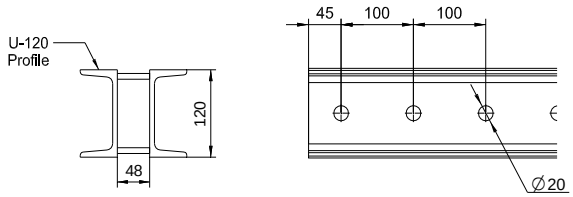
- Two U-120 profiles brought face to face and bolted together by spacers.
- Profile drilled all along its length.



	QUANTITY	NAME	ITEM No.
A	-	SPACER	1990200
B	2	HEX. BOLT M16x90 DIN931 8.8C	9053011
C	2	HEX. NUT M16 DIN985 8.C	0241608

2.2.2.3. WALER: DU-120

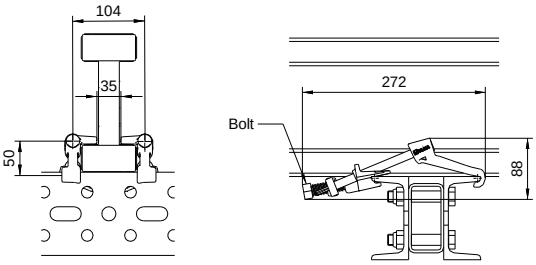
- Two U-120 profiles brought face to face.
- Profile drilled all along its length.



➢ Wide range of lengths available.

2.2.2.4. WALER-VM20 CLAMP

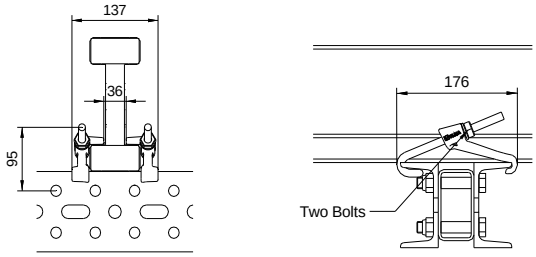
- Joins VM20 beam and waler with an only bolt.
- Faster and best accesibility below the table.
- Keeps VM20 beam perpendicular to the waler.
- Only for DU-120, not for MK-120.



Waler-VM20 clamp.

2.2.2.5. WALER-VM20 CLAMP 2T

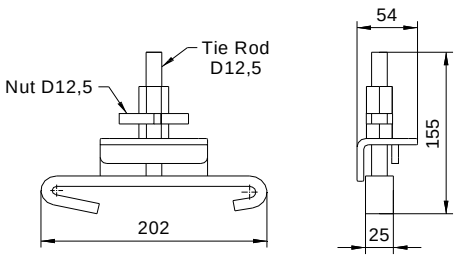
- Joins VM20 beam and waler with two bolts.
- Clamp accesibility above the table: suitable for horizontal template assembly.
- Keeps VM20 beam perpendicular to the waler.

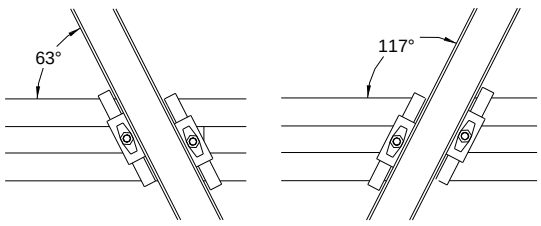


Waler-VM20 clamp 2T.

2.2.2.6. WALER-VM20 ANGULAR CLAMP

- Non-perpendicular VM20 beam and waler joint.
- Two clamps per joint are necessary.





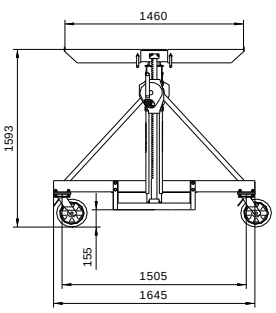
Minimum and maximum connection angles: 63º to 117º.

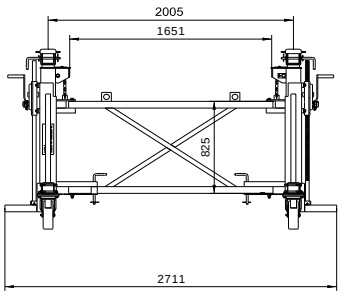
2.2.3. Accessories

2.2.3.1. TROLLEY VR

- For moving ULMA VR Tables.
- Load bearing capacity: 15 kN.

- Minimum height:	1450 mm
- Maximum height:	3200 mm
- With extension 1 m:	4200 mm
- With extension 1.5 m:	4700 mm





- Not approved for personnel transporting
- Only move on clean, level and sufficiently strong surface.
- Comply with minimum safety regulations. CE Mark.

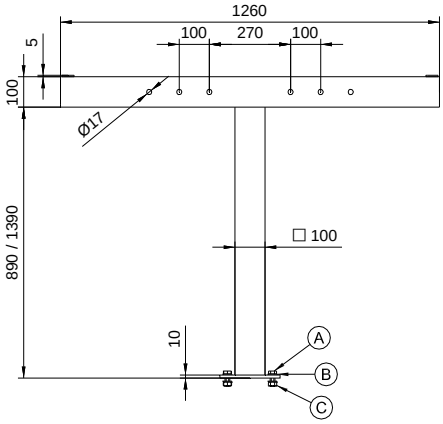
For further information see TROLLEY VR User's guide.

2.2.3.2. EXTENSION 1 m
EXTENSION 1.5 m

- For increasing 1 m / 1.5 m the height of the trolley:

- Minimum:	2.45 m / 2.95 m
- Maximum:	4.20 m / 4.70 m

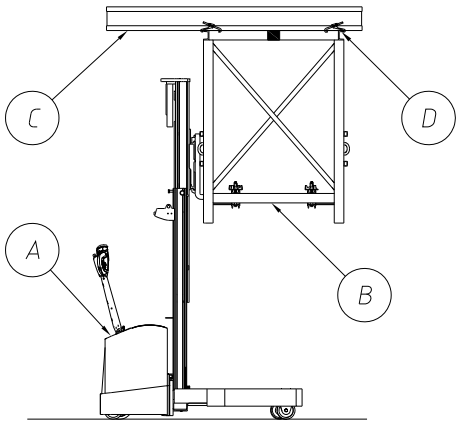
- 2 units are necessary for each trolley.
- Telescopic arms must be reused.



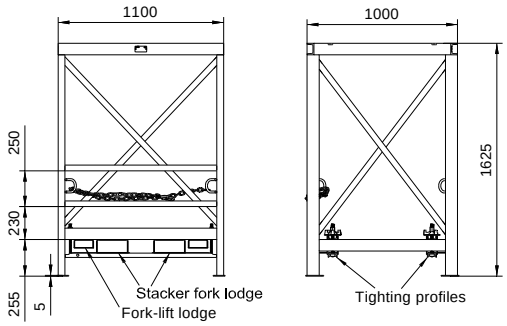
	CUANTITY	NAME	ITEM No.
A	4	BOLT M16x40 DIN-933 8.8	0241640
B	4	WASHER A16 DIN-125	0241601
C	4	NUT M16 DIN-934 8.8	0241600

2.2.3.3. SPT TRUCK ADAPTOR

- For moving ULMA VR Tables.
- Adaptable to any kind of Self Powered Trucks (stackers, forklift,…) for transportation.
- Load bearing capacity: 15 kN
- Not approved for transporting personnel.
- Use only in clean, flat and sufficiently strong carring surfaces.



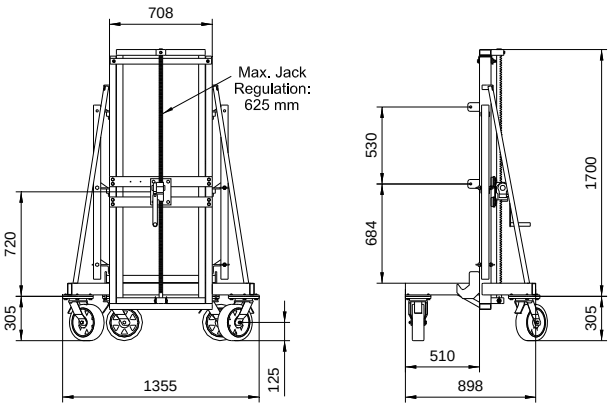
	QUANTITY	NAME	ITEM No.
A	1	FORKLIFT	-
B	1	SPT TRUCK ADAPTOR	2211330
C	2	LOAD DISTRIBUTION VM20 BEAMS	-
D	4	WALER-VM20 CLAMP 2T	1960375



For further information see SPT TRUCK ADAPTOR User's guide.

2.2.3.4. LATERAL TROLLEY VR

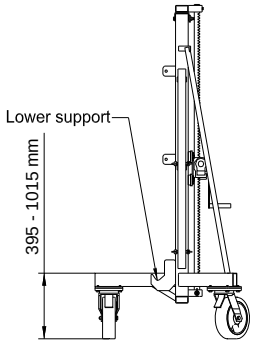
- For moving ULMA VR Tables with shoring towers. Two trolleys are necessary for moving one table.
- Load bearing capacity: 10 kN.
- Not approved for personnel transporting.
- Only move on clean, level and sufficiently strong surface.



Two different working positions:

1-Lower support:

- Height range: 395 mm – 1015mm

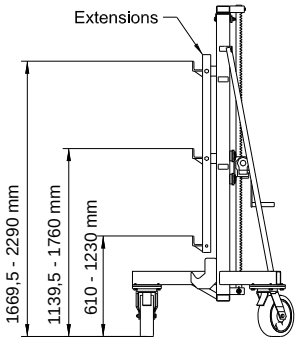


Lower position of the lateral trolley

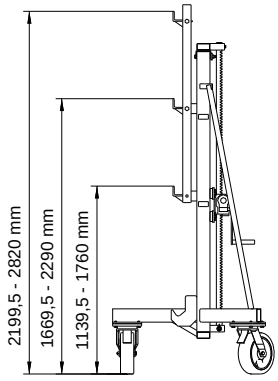
2-Lateral trolley extensions:

- Lower position:
  - Min. height range: 610 – 1230 mm
  - Med. height range: 1140 – 1760 mm
  - Max. height range: 1670 – 2290 mm
- Upper position:
  - Min. height range: 1140 - 1760mm
  - Med. height range: 1670 – 2290mm
  - Max. height range: 2200 - 2820mm

Extension Lower position



Extension Upper position



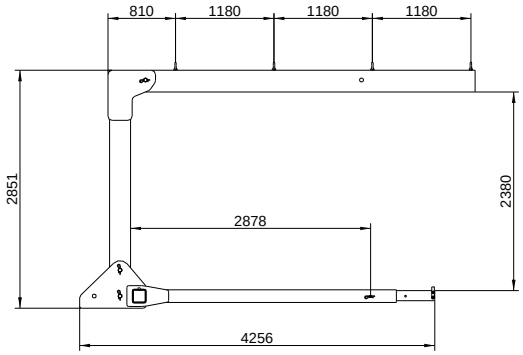
Bolts for Extensions assembly included.

For further information see LATERAL TROLLEY VR User's guide.

2.2.3.5. HOOK VR

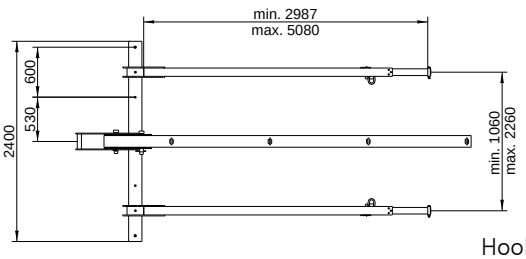
HOOK VR 600/540

- For lifting ULMA VR Tables.
- Following slab tables systems can be move:
  - Props EP.
  - Aluprop (towers).
  - T-60.



Hook VR:

- Load bearing capacity: 10 kN.
- Table length: up to 5m.
- Table width: up to 2,5m.



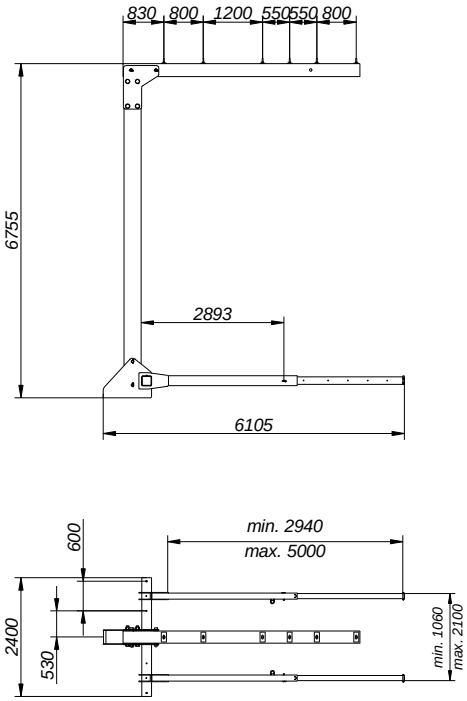
Hook VR

- For further information see User's guide HOOK VR.

Hook VR 600/450:

- Load bearing capacity: 15 kN
- Table length: up to 5 m.
- Table width: up to 2.,5 m

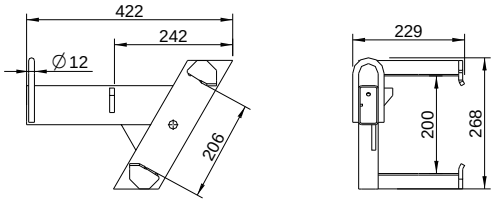
For further information HOOK VR 600/450 User's guide.



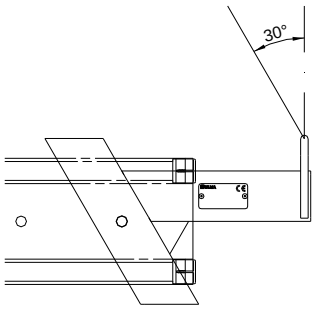
Hook VR 600/450

2.2.3.6. LIFTING HOOK VR

- Lifting component for VR Table with VM20 as main beam.
- Load bearing capacity: 2.5 kN
- 4 units required for VR table lifting.



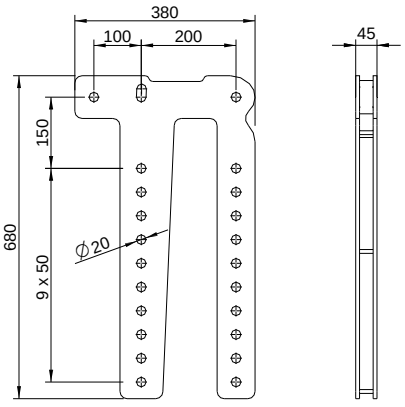
Lifting hook VR.



Maximum sling angle: 30º.

2.2.3.7. HANGING BEAM PLATE 60

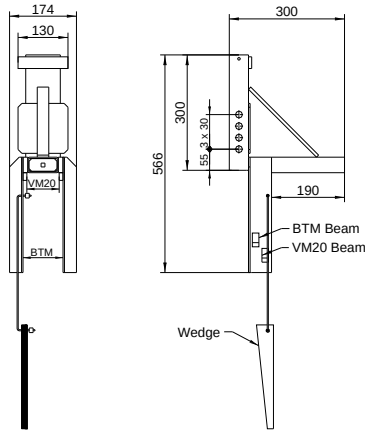
- For VR Table with waler as main beam.
- Standardised solution for slab edge hanging beams.
- From 150 mm up to 600 mm, every 50 mm.
- Valid for MK-120 and DU-120 walers.



Hanging beam plate 60.

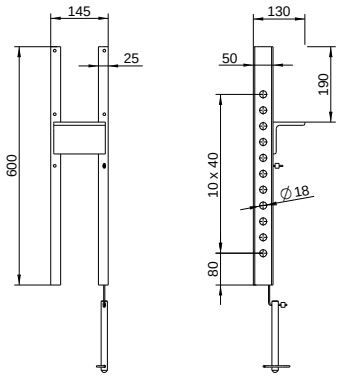
2.2.3.8. VM20 HANGING BEAM SUPPORT
HANGING BEAM SUPPLEMENT

- Main elements for hanging beams and stopends.
- Designed for VM20 and BTM beam.



VM20 Hanging Beam Support

Hanging Beam Supplement

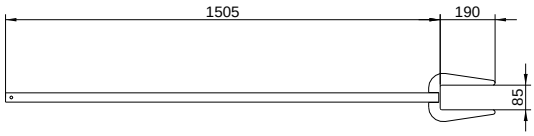


- Accessory to combine with the Support for hanging beams up to 90 cm.

- For further information see VM20 HANGING BEAM SUPPORT User's guide.

2.2.3.9. FORK VR

- Erection and dismantling accessory.

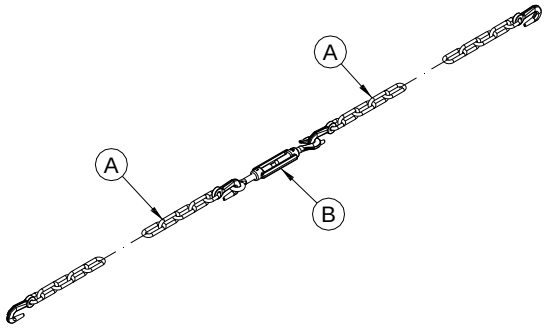


Fork VR

2.2.3.10. CHAIN VR

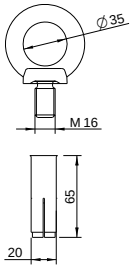
- VR Table anchoring system to prevent overturning.
- Max. load capacity: 7.5 kN.

- The chain consists of 2 double hook chains and a M14 Turnbuckle.



Include:

- Eyebolt screw M16 (9165400)
- HKD Hilti Plug M16 (9850530)



	QUANTITY	NAME	ITEM No.
A	2	DOUBLE HOOK CHAIN	2211751
B	1	M14 TURNBUCKLE	9371857

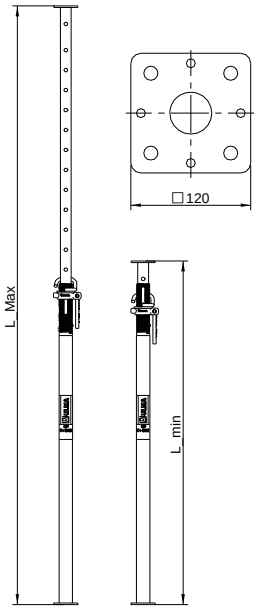
For further information see CHAIN VR Instructions for use.

2.2.4. Shoring system

2.2.4.1. PROPS EP

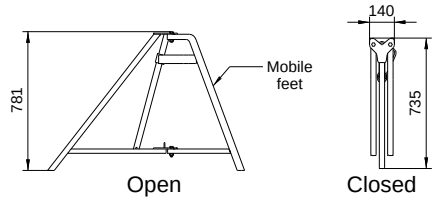
- Designed according EN1065.

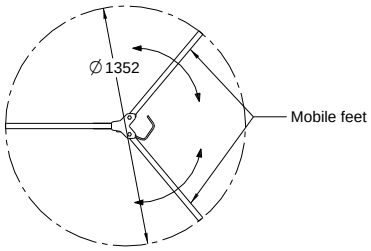
	CODES	L_min	L_Max	WEIGHT (kg)
C25	2200048	1477	2500	14.6
C+D30	2200000	1722	3000	16.5
C+E30	2200023	1722	3000	18.9
C+D35	2200068	1974	3500	21.2
C+D40	2200012	2222	4000	23.7
C+E40	2200033	2222	4000	26.4
C+D45	2200084	2477	4500	29.1
C+D50	2200057	2730	5000	31.7



2.2.4.2. UNIVERSAL TRIPOD

- Stabilises and ensures correct assembly.
- Suitable for all ULMA props: from 40 to 120 mm diameter tubes.
- High tripod flexibility due to mobile legs.

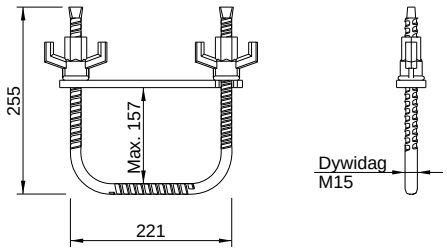




Universal tripod.

2.2.4.3. PROP BRACING CLAMP

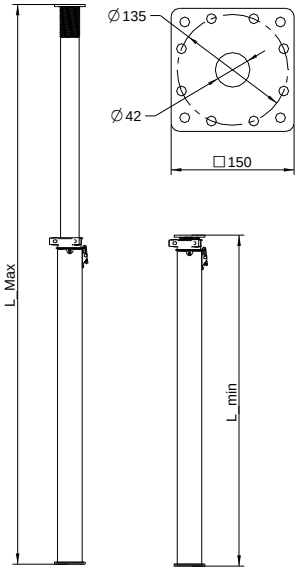
- Braces and stabilises all Ulma props with wood planks.
- Wood plank maximum width: 150 mm.
- For further information see PROP BRACING CLAMP Instructions for use.



Prop bracing clamp.

2.2.4.4. ALUPROP

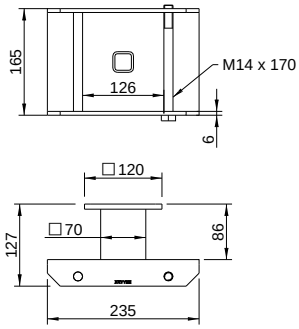
- Light and high load capacity aluminium prop.
- Towers can be easily built with bracing frames.
- Approved product.



NAME	ITEM No.	WEIGHT (kg)
ALUPROP 1.65 – 2.8	2220010	17.4
ALUPROP 2.2 – 3.7	2220020	21.4
ALUPROP 3.3 – 4.8	2220030	25.1
ALUPROP 4.5 - 6	2220040	29.2

2.2.4.5. ADAPTER W/PIN ALUPROP

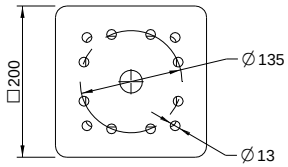
- Allows ALUPROP assembly with Head VR and Head waler VR.
- ALUPROPS are trapped by the bolt M14x170 and the pin.
- With the Adapter w/pin, props must be braced as a tower.



Adapter W/Pin ALUPROP.

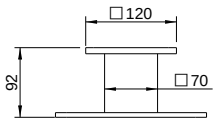
2.2.4.6. ALUPROP ADAPTER W/SCREW

- Allows ALUPROP assembly with Head VR and Head Waler VR.
- ALUPROPS are bolted to the adapter.
- With the Adapter w/screw, props musn't be braced.



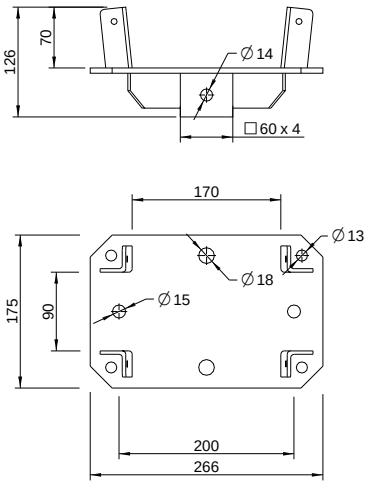
Complete with:

QUANTITY	NAME	ITEM No.
3	HEXAGONAL SCREW M10x50 DIN933 8.8	9521592
3	NUT M10 DIN934 5.6	0241000
3	SPRING WASHER B10 DIN127	9000001



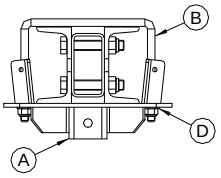
2.2.4.7. TWO-WAY U-HEAD VM-DU

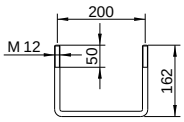
- VR table and T-60 shoring connection head for VM20 and Waler main beams.



Two options:

Waler:

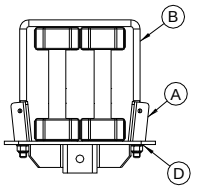


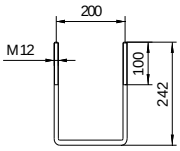


Waler rod thread

	QUANTITY	NAME	ITEM No.
A	1	TWO-WAY U-HEAD VM-DU	1906880
B	1	WALER ROD THREAD	2211103
C	2	NUT M12 DIN985-8 CINC COATED	9056900
D	2	WASHER B13 DIN125 ST ZINC COATED	9033000

VM20 Beam:



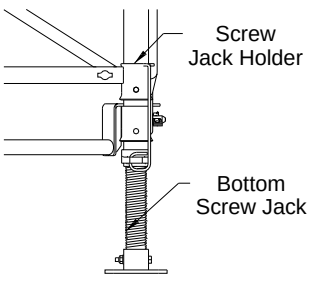


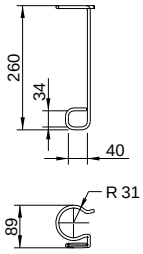
Rod Thread

	QUANTITY	NAME	ITEM No.
A	1	TWO-WAY U-HEAD VM-DU	1906880
B	1	ROD THREAD	2211102
C	2	NUT M12 DIN985-8 CINC COATED	9056900
D	2	WASHER B13 DIN125 ST ZINC COATED	9033000

2.2.4.8. SCREW JACK HOLDER

- Fixes bottom screw jack to the tower during lifting.

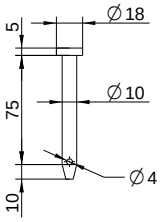




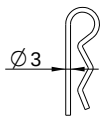
Screw jack holder.

2.2.4.9. PIN D10x90
COTTER PIN R/3

- Fixes T-60 frames during lifting.



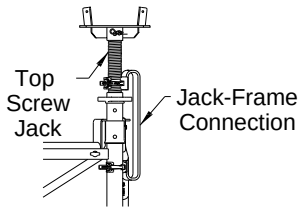
Pin d10x90.

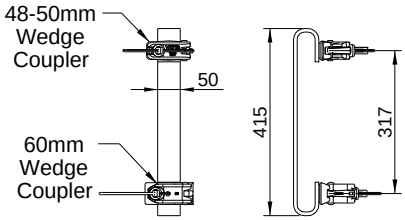


Cotter pin R/3.

2.2.4.10. JACK FRAME CONNECTION

- Fixes top screw jack to the tower during lifting from formwork.



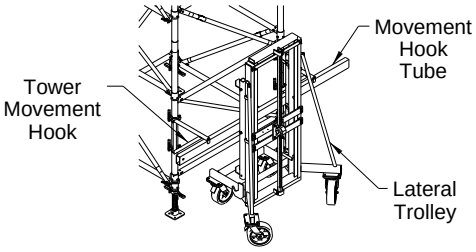


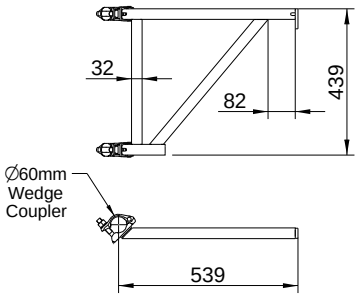
Jack frame connection.

- For further information see User's guide T-60.

2.2.4.11. TOWER MOVEMENT HOOK

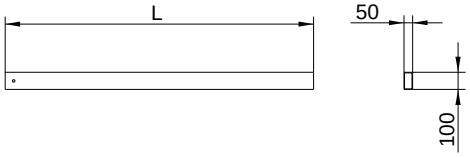
- Accessory for moving towers with Lateral Trolleys.





Tower movement hook.

Complete with:



- For further information see T-60 Tower User's guide.

ITEM No.	NAME	L (mm)
1906163	MOVEMENT HOOK TUBE 1,8	1800
1906164	MOVEMENT HOOK TUBE 2,4	2400

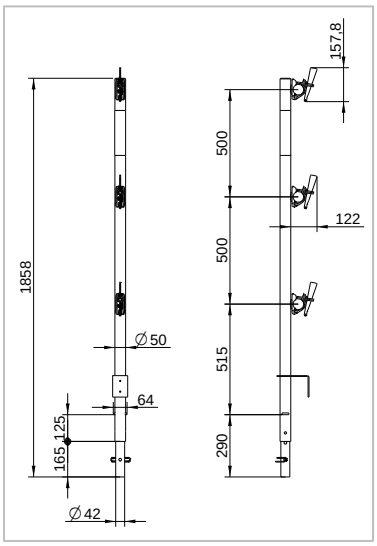
2.2.5. Safety elements

2.2.5.1. SAFETY HANDRAIL 1.5

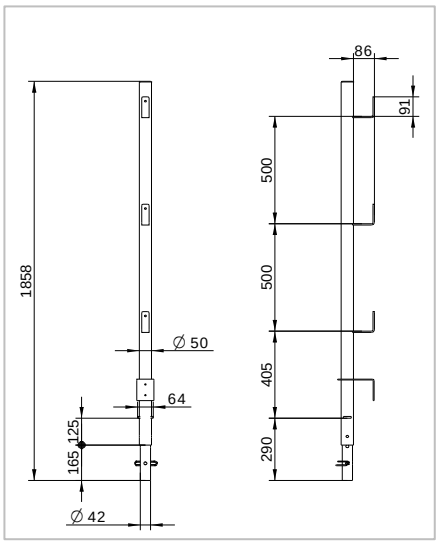
SAFETY HANDRAIL 1.5 m WOOD

SAFETY HANDRAIL POST

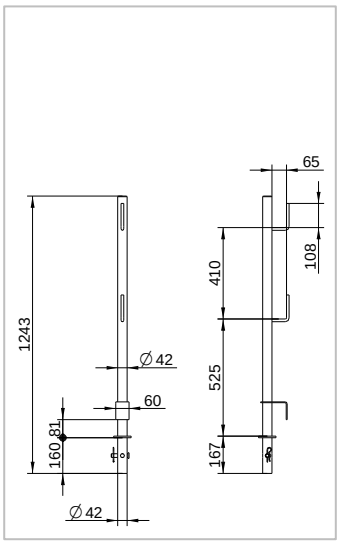
- 1.5 m high handrail post for 48 or 50 mm diameter tube and wood plank.
- 1 m high handrail post for wood plank.



Safety handrail 1.5.



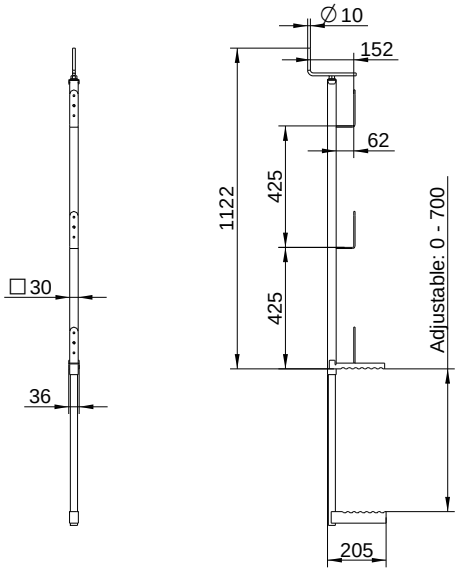
Safety handrail 1.5 m Wood.



Safety handrail 1 m.

2.2.5.2. CLAMP HANDRAIL 1 m

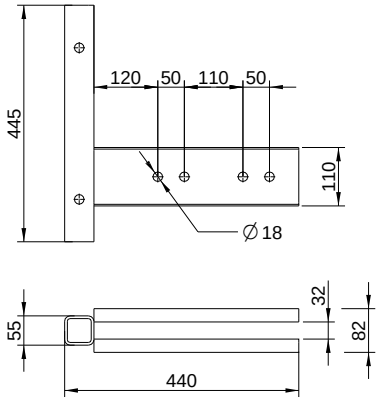
- Designed according EN 13374.
- 1.1m high adjustable clamp for European Board of 30x150mm.
- Adjustable from 0 to 700 mm.



Clamp Handrail 1 m.

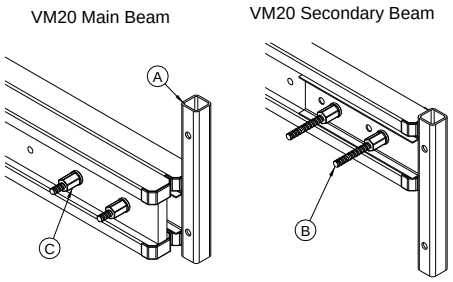
2.2.5.3. VM HANDRAIL SUPPORT

- Solution certified by AIDICO according EN13374 with Safety handrail 1.5 (2211156).
- Accessory for VM20 timber beam.



Two assembly positions are possible:

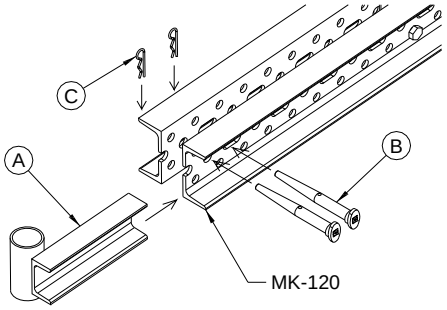
On main beam On secondary beam:



	QUANTITY	NAME	ITEM No.
A	1	VM HANDRAIL SUPPORT	2211165
B	2	PANEL BOLT	1861122
C	2	HEXAGONAL NUT 15	7238001

2.2.5.4. HANDRAIL SOCKET D50

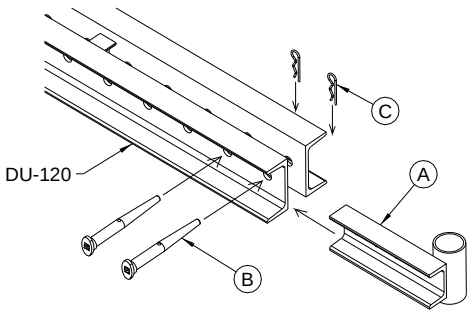
- Accessory for Waler MK-120 and DU-120.
- Solution certified by AIDICO according EN13374 with Safey handrail 1.5 (2211156).



Handrail socket with waler MK-120.

Complete with:

	QUANTITY	NAME	ITEM No.
A	1	MK-120 / DU-120	-
B	2	PIN E20x70	0252070
C	2	COTTER PIN R/5	0250000

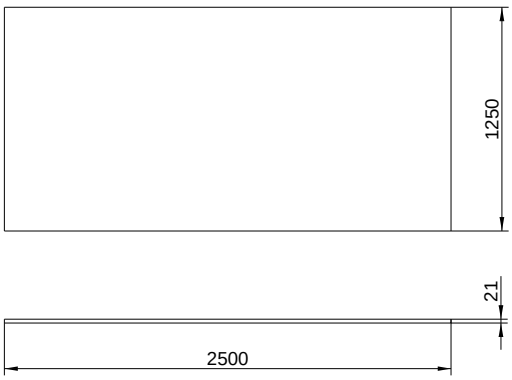


Handrail socket with waler DU-120.

2.2.6. Plywood

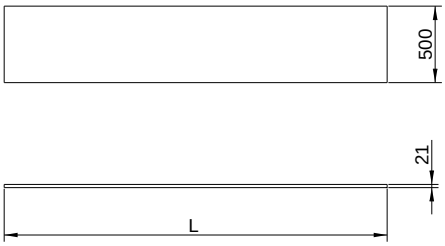
2.2.6.1. PLYWOOD 1.25x2.5x0.021 BIRCH
PLYWOOD 1.25x2.5x0.018 BIRCH
PLYWOOD 1.25x2.5x0.021 BETO
PLYWOOD 1.25x2.5x0.018 BETO

- Phenolic film Plywood for excellent concrete finish with best mechanical properties.
- Any other type of wood can be used with the VR Tables.



2.2.6.2. 3-PLY SHEET 2500x500x21
3- PLY SHEET 2000x500x21
3- PLY SHEET 1500x500x21

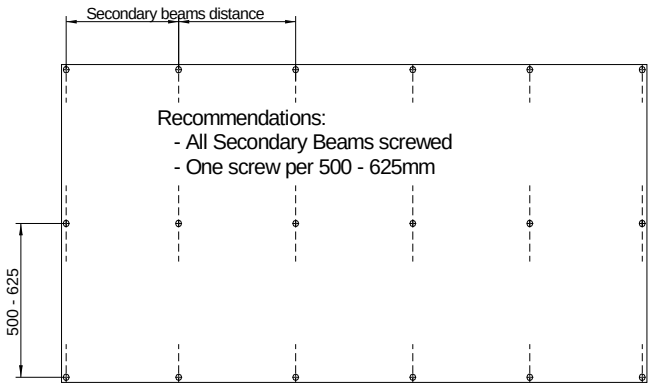
- Resistant melamine coated board for good concrete finish with best mechanical properties.
- Any other type of wood can be used with the VR Tables.



2.2.7. Screws

2.2.7.1. SCREW 5x50 DIN7505-A C

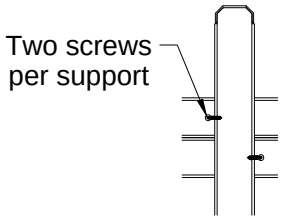
- To fix the plywood over the secondary beam.
- For VR Tables follow recommendations shown in the drawing.



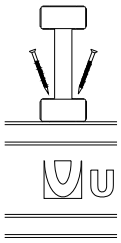
Recommendations for plywood fixing.

2.2.7.2. SCREW 6x80 DIN 7505-A

- To fix the VM20 secondary to the VM20 main beam.
- Two screws diagonally per support recommended.



Top view.



Side view.

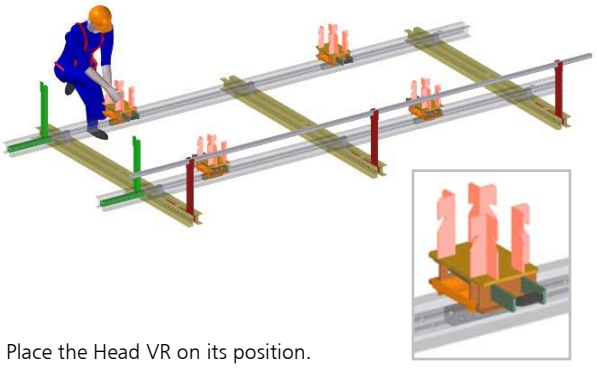
3. Assembly and Use

3.1. VR TABLES ASSEMBLY

A flat level and properly delimited area is required for the assembly of a table. VR Table assembly templates can be used. For more information look up the VR Tables Assembly Technical instructions.

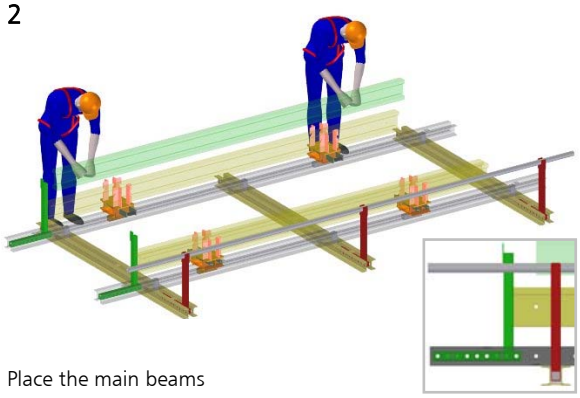
STANDARD VR TABLES ASSEMBLY SEQUENCE

1



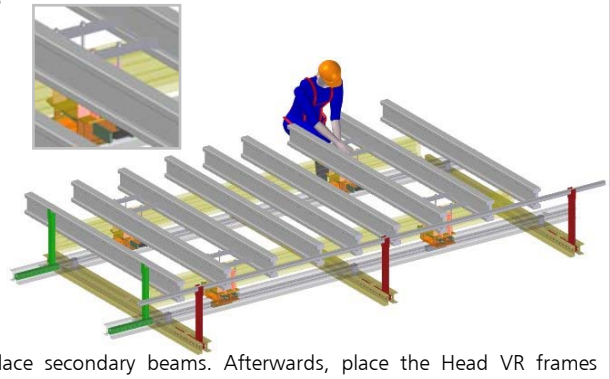
Place the Head VR on its position.

2



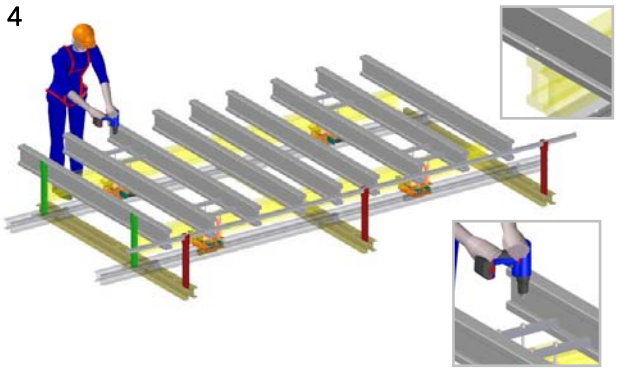
Place the main beams

3



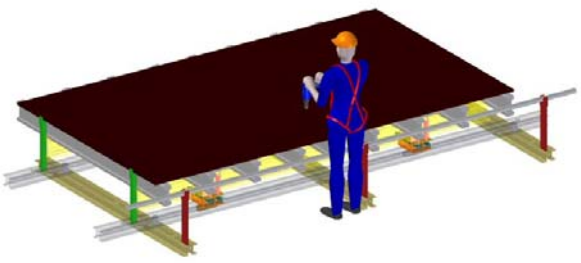
Place secondary beams. Afterwards, place the Head VR frames with the rod or with the connection units.

4



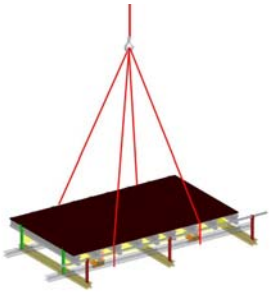
Fix the main and secondary beams with lag screws 6x80 (9371436) and tight the nuts of the Head VR frames.

5



Lay the boards on, align and screw them with 5x50 screws (9370901). Using marking gauges make the work easier.

6



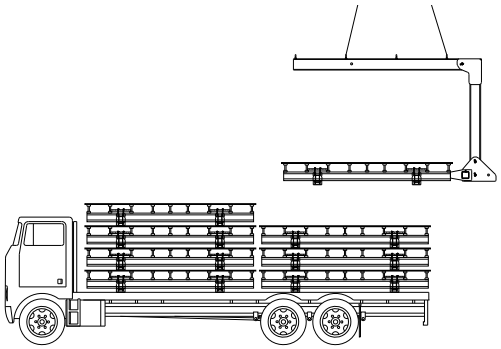
Shift and stack the assembly on the corresponding place using the crane. Be careful not to damage the plywood edges.

3.2. TABLES VR AT SITE

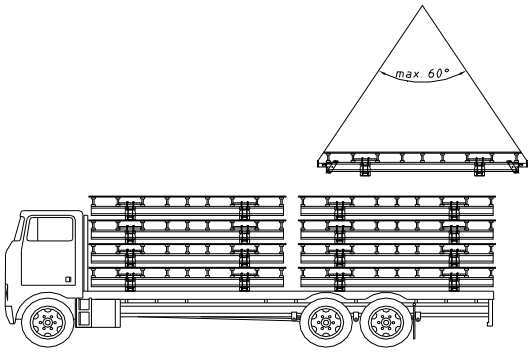
3.2.1. Site delivery

VR Tables can be delivered directly to the site, ready for immediate use.

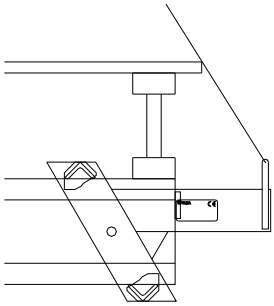
1- Unload VR pre-assembled Tables straight from the lorry with Hook VR (2211030):



2- Unload VR pre-assembled Tables with Lifting hook VR (2211190).



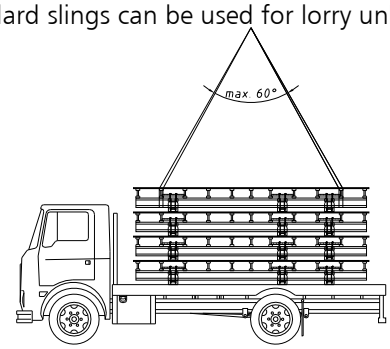
For Tables shifting, 4 Lifting Hooks VR are necessary.



Only for VR Tables with VM20 as main beam.

The edge of long plywood cantilevers, must be protected.

3- Standard slings can be used for lorry unloading.

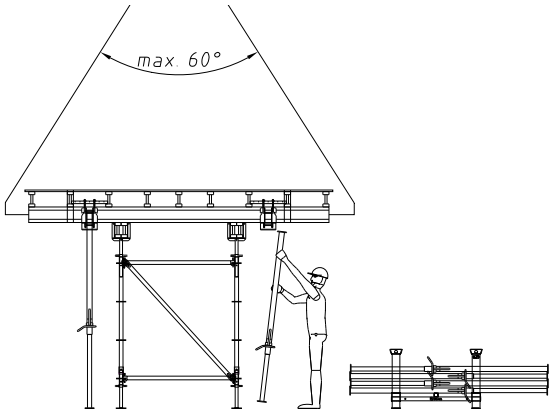


Check sling length to assure max. 60º pulling angle. Prevent plywood damaging.

- VR Table dimensions must always be checked to avoid additional transport over costs.
- Unloading area must be delimited assuring crane accessibility.
- Good synchronization between unloading and supports assembling process can save crane time.
- Hook VR and Lifting hook VR can also be used for:
  - Loading or unloading lorries.
  - Lifting VR Tables away from assembly area.
  - Shifting VR Tables to next use position.
  - Stacking tables.

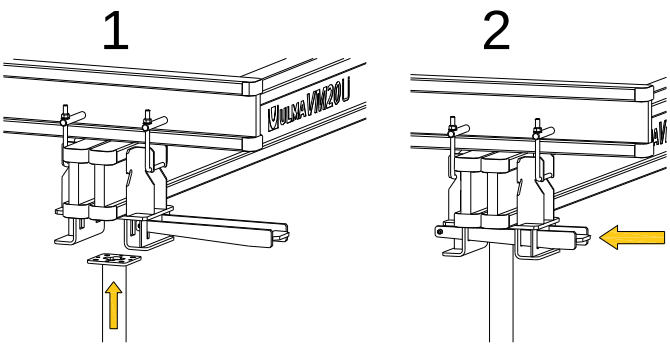
3.2.2. Support system assembly

For VR Tables solutions different support systems are available:



3.2.2.1. PROPS EP

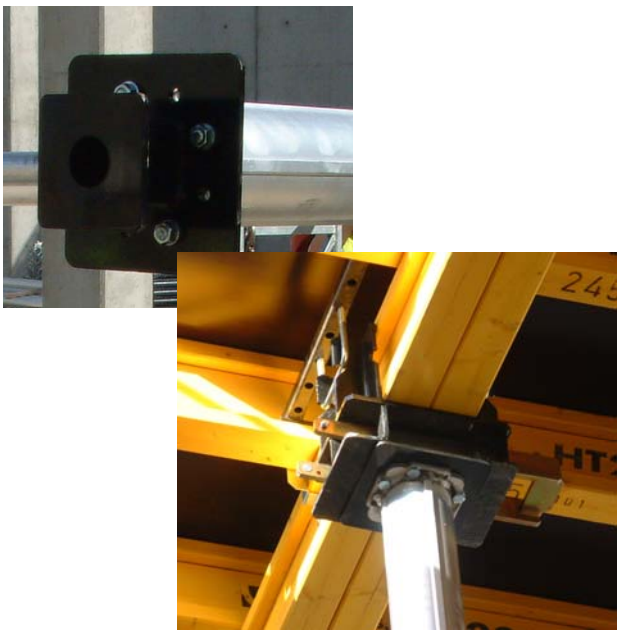
EP props must be prepared for support system assembly. A security scaffolding tower or VR Trolley should be assembled to avoid worker crushing risk.



For EP props assembly, (1) release Head VR's wedge, (2) insert the prop and hit the wedge to fasten it.

3.2.2.2. ALUPROP

ALUPROP Adapter w/screw (2211090) must be assembled on the ALUPROPs. Prepare the props adjusting their extension.



Telescopic handlers or scaffolding towers should be used for fixing the props on the tables' heads. Release the wedge, insert the props and fix the wedge.

3.2.2.3. ALUPROP SHORING TOWERS

- VR Tables and ALUPROP shoring towers must be assembled separately. ALUPROP head connects the Table and the tower. Safe tower accessibility must be provided, e.g. with scaffolding towers or telescopic handlers.

Fit pre-assembled Tables on the tower's ALUPROP heads. Tighten the VR Table to the tower with the rod thread.

3.2.2.4. T-60 SHORING TOWERS

- Follow similar assembly process as for ALUPROP towers.
- Use Two-way U Head VM-DU (1906880) to connect the VR Table and the T-60 towers.
- Stability of the T-60 towers must be checked during assembly process.
- Tighten the VR Table with the rod thread (2211102) or Waler rod thread (2211103).

VR Table with T-60 shoring.

3.2.3. VR Tables shifting with Hook VR

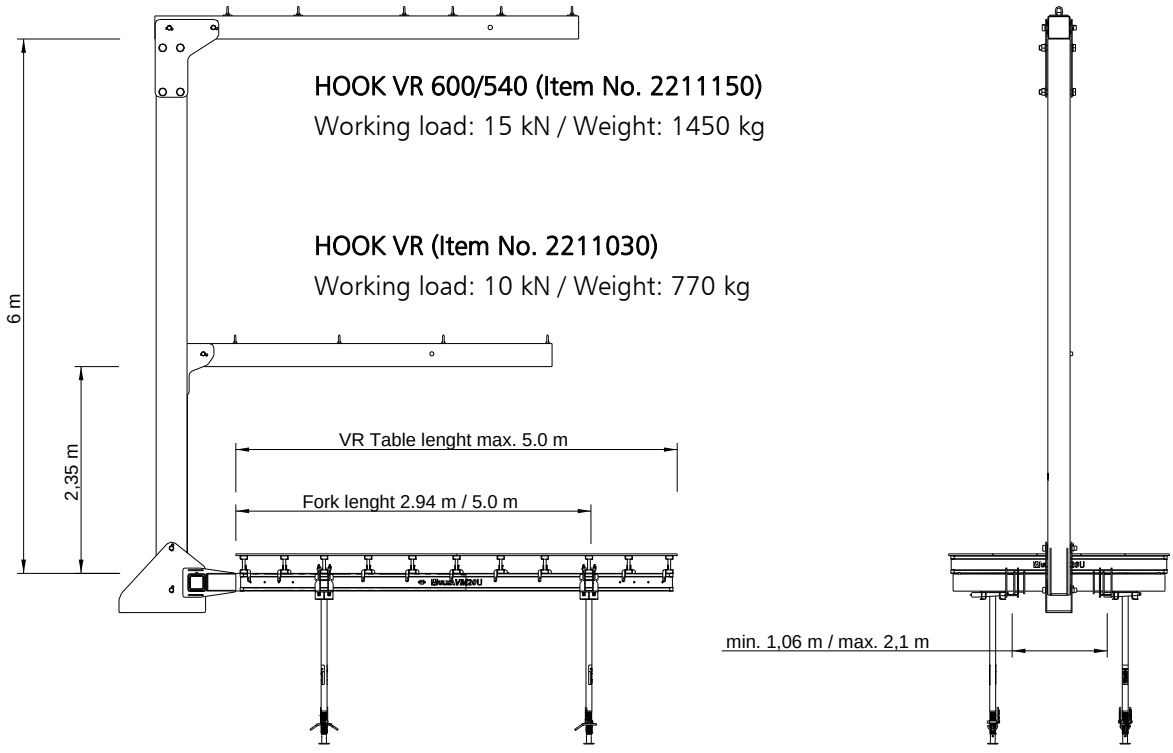
With the Hook, VR Tables can be shifted by crane. Designed to remove VR Tables from a story when four rope slings cannot be used.

Two different Hooks are available:
- Hook VR
- Hook VR 600/540

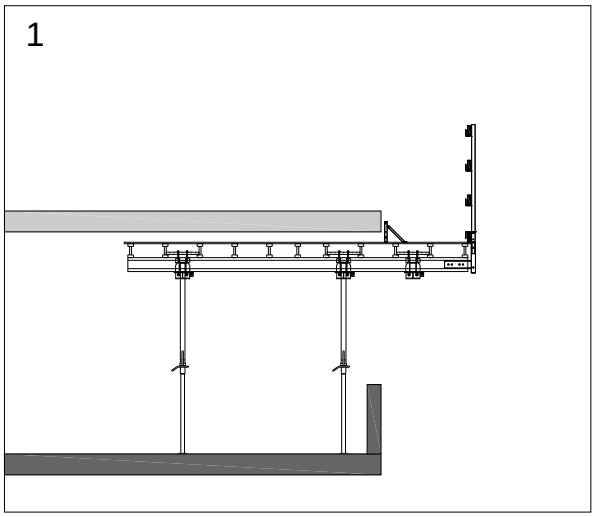
For further information see HOOK VR or HOOK VR 600/540 User's guide.

The following ULMA slab table systems can be lifted with the Hooks VR:
- Props EP.
- ALUPROP (single props or shoring towers).
- T-60 shoring towers.

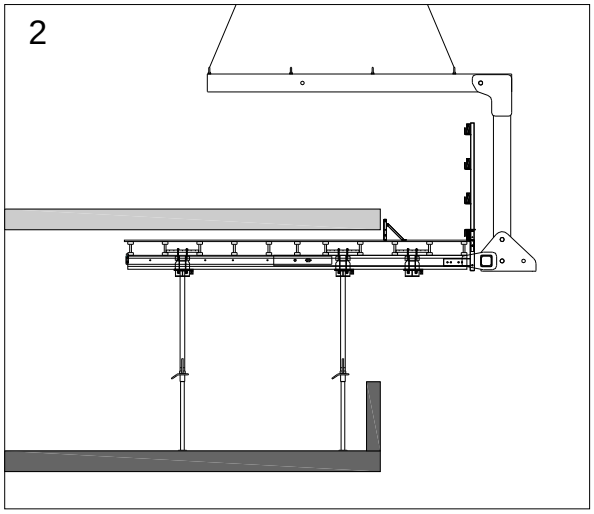
VR Table shifting with Hook VR



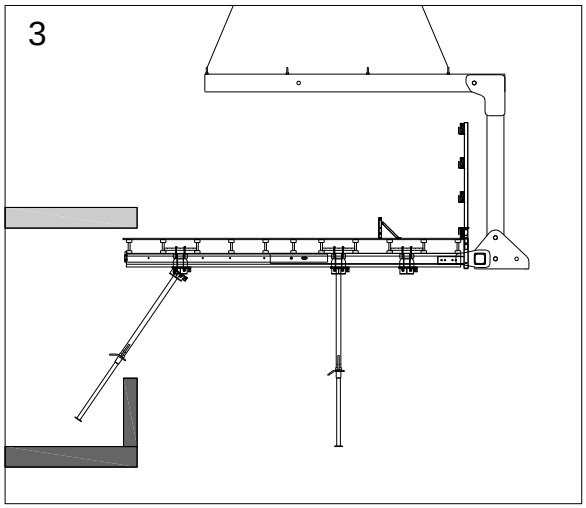
- Choose the correct crane eye to balance the VR Table.
- VR Tables shifting must be programmed to avoid Table interferences and crane overloading.
- Hooks VR are delivered properly folded. At the site, follow User's guide to unfold them.



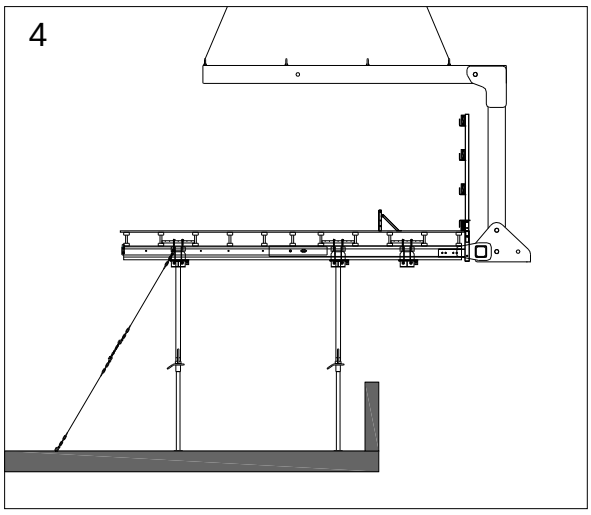
Once the concrete reaches the required strength, strip the VR Table and lower it at least 150 mm. Remove auxiliary elements like Chain VR, nets and intermediate props.



Insert the Hook VR underneath the table. The table's center of gravity must be aligned with the one of the hook.



Lift the Table and carefully take it out of the building. With Swivel head, fold up the props to negotiate parapets or handrails.



Shift the Table to the next position, extend the props to the correct height, align and set it down. Use the Trolley VR for the fine height adjustment.

3.2.4. VR Tables travelling

For Table horizontal movements, ULMA provides a wide range of different solutions:

3.2.4.1. TROLLEY VR

Accessory for elevating and transporting VR Table with non-braced props shoring

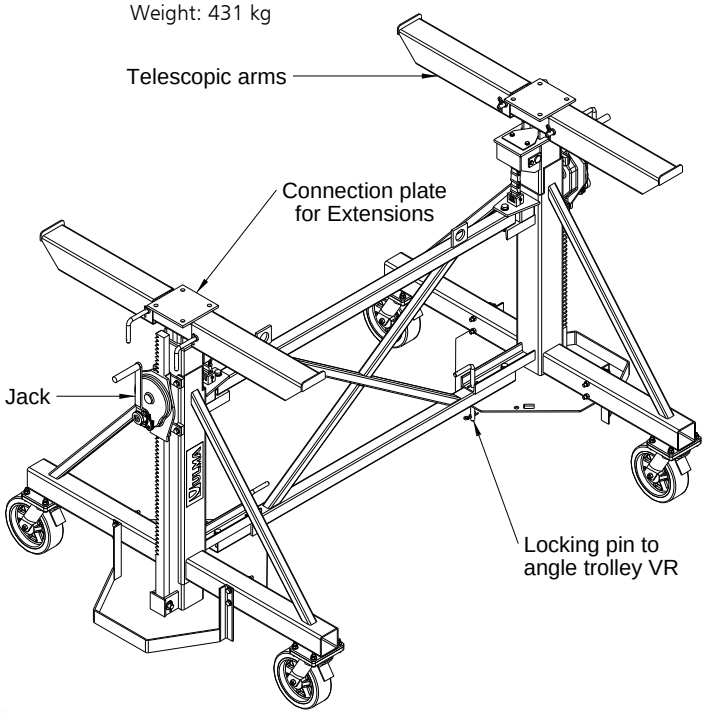
Working load: 15 kN
(with and without extension)

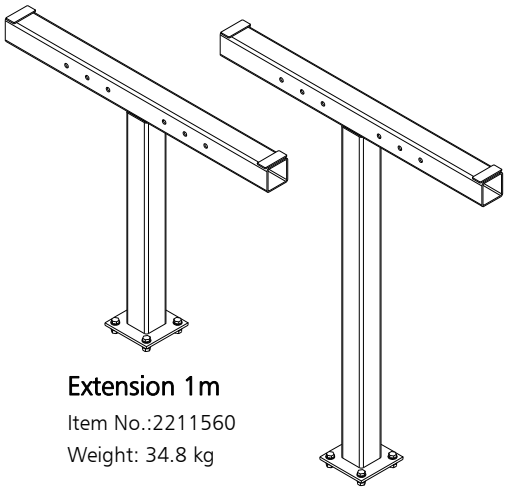
Trolley VR application height:
- without extension: 1.45 m – 3.2 m
- with extension 1 m: 2.45 m – 4.2 m
- with extension 1.5 m: 2.95 m – 4.7 m

Telescopic arms width:
- Narrow position: 1.46 m
- Medium: 1.66 / 1.86 m
- Wide position: 2.06 m

Trolley VR with a pre-assembled Table

Trolley VR
Item No.: 2211031
Weight: 431 kg

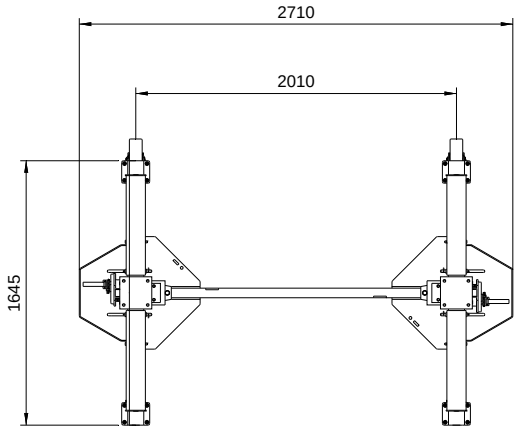




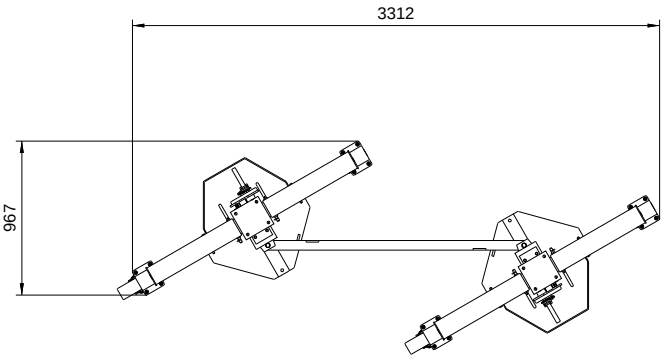
Extension 1m
Item No.:2211560
Weight: 34.8 kg

Extension 1.5m
Item No.:2211569
Weight: 42 kg

Working position:



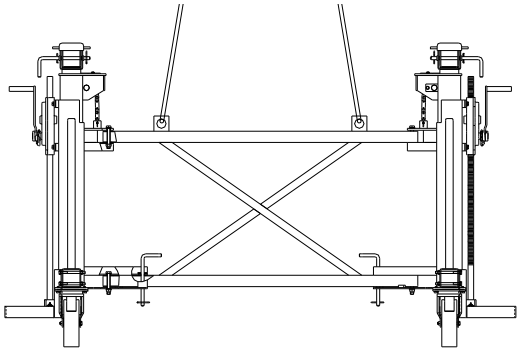
Angled position:



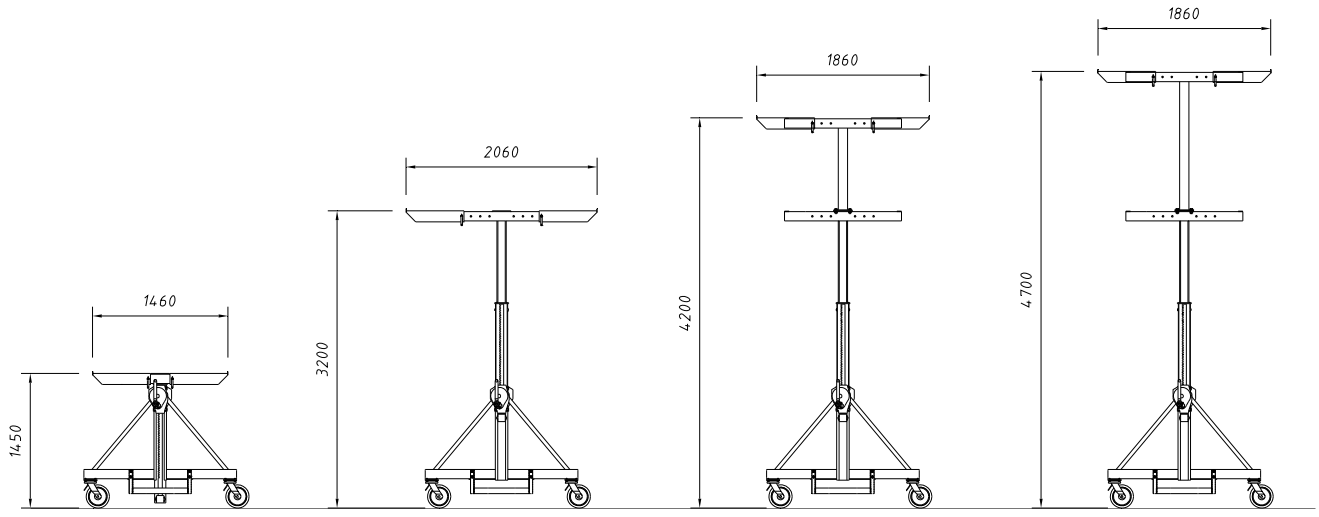
Instructions for use of the Trolley VR:

- Not approved for transporting personnel.
- Load over Trolley must be uniformly distributed.
- Operate both jacks uniformly.
- Extend telescopic arms equally.
- Only move on clean, levelled and sufficiently strong surfaces.
- Loads can only be moved with the trolley in working position, never in angled position.
- Move the VR Table in the longest base direction.

For lifting with crane:



General dimensions of the Trolley VR with the telescopic arms and the extensions:



3.2.4.2. LATERAL TROLLEY VR

Accessory for elevating and transporting VR Table with braced props shoring or shoring towers.

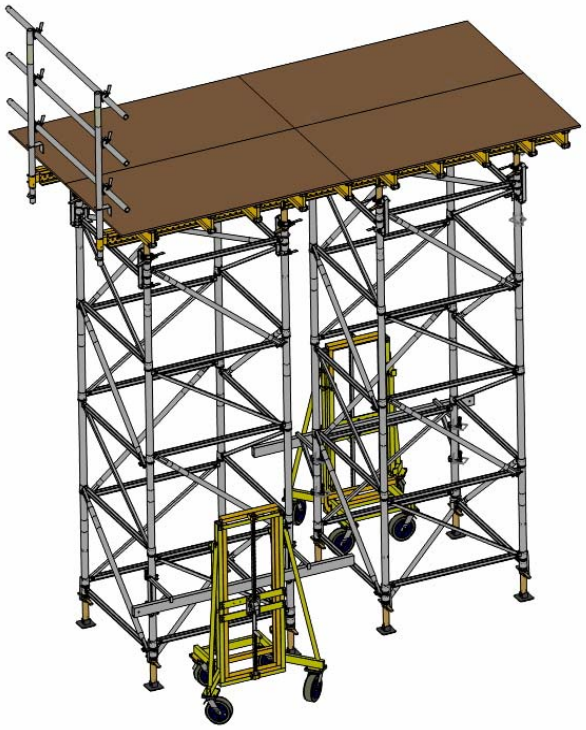
Working load: 10 kN
(2 Trolleys necessary for the travelling)

The following ULMA slab supports can be moved with Lateral Trolley VR:

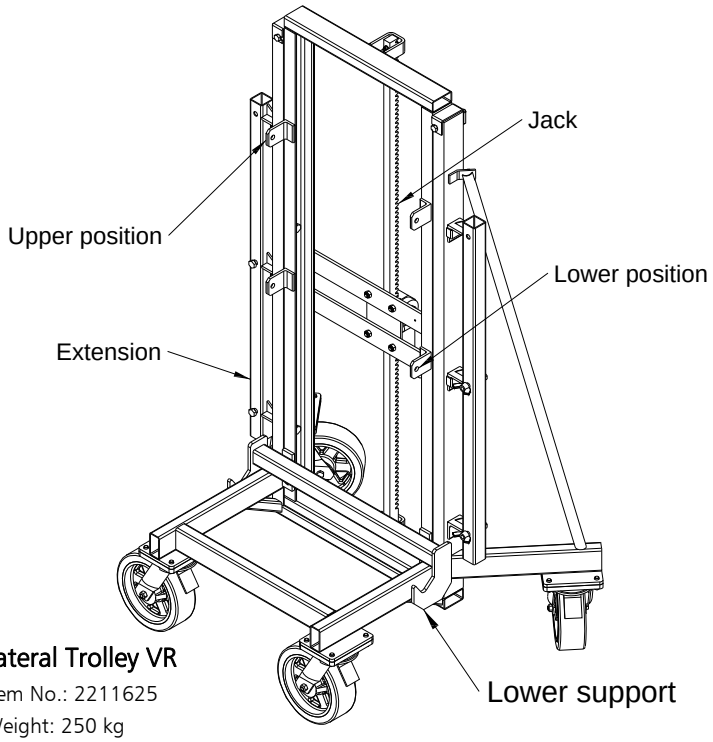
- ALUPROP shoring towers.
- T-60 shoring towers.

Lateral Trolley VR application heights:

- Lower support: 395 mm – 1015 mm
- With extensions:
  - Low position:
    - Min. height: 610 mm – 1230 mm
    - Med. Height: 1140 mm – 1760 mm
    - Max. height: 1670 mm – 2290 mm
  - Upper position:
    - Min. height: 1088 mm – 1713 mm
    - Med. Height: 1618 mm – 2443 mm
    - Max. height: 2148 mm – 2773 mm

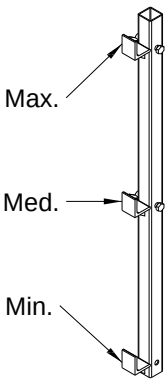


VR Table movement with Lateral Trolley VR.



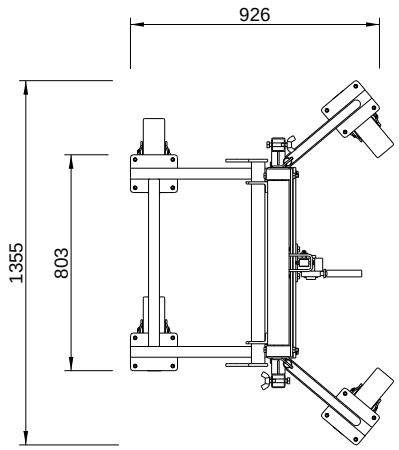
Lateral Trolley VR
Item No.: 2211625
Weight: 250 kg

Extension
Item No.: 2211638
Weight: 6.7 kg

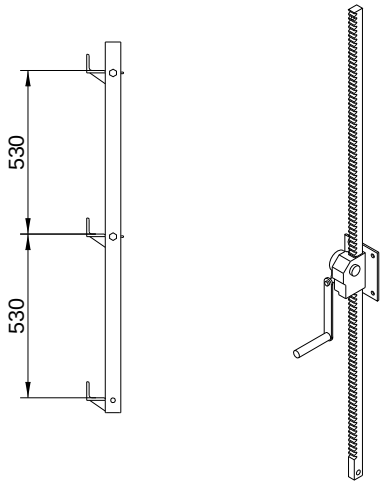


Bolt for extensions assembly included.
Both extensions are included in the Lateral Trolley VR.

General dimensions:



Extension and Jack regulations:



Jack regulations:
- 625 mm

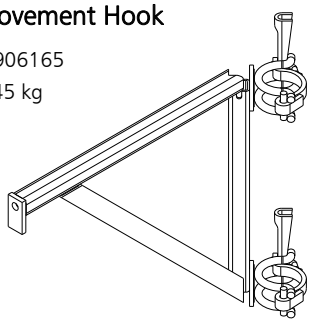
Instructions for use of the Lateral Trolley VR:

- Not approved for transporting personnel.
- Load over Lateral Trolley must be uniformly distributed.
- Operate both Lateral Trolleys uniformly.
- Before VR Tables movement, check the required height range and adapt Lateral Trolley's extensions position accordingly.
- Only move on clean, level and sufficiently strong surfaces.
- Move the VR Table in the longest base direction.

T-60 shoring application:

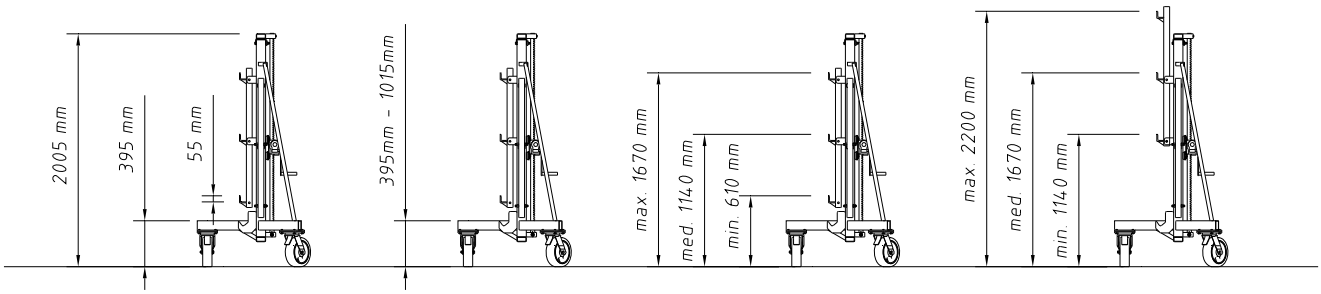
Tower Movement Hook

Item No.:1906165
Weight: 5.45 kg



For further information see User's guide Lateral Trolley VR.

General dimensions of the Lateral Trolley with the extensions:



Lower support *Extensions lower position* *Extensions upper position*

3.2.4.3. SPT TRUCK ADAPTOR

Accessory for elevating and transporting VR Tables with non-braced props shoring.

In addition to SPT Truck adaptor, any standard Self-Powered truck can be used.

Working load: 15 kN.
Under no circumstances it can be exceeded.

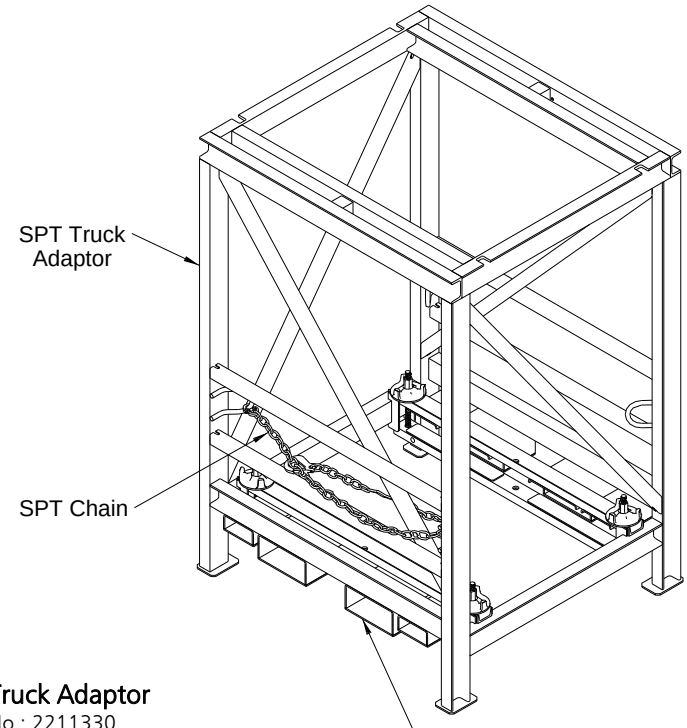
The following ULMA slab supports can be moved with SPT Truck Adaptor:

- EP Props.
- ALUPROPS.

The Adaptor modifies the load capacity and the height of the Truck. To use both together, it is compulsory to adapt the Truck's CE Mark Plate, calculating the residual working load.

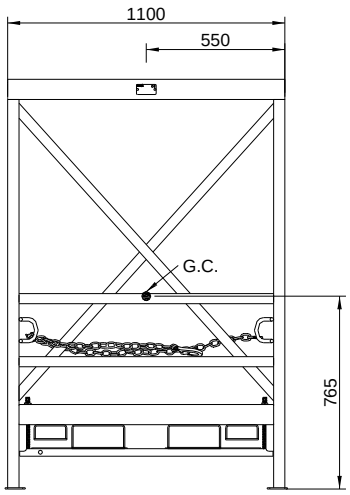
For further information see SPT TRUCK ADAPTOR User's guide.

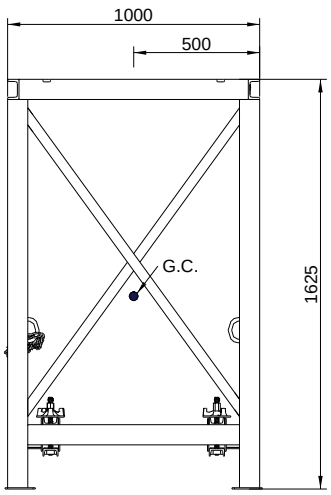
VR Table movement with SPT Truck Adaptor.



SPT Truck Adaptor
Item No.: 2211330
Weight: 240 kg

SPT Truck general dimensions and Gravity centre:

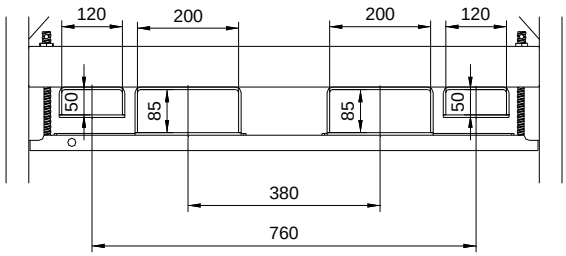




Instructions for use of the SPT Truck Adaptor:

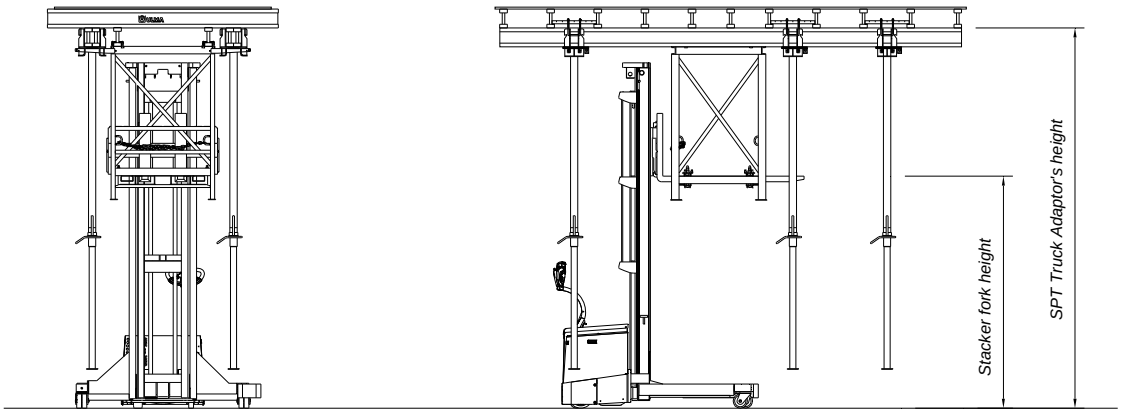
- It is totally forbidden to use the Truck without calculations of the residual working loads.
- Not approved for transporting personnel.
- Load over the Adaptor must be uniformly distributed. G.C. position must be considered.
- Only move on clean, level and sufficiently strong surfaces.
- Move the VR Tables slowly, avoiding sudden movements and in the longest base direction.
- Only trained and authorized personnel will manipulate the Truck.

SPT Truck Adaptor's fork positions:



Two fork fixing options for the wide range of available Trucks.

General application with SPT Truck Adaptor with four wheel operation stacker:



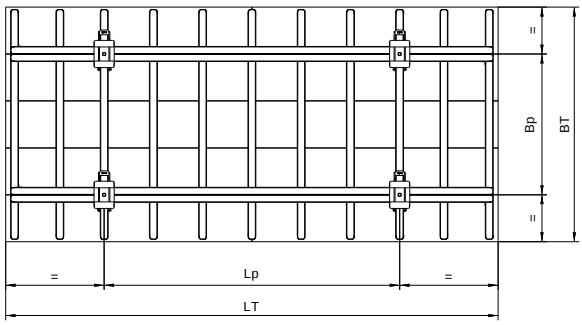
4. Solutions

4.1. STANDARD TABLES VR

Standard VR Table dimensions:

(m)	STANDARD VR TABLES (*)			
	2.5 x 5	2.5 x 4	2.0 x 5	2.0 x 4
L_T	5	4	5	4
L_P	3.0	2.25	3.0	2.25
B_T	2.5	2.5	2.0	2.0
B_P	1.5	1.5	1.5	1.5

* check your local ULMA branch sizes



Standard VR Table dimensions.

Standard VR tables are supplied to site fully pre-assembled and ready for immediate use.

Reduced height makes them easy to transport and storage, suitable for formwork hiring market.

Head VR wedge connection makes props easy to assemble and disassemble.

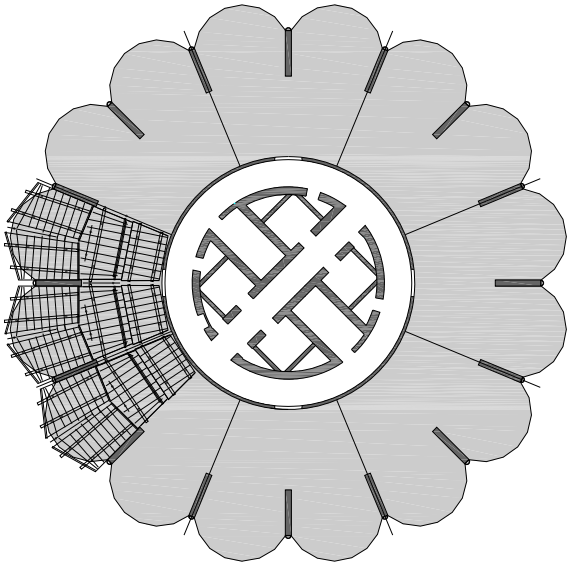
They are easy to reinforce with Double Head VR.

The whole range of EP Props is available to support Standard VR Tables system, up to 5.4 m.

Head VR connections increase the load-bearing capacity of the EP props.

4.2. CUSTOMISED TABLES VR

Customised VR Tables are also possible where needed. Designed to fit in a particular building structure, they are often the most cost-effective solution.



Customised solution for DONA Towers, Dubai, UAE.

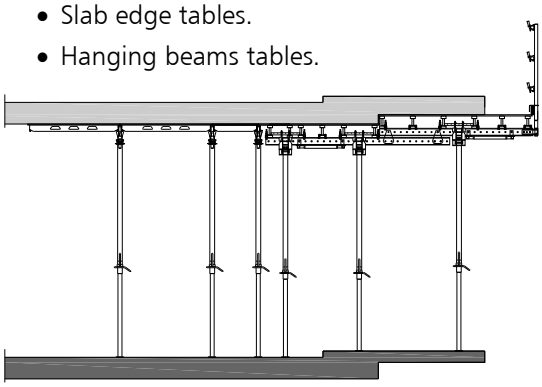
With Customised VR Tables.

- Minimise infill areas.
- Optimise girder spans and prop load capacities for the given slab thicknesses.
- Solution with integrated safety elements.

Customised VR Table solution for FIRA Towers, BCN, Spain.

VR Tables' flexibility provides many different solutions like:

- Trapezoidal tables.
- Slab edge tables.
- Hanging beams tables.



Edge hanging beam slab table.

4.3. GENERAL RECOMMENDATIONS FOR VR TABLES TECHNICAL STUDIES

The following recommendations should be considered for VR Tables technical studies:

- Characteristics of projects suitable for VR Tables:
  - Tight project time schedule.
  - High formwork performance requirements.
  - Example of VR Tables' target jobsites: airports, malls, hospitals.
- Basic initial data:
  - Concrete structure construction planned timing.
  - Total projected slab area.
  - Minimum formwork removal time: concrete tests might be required.
- Construction joints:
  - All construction joints location should be planned.
  - Good concrete effort transmission must be assured at the joint, through the adherence between the new and the old poured concrete.
  - Make the construction joints coincide with the expansion joints, if it is possible.
  - The construction joint should be placed where minimum bending moment will appear: one fifth of the span between columns.
- Slab formwork material estimation:
  - With the basic initial data, daily production can be estimated.
  - For daily production over 3000 m^2, differenced working teams are suggested.
  - Working in teams avoids worker crowds and overloading auxiliary resources, e.g. cranes, trucks…
  - The final formwork set up should be adopted consistently with the site's necessities.
- VR Tables shifting:
  - 2 different possibilities: horizontal travelling or lifting.
  - *Travelling*: fastest way to shift VR Table. No need for crane. Ensure that VR Tables will not be trapped in the building structure.
  - *Lifting*: Risk of crane overloading and delay due to excessive wind. Hook VR's maximum height and working load must be checked.
- Recommendations for VR Tables layout:
  - Decide the moving direction of each table according to columns alignment and column infilling solution.
  - From the very beginning, the whole project should be studied to try to reuse the same Tables configuration in each pouring stage. Eventual future problems should be detected in this early phase.
  - Auxiliary resources must be defined: cranes, trucks and even their site situation (VR Tables accessibility). Minimising the auxiliary resource dependence increases VR Tables efficiency.
  - Estimate the life span of the plywood to be used during the whole construction time. Replacing the plywood might be necessary.

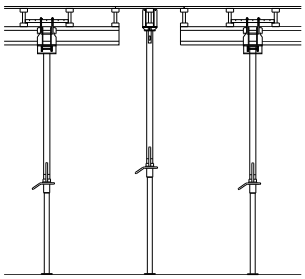
4.4. INFILLINGS

The area between VR Tables has to be filled by plywood pieces.

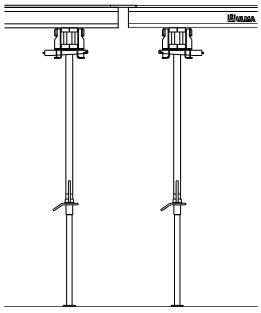
Transversal infilling areas between VR tables and columns

- Correct infilling applications must ensure easy striking and table edge protection. The infilling area can be used for temporary slab support.
- VR Tables must be horizontally restrained in both directions before concrete pouring. Infilling areas and boundary Tables should provide this restriction.

Longitudinal infilling with additional support



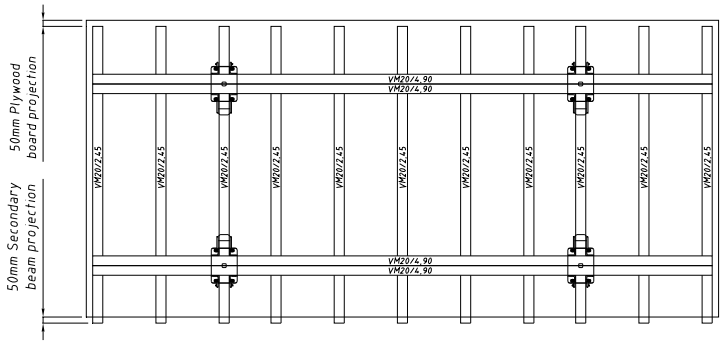
Transversal infilling



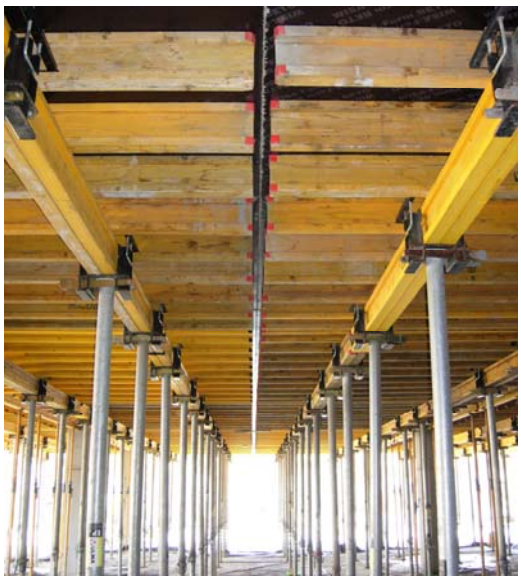
Depending on the building structure and the project schedule, different table solutions can be adopted:

4.4.1. Standard solution:

- Suggested table configuration:

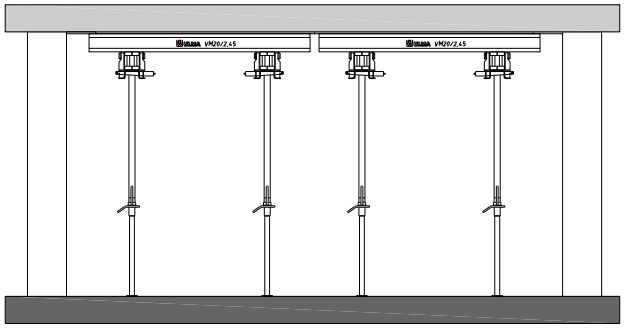


Suggested standard solution.



Standard solution.

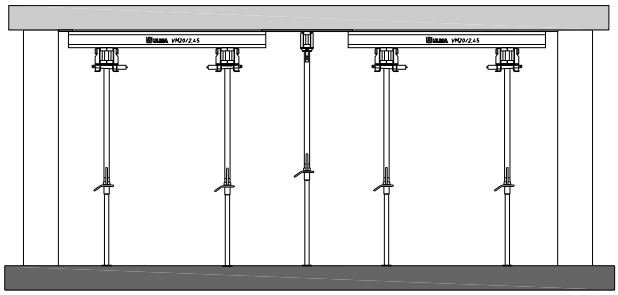
- Adjust Tables in the inner part avoiding infillings.
- Accumulate total infilling between columns.
- Column infilling can be temporary supported.



For early formwork removal, reshoring is required.

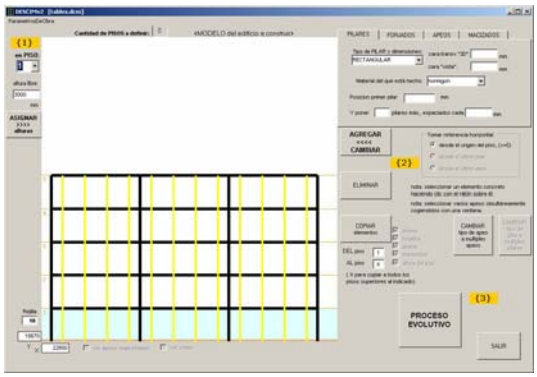
4.4.2. Early formwork removal

- Distribute total infilling between the Tables. Inner infilling can be additionally supported. Early formwork removal is possible by maintaining the inner infillings.



- Concrete structure calculation may be required before striking the tables.

Early formwork removal solution.



DESCIM, ULMA Construcion's calculation software

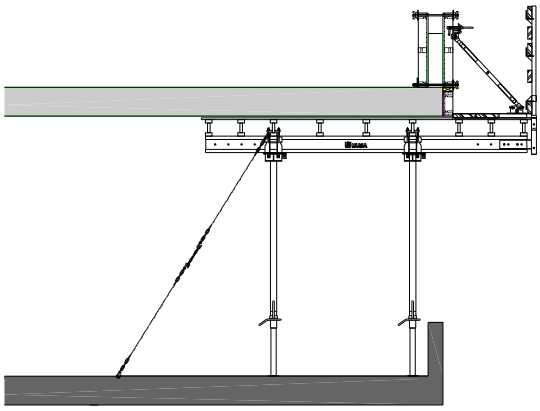
- ULMA construcción has developed a specific software for the calculation of early formwork removal, shoring and reshoring of multy-storey building.

4.5. SAFE SLAB EDGE SOLUTION

Slab edge VR Tables solution.

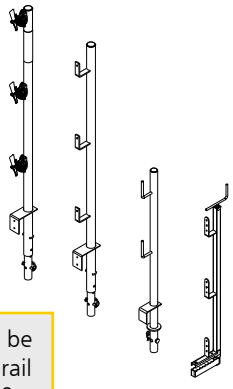
- VR Table system provides a safe slab edge solutions with:
  - Handrails.
  - Anchoring system.
  - Edge stopends.
  - Working platform.

- The striping and shifting of VR Tables fulfil all safety standards and recommendations



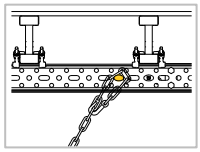
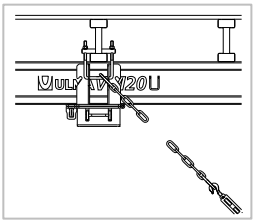
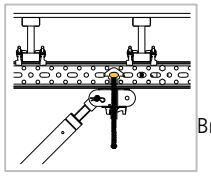
VR Table slab edge solution.

- Slab edge tables must incorporate an anchoring system to prevent overturning. Different options are available:
  - Chain VR.
  - Push-Pull props and Brace Heads.



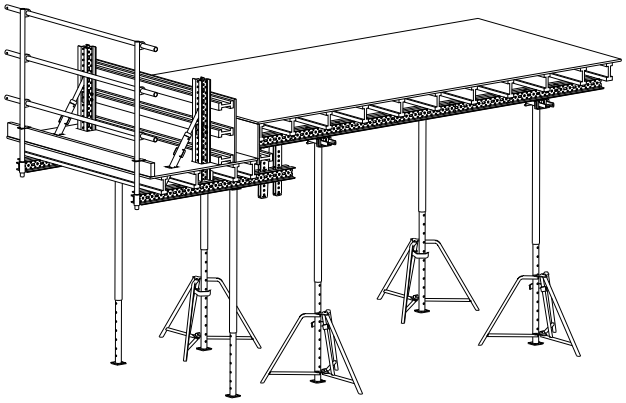
All safety handrails can be assembled with VM Handrail Support or Handrail socket D50

- Safety handrail must be included in ground pre-assembled tables. A wide range of ULMA Handrail options are available:
  - Safety handrail 1.5 m (steel tube or wood plank).
  - Safety handrail post.
  - Clamp handrail 1m.

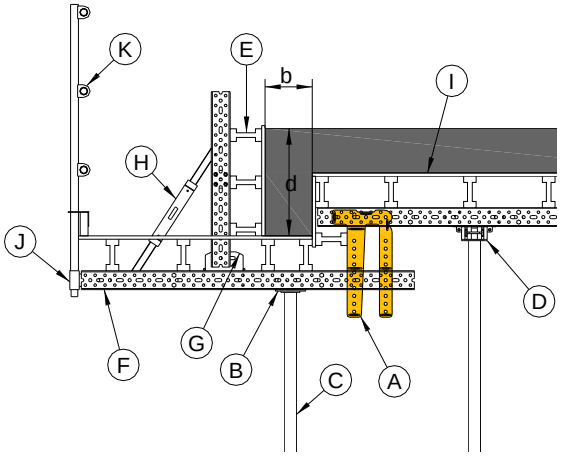
For Waler:	For VM20:
1 	1 
Chain VR (2211750)	
2 	
Push-Pull prop and Brace Heads (1960275)	

4.6. SLAB EDGE HANGING BEAMS

- Standard slab edge hanging beam solution with Hanging beam plate 60:
  - Up to 60 cm hanging beam (every 5 cm).
  - Assembly with Pin E20x70.
  - Secondary beams with VM20 Timber beam.
  - Working platform incorporated.
  - Safety handrail incorporated.
  - Solution for all walers: MK, DU-120 and V-100.
  - Anchoring system necessary.



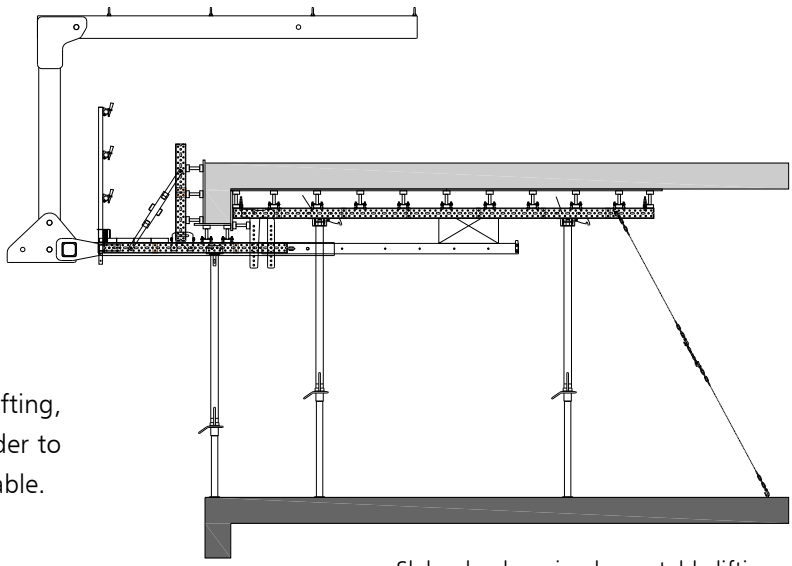
Perimeter slab edge hanging beam solution with VR Tables.



	ELEMENT	ITEM No.
A	HANGING BEAM PLATE 60	2211360
B	SIMPLE HEAD WALER	2211300
C	EP PROP C+D30	2200000
D	HEAD WALER VR	2211310
E	TIMBER BEAM VM20	-
F	MK-120	-
G	BOTTOM ADJUSTABLE JOINT	1960080
H	PUSH-PULL PROP	-
I	PLYWOOD	-
J	HANDRAIL SOCKET D50	0121004
K	SAFETY HANDRAIL 1.50	2211156

d max. dimensions: 90 cm

b depends on the lengths of walers (vertical and horizontal), and props load carrying capacity.



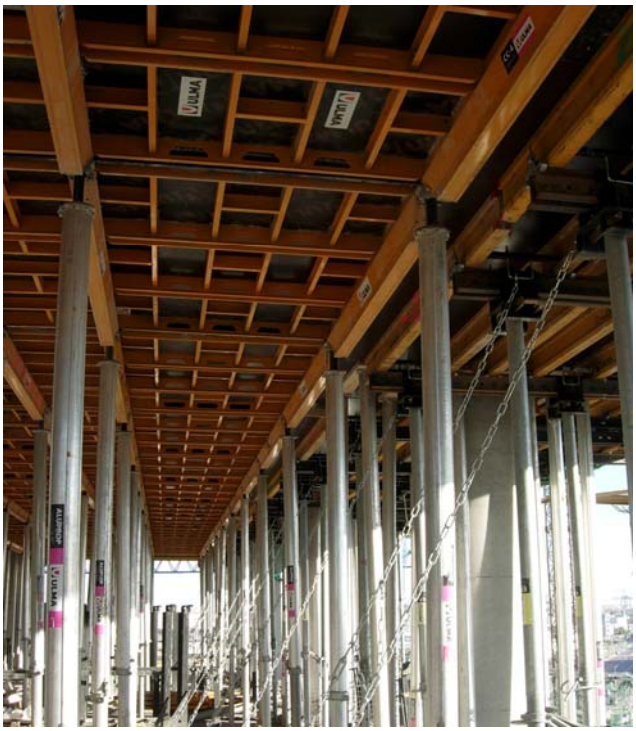
Slab edge hanging beam table lifting.

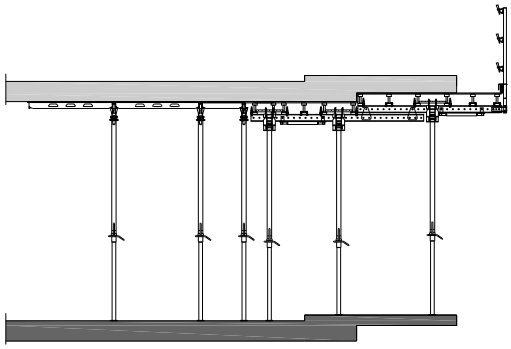
- For slab edge hanging beam tables lifting, the Hook VR must be adapted in order to provide an uniform support to this table.

4.7. COMBINING WITH OTHER ULMA SYSTEMS

VR Tables system can be easily combined with other ULMA systems like:

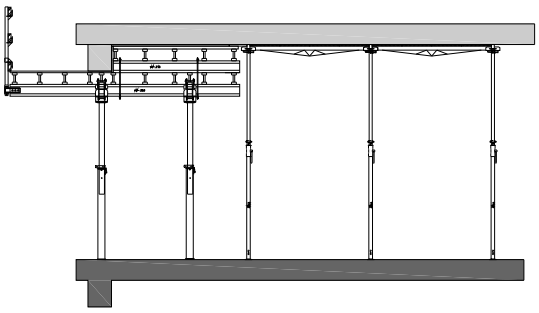
CC-4: Aluminium panel slab formwork





Slab edge VR Tables with CC-4.

RAPID: conventional slab formwork



Slab edge hanging beam tables with Rapid.

5. Features

5.1. MAXIMUM SLAB THICKNESSES

STANDARD VR TABLES WITH VM20 TIMBER BEAM AS MAIN BEAM

VR TABLES (with VM20 as main beam)	Standard Modules			
	M 2.5 x 5	M 2.5 x 4	M 2.0 x 5	M 2.0 x 4
Max. Slab Thicknesses (m)	0.4	0.52	0.52	0.66
Props max. load (kN)	38.23	38.82	38.88	38.26

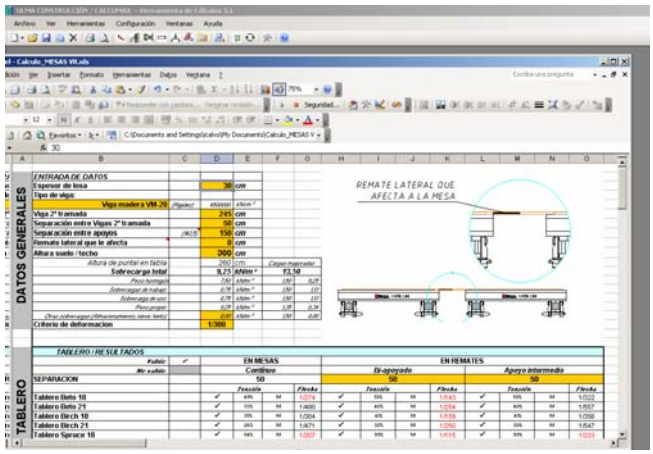
* check your local ULMA branch sizes

- Permissible slab thicknesses and props maximum loads for Standard VR Tables defined in 4.1.

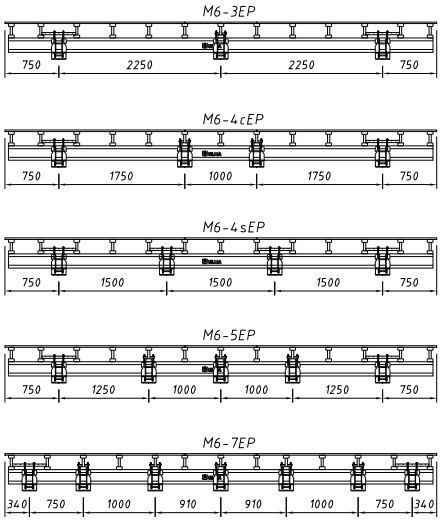
- For especial configurations check with your local ULMA technical department.

- For non-standard VR Tables, ULMA Construcción has developed specific software to calculate customised VR Tables.

- ULMA engineers can design and customised Tables according to the structure constraints. The program offers many customisation variables like:
  - Table's dimensions.
  - Secondary beams spacing.
  - Infilling influence in the table.
  - Slab thickness.
  - Selected plywood.
  - Selected shoring and calculation.



CALCUMAX, ULMA Construccion's customised tables software.



6 m long table types.

- Multiple types of Tables are available with different shoring systems. See beside suggested 6 m long tables with EP props.

5.2. EP PROPS

Working Loads for EP Props (kN).

Prop	EP C25		EP C+D30		EP C+D35		EP C+D40		EP C+D45		EP C+D50		EP C+E30		EP C+E40	
Inner tube	Up	Down	Up	Down	Up	Down	Up	Down	Up	Down	Up	Down	Up	Down	Up	Down
h (m)	1.50 m - 2.50 m		1.80 m - 3.00 m		2.00 m - 3.50 m		2.20 m - 4.00 m		2.50 m - 4.50 m		2.80 m - 5.00 m		1.80 m - 3.00 m		2.20 m - 4.00 m	
5											23.70	24.70				
4.9											25.10	26.60				
4.8											26.60	28.50				
4.7											28.10	30.30				
4.6											29.70	32.20				
4.5									28.90	30.60	31.40	34.20				
4.4									30.80	32.70	33.20	36.30				
4.3									32.80	34.90	35.20	38.70				
4.2									35.00	37.30	37.40	41.30				
4.1									37.20	39.90	39.80	44.10				
4							23.20	26.20	39.70	42.60	42.40	45.60			36.00	37.40
3.9							24.90	28.30	42.40	45.60	45.40	45.60			38.80	40.40
3.8							26.70	30.50	45.40	45.60	45.60	45.60			41.80	43.60
3.7							28.50	32.80	45.60	45.60	45.60	45.60			44.90	45.60
3.6							30.50	35.50	45.60	45.60	45.60	45.60			45.60	45.60
3.5					29.80	33.20	32.60	38.50	45.60	45.60	45.60	45.60			45.60	45.60
3.4					32.30	36.30	35.00	42.00	45.60	45.60	45.60	45.60			45.60	45.60
3.3					34.90	39.60	37.60	45.60	45.60	45.60	45.60	45.60			45.60	45.60
3.2					37.70	43.40	40.50	45.60	45.60	45.60	45.60	45.60			45.60	45.60
3.1					40.80	45.60	42.30	45.60	45.60	45.60	45.60	45.60			45.60	45.60
3			23.30	28.20	44.20	45.60	44.20	45.60	45.60	45.60	45.60	45.60	39.70	43.50	45.60	45.60
2.9			25.30	31.30	45.60	45.60	45.60	45.60	45.60	45.60	45.60	45.60	43.70	45.60	45.60	45.60
2.8			27.50	34.80	45.60	45.60	45.60	45.60	45.60	45.60	45.60	45.60	45.60	45.60	45.60	45.60
2.7			29.90	38.90	45.60	45.60	45.60	45.60	45.60	45.60			45.60	45.60	45.60	45.60
2.6			32.50	44.00	45.60	45.60	45.60	45.60	45.60	45.60			45.60	45.60	45.60	45.60
2.5	32.30	39.30	34.20	45.60	45.60	45.60	45.60	45.60	45.60	45.60			45.60	45.60	45.60	45.60
2.4	35.80	44.20	35.50	45.60	45.60	45.60	45.60	45.60					45.60	45.60	45.60	45.60
2.3	37.80	45.60	37.10	45.60	45.60	45.60	45.60	45.60					45.60	45.60	45.60	45.60
2.2	39.10	45.60	39.20	45.60	45.60	45.60							45.60	45.60		
2.1	40.20	45.60	42.20	45.60	45.60	45.60							45.60	45.60		
2	41.70	45.60	45.60	45.60	45.60	45.60							45.60	45.60		
1.9	43.80	45.60	45.60	45.60									45.60	45.60		
1.8	45.60	45.60	45.60	45.60									45.60	45.60		
1.7	45.60	45.60														
1.6	45.60	45.60														
1.5	45.60	45.60														

Loads are only valid for VR Head, Swivel Head VR and Head Waler VR.
Working Loads for Inner tube down can only be used with VR Tables.
For working loads of props with other systems or system- independent, check product manuals.

5.3. ALUPROP

Working Loads for ALUPROP (kN).

Prop	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						

Working loads based on European Standard UNE-EN-1065.

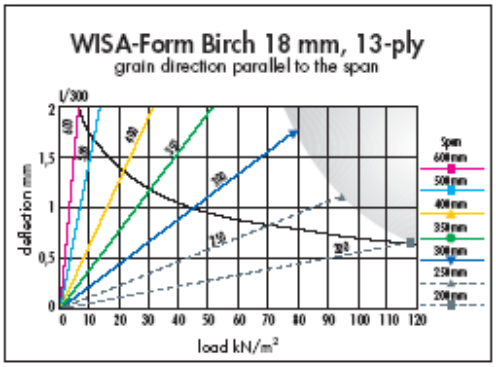
5.4. PLYWOOD

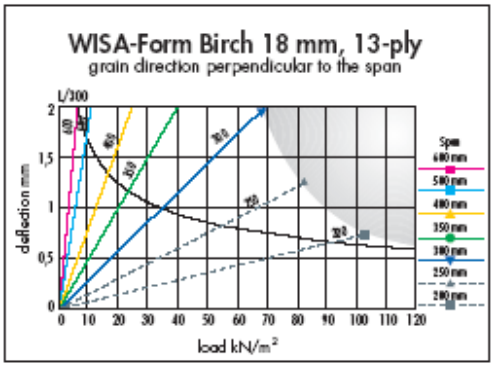
- ULMA provides different surface grades and structural performance plywoods for all project requirements.
- Increased moisture content and temperature variation may cause internal stresses, thickness swelling or surface defects. Metal slings, hooks or chains mustn't be in contact with the panels.

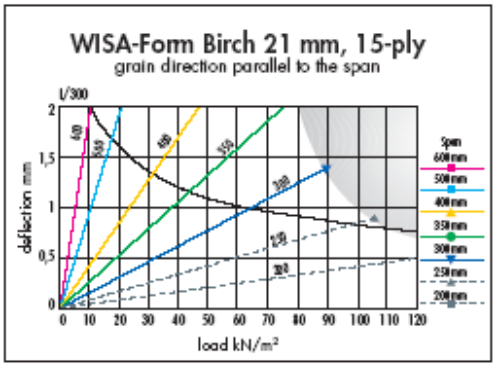
BIRCH PLYWOOD:

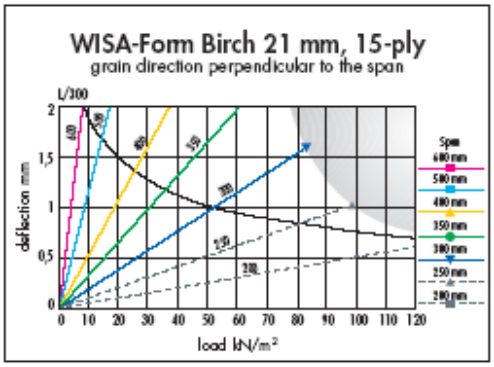
- Excellent strength, stiffness and resistance to creep.
- High planar resistance and impact resistance make it especially suitable for heavy-duty floor structures.
- Excellent surface hardness, damage and wear resistance.
- Properly surfaced and edge sealed Birch plywood also offers excellence weather and moisture resistance.

Nominal thickness (mm)	Mean modulus of elasticity bending (N/mm²)		Characteristic strength bending (N/mm²)	
	Em,II	Em,⊥	fm,II	fm,⊥
18	10048	7452	40.2	34.1
21	9858	7642	39.4	34.3







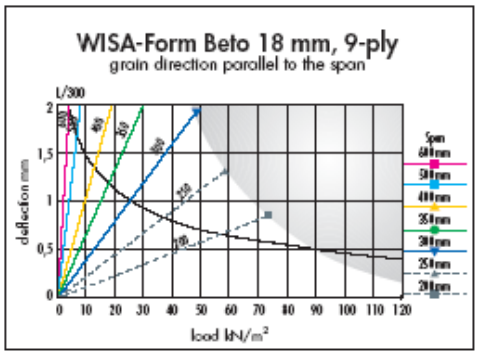


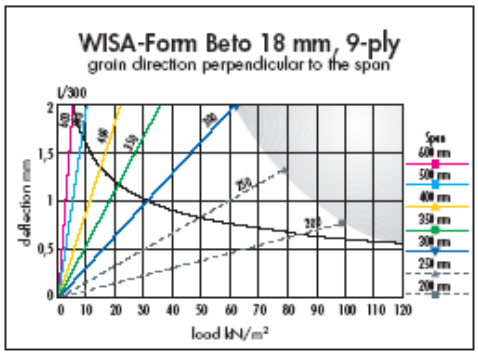
Moisture content 27 %, short time loading
Partial safety factor for the material is 1.3. Partial safety factor for the loads is 1.2.
Deflection limit L/300 of the span
Support width is not taken into account in calculations

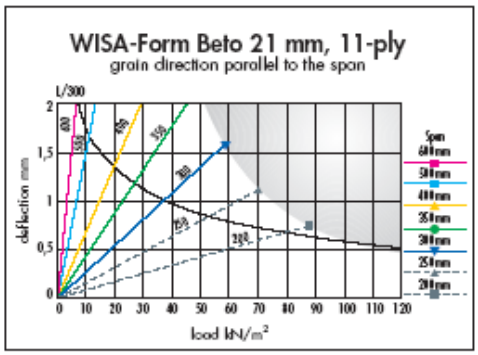
BETO PLYWOOD:

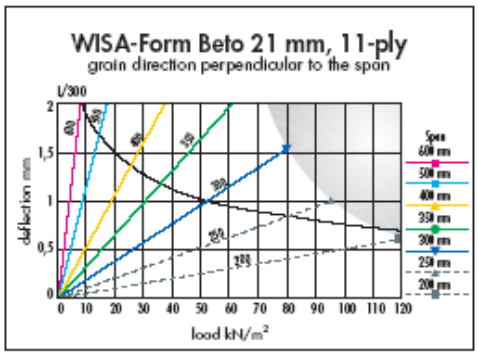
- Strength and stiffness on its major axes are quite similar ensuring a balanced structure.
- These properties are in many respects virtually same as those of birch plywood.
- An exception to this is planar shear, where the strength in the cross-grain direction of the face veneer is clearly inferior to the strength in the grain direction.
- Plywood has a smooth and durable birch face, and surface hardness and damage resistance are comparable to those of birch plywood.
- Properly surfaced and edge sealed, Beto plywood offers excellence weather and moisture resistance.

Nominal thickness (mm)	Mean modulus of elasticity bending (N/mm²)		Characteristic strength bending (N/mm²)	
	$E_{m,II}$	$E_{m,\perp}$	$f_{m,II}$	$f_{m,\perp}$
18	7864	7158	31.5	25.3
21	7621	7338	30.5	25.3









Moisture content 27 %, short time loading
Partial safety factor for the material is 1.3. Partial safety factor for the loads is 1.2.
Deflection limit L/300 of the span
Support width is not taken into account in calculations

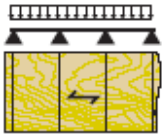
SPRUCE PLYWOOD:

- Spruce plywood is characterised by its less dense surface when compared with birch, a prominent grain structure and a larger number of knots.
- It is easy to work and nail. Remarkable low weight
- Strength and stiffness properties are reasonable good and dimensional changes when subjected to moisture variations are minimal.

Nominal thickness	Mean modulus of elasticity bending (N/mm²)		Characteristic strength bending (N/mm²)	
	$E_{m\parallel}$	$E_{m\perp}$	$f_{m\parallel}$	$f_{m\perp}$
18 mm	5395	6605	13.5	18.8
21 mm	5226	6774	13.1	18.9

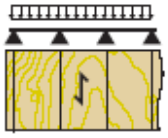
Face grain parallel to the span

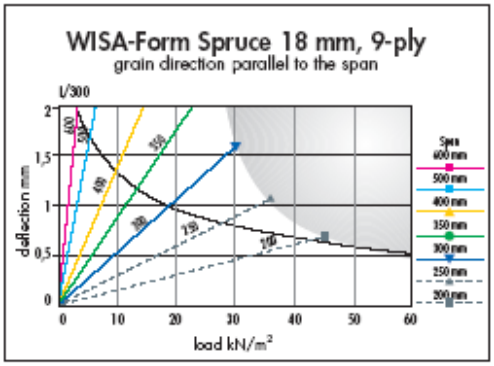
grain direction of surface veneers

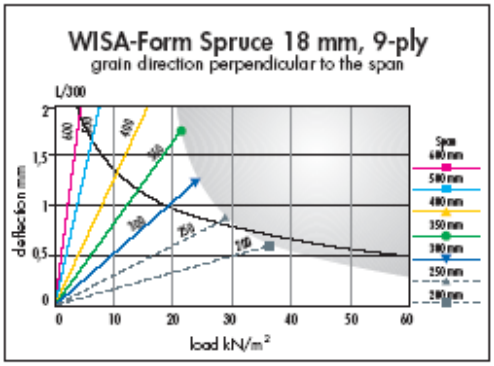


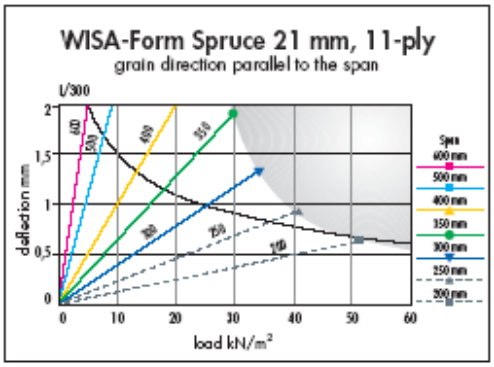
Face grain perpendicular to the span

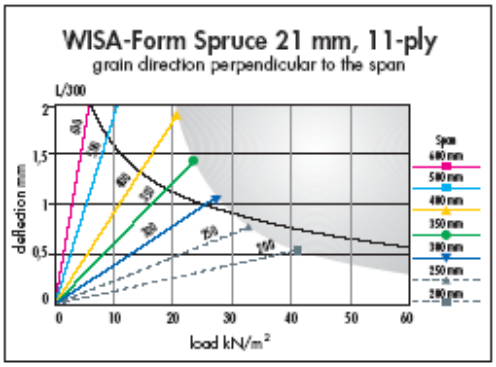
grain direction of surface veneers











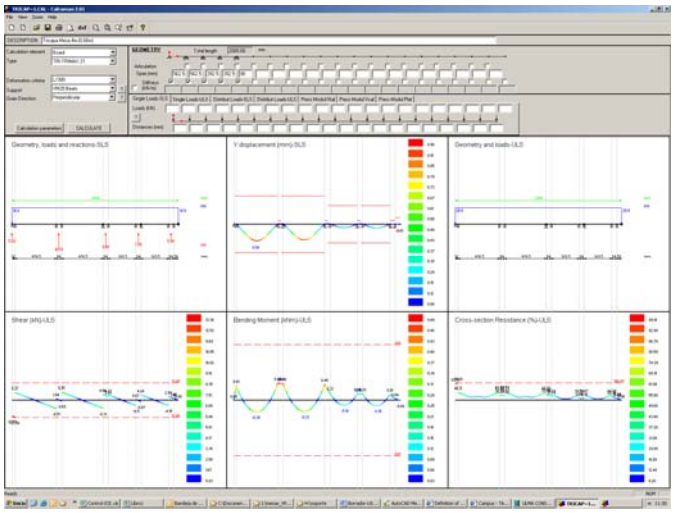
Moisture content 27 %, short time loading
Partial safety factor for the material is 1.3. Partial safety factor for the loads is 1.2.
Deflection limit L/300 of the span
Support width is not taken into account in calculations

3 LAYER SHEET

- 3 layer solid wood panel made of high grade spruce, fir or pine laminations with resistant melamine coating of approximately 130 g per m^2 and side.
- Gluing with MUF under controlled temperature and pressure conditions, based on the SWP/3 Exterior condition of the UNE CEN/TS 13354.
- Best surface and edge seal quality: Seamlessly sanded surfaces and water repellent formwork edge finish.
- Robust, resilient formliner with a long service life.

Nominal thickness (mm)	Mean modulus of elasticity bending (N/mm^2)		Mean modulus of elasticity bending (N/mm^2)	
	Em $_{\|\|}$	Em $_{-\|-}$	fm $_{\|\|}$	fm $_{-\|-}$
21	10400	960	42	6
27	9700	1800	36	10

- For special 3-layer sheet configurations contact to your local ULMA technical department. ULMA Construcción has developed specific software to boards and the beams calculation.



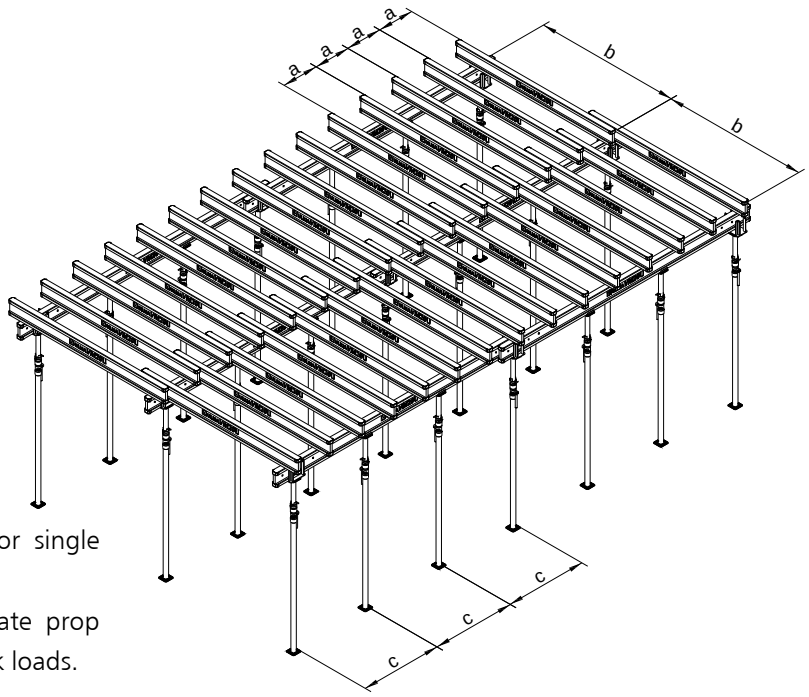
ULMA's Boards and beams calculation software.

5.5. ENKOFLEX

The most flexible slab formwork with VM20 timber beams.

SLAB THICKNESS (m)	Load according EN 12812 (kN/m2)	DISTANCE BETWEEN MAIN BEAMS "b" (m)				DISTANCE BETWEEN PROPS "c" (m)								
		Distance between Secondary Beams "a" (m)				Distance between Main Beams (m)								
		0.357	0.416	0.500	0.625	1.00	1.50	1.75	2.00	2.25	2.50	2.75	3.00	3.50
0.10	4.00	4.63	4.40	4.14	3.84	3.16	2.58	2.39	2.24	2.11	2.00	1.91	1.83	1.57
0.12	4.50	4.41	4.20	3.95	3.66	2.98	2.43	2.25	2.11	1.99	1.89	1.78	1.63	1.40
0.14	5.00	4.23	4.02	3.78	3.51	2.83	2.31	2.14	2.00	1.89	1.76	1.60	1.47	1.26
0.16	5.50	4.08	3.88	3.65	3.39	2.70	2.20	2.04	1.91	1.78	1.60	1.45	1.33	1.14
0.18	6.00	3.95	3.75	3.53	3.27	2.58	2.11	1.95	1.83	1.63	1.47	1.33	1.22	1.05
0.20	6.50	3.83	3.64	3.42	3.14	2.48	2.03	1.88	1.69	1.50	1.35	1.23	1.13	0.97
0.21	6.75	3.77	3.59	3.37	3.08	2.43	1.99	1.84	1.63	1.45	1.30	1.19	1.09	0.93
0.24	7.50	3.63	3.45	3.24	2.92	2.31	1.89	1.68	1.47	1.30	1.17	1.07	0.98	0.84
0.26	8.00	3.54	3.37	3.16	2.83	2.24	1.83	1.57	1.38	1.22	1.10	1.00	0.92	0.79
0.28	8.50	3.47	3.29	3.07	2.74	2.17	1.73	1.48	1.29	1.15	1.04	0.94	0.86	0.74
0.30	9.00	3.39	3.23	2.98	2.67	2.11	1.63	1.40	1.22	1.09	0.98	0.89	0.81	0.70
0.35	10.38	3.24	3.04	2.78	2.48	1.96	1.41	1.21	1.06	0.94	0.85	0.77	0.71	0.61
0.40	11.75	3.09	2.86	2.61	2.33	1.85	1.25	1.07	0.94	0.83	0.75	0.68	0.62	0.53
0.45	13.13	2.92	2.71	2.47	2.21	1.68	1.12	0.96	0.84	0.74	0.67	0.61	0.56	0.48
0.50	14.50	2.78	2.58	2.35	2.10	1.52	1.01	0.87	0.76	0.67	0.61	0.55	0.51	0.43
0.55	15.88	2.66	2.46	2.24	2.01	1.39	0.92	0.79	0.69	0.62	0.55	0.50	0.46	0.40
0.60	17.25	2.55	2.36	2.15	1.93	1.28	0.85	0.73	0.64	0.57	0.51	0.46	0.43	0.36
0.65	18.63	2.45	2.27	2.07	1.85	1.18	0.79	0.67	0.59	0.52	0.47	0.43	0.39	0.34
0.70	20.00	2.37	2.19	2.00	1.76	1.10	0.73	0.63	0.55	0.49	0.44	0.40	0.37	0.31
0.75	21.25	2.30	2.13	1.94	1.66	1.04	0.69	0.59	0.52	0.46	0.41	0.38	0.35	0.30
0.80	22.50	2.23	2.07	1.89	1.56	0.98	0.65	0.56	0.49	0.43	0.39	0.36	0.33	0.28
0.85	23.75	2.17	2.01	1.84	1.48	0.93	0.62	0.53	0.46	0.41	0.37	0.34	0.31	0.26
0.90	25.00	2.12	1.96	1.76	1.41	0.88	0.59	0.50	0.44	0.39	0.35	0.32	0.29	0.25
0.95	26.25	2.07	1.91	1.68	1.34	0.84	0.56	0.48	0.42	0.37	0.34	0.30	0.28	0.24
1.00	27.50	2.02	1.87	1.60	1.28	0.80	0.53	0.46	0.40	0.36	0.32	0.29	0.27	0.23

BEAMS	ITEM No.
TIMBER BEAM VM 20/1.45	1940191
TIMBER BEAM VM 20/1.9	1940172
TIMBER BEAM VM 20/2.15	1940197
TIMBER BEAM VM 20/2.45	1950129
TIMBER BEAM VM 20/2.65	1940196
TIMBER BEAM VM 20/2.9	1940144
TIMBER BEAM VM 20/3.3	1950130
TIMBER BEAM VM 20/3.6	1940146
TIMBER BEAM VM 20/3.9	1950112
TIMBER BEAM VM 20/4.5	1940178
TIMBER BEAM VM 20/4.9	1950113
TIMBER BEAM VM 20/5.9	1940149



- Deformation criterion. L/300.
- VM20 Timber Beams properties:
  - Permissible shear force: Q= 11 kN
  - Permissible bending: M= 5 kN
  - Stiffness (EI): EI=450 kNm^2
- Max. prop loads never exceed 22 kN for single VM20 main beam.
- Depending on the height, the appropriate prop must be selected to support the formwork loads.

6. Terms and conditions of use

6.1. SAFE OPERATING GUIDELINES

6.1.1. General guidelines

- It is recommended to strictly follow the instructions of the project plan, the health and safety plan, as well as any further technical and/or safety rules which might apply to the project.
- Works are carried out by qualified personnel only, and under the supervision of a competent person.
- Instructions of use for the employed equipment must be followed. Consult operating manuals of the manufacturer or distributor.
- Only statutory auxiliary means and the corresponding protection equipment, preferably collective protection equipment are employed.
- Personal protective equipment (PPE) should comprise at least safety helmet, safety footwear, protective gloves and tool holder belt. Whenever necessary use further PPE, such as reflective jackets, anti-fall harness with lifeline, goggles, breathing masks, earmuffs, etc.

- The safety handrail should be used as collective protection, and, as the case may be, the mobile tower, nets under the formwork and perimeter scaffolding.
- Avoid heavy impacts on working platform or plywood. It is strictly forbidden to jump on platforms or plywood, to abruptly unload material or letting it fall from height onto the platforms.
- 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.
- Under adverse weather conditions, works on the building site should stop.
- Under heavy wind conditions, remove materials and other objects from the platforms, and check the stability of all ties, meshes, platform anchorages, etc. before and afterwards.
- Before starting the stripping/dismantling procedure, check that all structural components (e.g. ties) are in place. If not, revise the assembly before proceeding with stripping/dismantling.
- Furthermore, check that no loose material remains on the structure, e.g. on working platforms, in danger of falling from it, and striking persons below.
- The following measures must be taken to restrict access to the structure during erection and dismantling or whenever the structure is not in correct working conditions (e.g. missing collective protection): signposting, fencing, closing or demarcation with straps, barriers or meshes of the working area and third-party passageways.
- Employees and any third party accessing a structure without collective protection yet in place, must wear all indicated PPE to prevent falls from height or to be protected from falling objects.
- The purchaser or lessee of the structure shall instruct its employees on all necessary guidelines for the safe operating of the structure.
- Any alterations of the structure must be executed under the supervision of a competent person and must comply with instructions in the operating manuals of the manufacturer or distributor.
- The purchaser or lessee shall conduct periodic checks of the assembly to verify the correct installation of critical structural elements and to

identify the potential withdrawal of parts or the alteration of the structure as such by employees or a third party.

6.1.2. Guidelines for formwork

6.1.2.1. Formwork

- Do not leave any part half-assembled or half-dismantled.
- Before concrete pouring, make sure the formwork surfaces are clean.
- Clean tables after each use. Wire brushes are not suitable for cleaning as they are damaging the phenolic film of the plywood.
- It is important to state that the phenolic coating rarely suffers from the chemical and abrasive action of the concrete. But where it is already damaged, e.g. at holes and deteriorated areas, it must be thoroughly sealed to prevent any further damage to the plywood.
- Any cut edge of the plywood should be sealed as soon as possible, because cut edges soak up water from the concrete and swell, thus increasing in thickness.
- In general, it is not recommended to use nails or screws on the plywood.
- For storage, the tables should be stacked one on top of the other, placing wood runners between them. Use some sort of support to separate them from the ground, and provide shelter. Prolonged sun and rain exposure damages the panels.

6.1.2.2. Before VR TABLES assembly:

- All staff handling the VR Tables must be trained and must have read the "User's guide" before working with said equipment. Additionally, they must have access to the user's guide at all time.
- Mark off and impede circulation in working areas.
- Move only through signposted areas on the working zone.
- Check formwork elements and safety elements. Replace as necessary. Confirm:
  - That no knocks or blows have damaged their section.
  - That they are not bent.
- Check the following in timber or plastic elements:
  - That they have no knocks, cracks or knots that reduce their resistance.
  - That they are properly secured to their supports.
  - Replace as necessary.
- Check safety hooks and slings before putting up or removing the formwork.
- Use suitable anchoring and certified slings and hoists when lifting.
- To access the formwork, use the mandatory ladders, stair towers or walkways.
- In mobile scaffolding towers, work with the brake on and do not move them when the operator is on top of them.
- Train personnel in manual load handling.

6.1.2.3. Working with VR TABLES

- The VR Table formwork must be layout and removed by competent people assigned by the foreman to avoid any wrong operations.
- When moving material in slings, secure it to make sure that it does not come loose in transit.
- Do not drive under hanging loads or in areas where machinery is operating.
- Holes should be protected with covers, handrails, nets or meshes to prevent people from falling from one level to another.
- Do not leave any element semi-assembled.
- Properly brace the structure when it is assembled.

- Check that the Head VR and Swivel Head VR have been wedged properly.

Slab edge formwork:

- Follow the specific procedure in the assembly and disassembly of the slab edge formwork.
- The sides of the formwork or slab edge scaffolding will have handrails. Handrail supports must be in place in order to install the handrail on the standard grid. The housing is included in the perimeter solution.
- Use 15 cm toe boards on the perimeter handrails.
- In slab edge areas, make sure that the anti-flip, anchoring system element (Chain VR, push-pull props…) have been properly assembled in the table.

Props:

- Props should be used properly, observing working loads, plumbing and with stable support.
- When height of prop is exceeded, use the shoring towers.

6.1.2.4. Release agent

- Release agent helps separating the formwork from the concrete, and thus increases the number of uses and the life span of the table in general.
- It plays an important role for the quality of the concrete finishing because it prevents holes from air bubbles on the concrete surface and provides a uniform colour.
- Apply the release agent uniformly and in thin layers onto the panel, bearing in mind at all times the instructions for correct use.
- Thoroughly clean the panel surface before applying the release agent on it.

6.1.2.5. Concrete placement and compaction

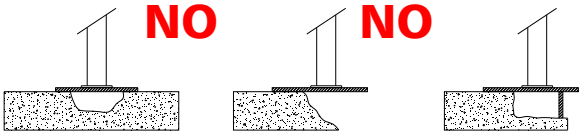
- Comply with the maximum pressures according to the instructions of the respective formwork system.
- Continuously check the state of the formwork during concrete casting. Stop further casting in case of any incident.
- Place the concrete in uniform layers of 30 to 45 cm.
- For vertical concrete placement, cast the concrete from the least height above the formwork possible. Do never exceed 2 m height unless a pipe or tube or any similar accessory is used to channel the concrete. Deposit the concrete as near as possible to the formwork base, centring on one point without casting directly against the formwork.
- When casting with bucket, take special care of not hitting the formwork, and of complying with the maximum load-bearing capacity of the crane.
- Avoid concrete splashes on the plywood as these will reflect on the finished surface.
- Use the appropriate method for concrete consolidation and compaction depending on the concrete consistency and its workability.
- The preferred consolidation and compaction method for wet cast-in-place concrete are poker vibrators. Use external vibrators only when the concrete cannot be accessed with poker vibrators and for parts moulded already in the workshop. External vibration requires a specific analysis.
- Completely immerse the poker 10 to 15 cm into the concrete, and put it into each area of concrete, only once. When concrete is poured in layers, place the vibrator into the previous layer to meld the two layers together.

- Never allow the vibrator to touch the formwork to prevent exceeding the considered loads.
- Immerse vertically or slightly inclined and quickly, but withdraw slowly.

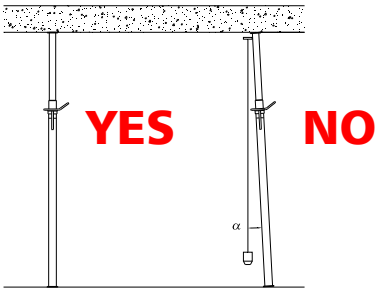
6.1.2.6. Concrete curing and formwork stripping

- Check that curing is sufficiently advanced for stripping without causing spalling at the concrete surface which destroys the finishing and can affect the strength and durability of the concrete.
- Increase the curing time of the concrete when facing fast drying and shrinkage due to evaporation from wind or low temperatures.
- The time span between casting and stripping shall be the same for all parts of the concrete structure. This is justified when a high finishing quality is aimed for because the tone of the concrete surface depends on how long the concrete surface is isolated from the outside.
- Ensure the absence of unauthorised people in the vicinity where stripping takes place.
- Once stripping is finished, place the formwork on a sort of support and proceed with its cleaning and dismantling, if it is not going to be used for further casts.

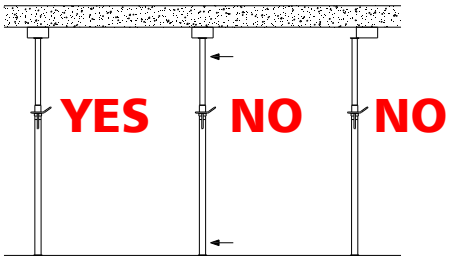
6.2. RECOMMENDATIONS



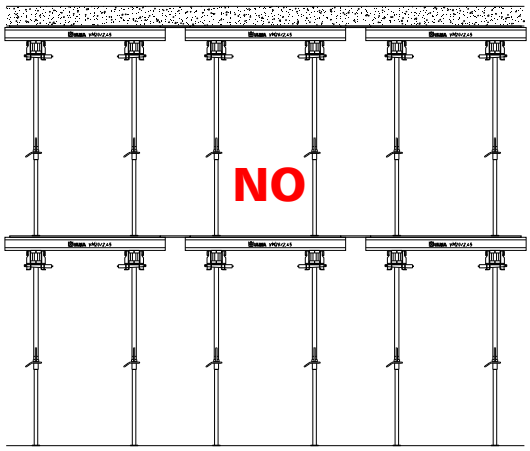
The prop's support should be horizontal, flat and with a stable support.



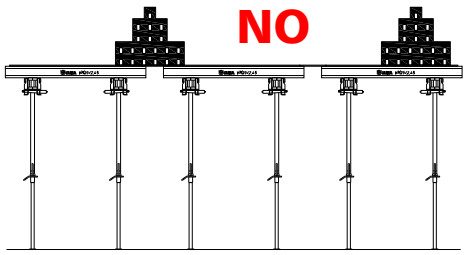
The prop must be plumbed.

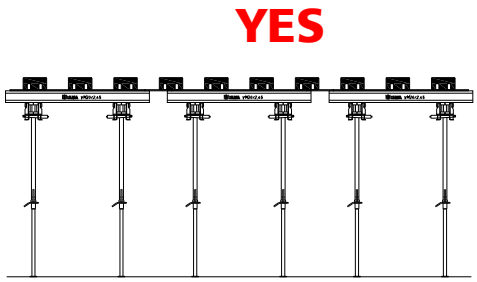


The application of the load on the prop must be vertical and centred. No horizontal loads will be applied to the prop.

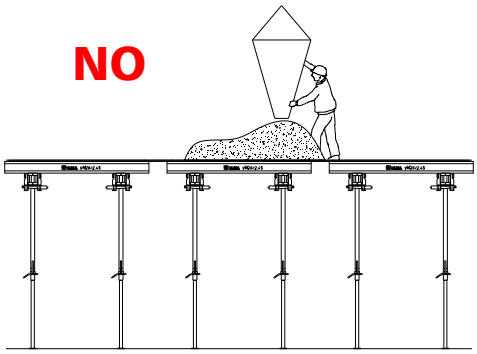


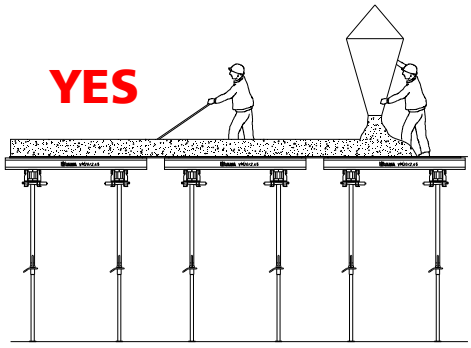
The props must be used between support and load. Do not use overlay because they can cause crashes and loss of effective load.





Do not collect material on the formwork in a place. Always perform a uniform load distribution.





Perform the concrete pouring in layers of uniform thickness and vibrating continuously, preventing accumulations.

6.3. TRANSPORT, HANDLING AND STORAGE

6.3.1. General guidelines

- Get informed about hazards on the building site and preventive measures to avoid those.
- Obey the instructions of the person-in-charge at the workplace.
- Use work equipment only when authorised, trained and provided with all required information to conduct it.
- Maintain minimum distances to mobile work equipment (forklifts, lorries, cranes, other construction machinery) and to areas with the risk of falling objects.
- Do not stand, walk, or work under suspended loads, nor under the trajectory or in the vicinity of these loads.
- Avoid the parts suffering blows and crushing during transport, handling and storage.
- The material is packed for transport in appropriate containers such as wood or steel pallets, boxes, or strapped in bundles with stable base.
- Strap the bundles sufficiently stable to prevent them from moving and getting damaged. If necessary, protect the items with some sort of buffer.
- Cut the metal strap, standing on the side, using gloves and goggles to prevent getting cut by the bouncing strap or caught in the strap.

6.3.2. Transport

- Ensure the stable loading of the material, complying with the instructions of the driver (equilibrated distribution on the lorry bed, fastening of auxiliary items, etc.).

6.3.3. Handling

6.3.3.1. Manual handling of loads

Some ergonomic principles to be followed are listed below:

- Do not make any sudden jerky movements.
- Before lifting the load, examine it to detect any sharp corners, dirt, etc. and decide according to its shape, weight and volume for the best way to get a secure grip of the load.
- Lift, separating the feet at shoulder distance, duck, bending the knees, never the back.
- Do not attempt to lift alone, any load that is too heavy, too large, or awkward. Use a mechanical lifting device or get a helping hand from co-workers.

6.3.3.2. Mechanical handling of loads

- Only statutory mechanical lifting devices, appropriate for the operation are allowed for use.
- Check the condition of the lifting gear such as slings or cables before each use and report any defects.
- Place lifting accessories and step back to a secure distance from the load and other materials which could get affected.
- Comply with all instructions given by the team chef who is specifically trained for this.
- Cause no sudden acceleration or deceleration of the moving load.
- When conducting difficult or dangerous lifting operations, or in the case that the crane operator has no obstruction free visual control of the entire trajectory of the load, the crane operations are directed by a banksman who is in constant communication with the crane operator by means of a previously agreed sign code.

- If necessary, use tag lines to control the load from distance. Keep hands clear of suspended load if hands could get caught between the load and another object. Swinging and/or unforeseen movements with the load can cause serious accidents.

6.3.4. Storage

- Proper storage of the parts is fundamental to keep them in good working condition.
- Wherever possible, store the material in a place protected from atmospheric impact to avoid wear.
- It is recommended to place parts of the same type and dimensions in its respective container (boxes, steel pallets, etc.).
- Ensure the stability of any piles, bearing in mind the following aspects:
  - Load-bearing capacity of the ground
  - Varying ground levels
  - Levelling of the packages
  - Package or container support
  - Package stability
  - State of the strap
  - State and capacity of the containers used
  - Do not stack full containers on top of empty or half-empty containers
  - External conditions (wind, risk of another object hitting the pile, etc.)

6.4. INSPECTION AND MAINTENANCE

6.4.1. General guidelines

- ULMA is responsible for the delivery of the products, for sale or rent, in good working condition.
- From the moment of delivery, the responsibility for correct use, inspection and product maintenance passes on to the purchaser or lessee. All damaged and broken parts, parts with missing components, i.e. all parts in no proper working condition must be removed from service.
- For use, inspection and maintenance of the product, special attention should be paid to the following points:
  - Items aimed to ensure people´s safety
  - Items made of aluminium, as they are more vulnerable to damages of the welded joints and deformation

6.4.2. Inspection instructions of appliances with CE marking of ULMA Construcción

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

For more information, consult ULMA Construcción.

6.4.2.1. HOOK VR

HOOK VR 600/540

- The crane Sling used by the contractor should be designed for maximum admissible load of the Hooks.
- Condition, completeness and functionality of the Hook VR must be checked.
- Make sure that all maintenance work is carried out by skilled personnel only.
- Personnel underneath the danger zone of load must be avoided. Only a suspension gear with a stop chain should be used. The suspension gear must be able to rotate. Only use crane hooks with a safety device against accidental displacement.
- It is forbidden to transport people with the Hook VR or on the loading.

6.4.2.2. TROLLEY VR

LATERAL TROLLEY VR

- The trolleys cannot be used in applications not described in the User's Guide.
- Check visually the estate of the Trolleys before any use, discarding it if any problem.
- In case the Trolleys do not work properly, it will have to be taken back immediately to be removed.
- No worker will stand in the Trolley's way. Always look in the direction of travel and keep a clear view of the travel path.
- The Trolley VR is not approved for transporting personnel.
- It is strongly recommended not transporting Tables higher than 8m in open wind areas, or 12m in wind protected areas with Lateral Trolley VR.
- Only trained and authorised personnel will manipulate the Trolley VR and Lateral Trolley VR.

6.4.2.3. SPT TRUCK ADAPTOR

- The load over Adaptor must be uniformly distributed. Gravity centre's position must be considered.
- Only trained and authorized personnel will manipulate the Truck.
- The Adaptor must not suffer strong knocks and excessive crushing during its handling, storage, travelling and, mainly, when shifting the tables with the Adaptor.
- Check visually the estate of the Adaptor before any use, discarding it if any problem.
- No worker will stand in the adaptors shifting way. Always look in the direction of travel and keep a clear view of the travel path. Travel in reverse if the load blocks your view.
- The Adaptor is not approved for transporting personnel.

6.4.2.4. LIFTING HOOK VR

- Check visually the estate of the Lifting Hook VR before any use, discarding it if any problem.
- The crane Sling used by the contractor should be designed for maximum admissible load of the Hooks.
- It is forbidden to transport people with the Hook VR or on the loading.
- The Lifting Hook VR must not suffer strong knocks and excessive crushing during its handling, storage, travelling and, mainly, when shifting the tables with the Adaptor.

6.4.3. Inspection instructions with CE marking of equipment marketed by ULMA Construcción

Equipment with CE marking marketed by ULMA Construcción is checked following the instructions stipulated in the User´s Guide of the respective product.

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 89/654/EEC of 30 November 1989 concerning 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.
- Council Directive 92/58/EEC of 24 June 1992 on the minimum requirements for the provision of safety and/or health signs at work.
- Council Directive 89/655/EEC - Council Directive 95/63/EEC - Directive 2001/45/EC of the European Parliament and of the Council of 27 June 2001 amending Council Directive 89/655/EEC concerning the minimum safety and health requirements for the use of work equipment by workers at work.
- 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 6 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).
- EN 13374:2004 Temporary edge protection systems. Product specifications, test methods.

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