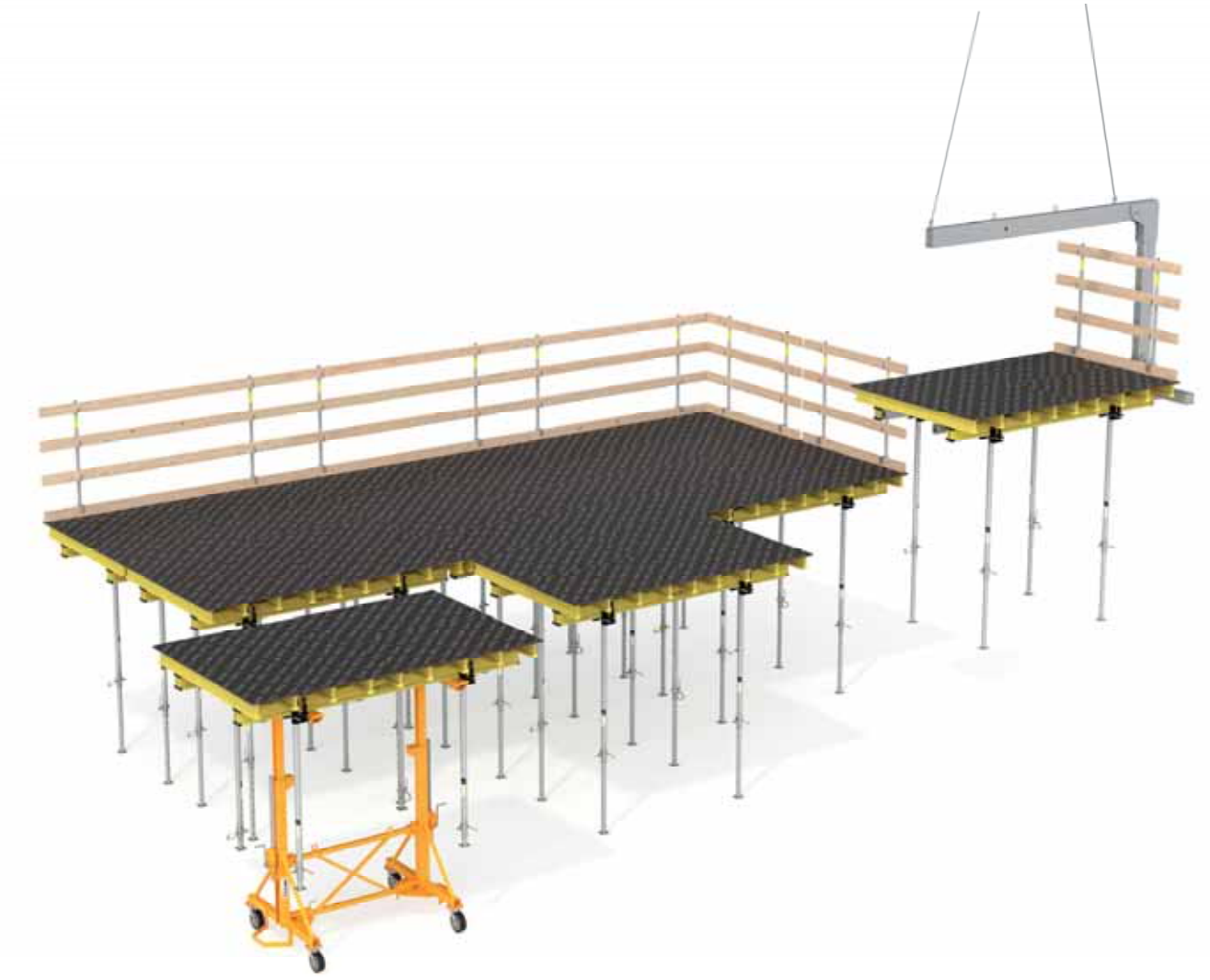
USER GUIDE

VR TABLE

MODULAR TABLEFORM



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'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

"Original document" produced and approved by ULMA.

ULMA

1. Product description

1.1. VR TABLES

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.

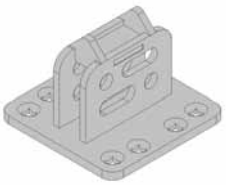
World Conference Center, Bonn (Germany)

1.2. SAME SYSTEM; DIFFERENT TABLES

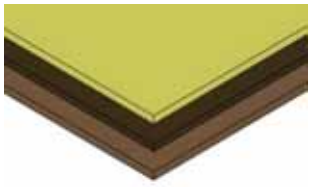
Few components for many different solutions.

Horizontal formwork	MODEL 1	MODEL 2
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)  Head VR-SP/EP (2211700)	 ALUPROP Head (2211095)
SUPPORTS	**EP Prop** **SP Prop** **ALUPROP**	**ALUPROP Tower**
BOARDS	**Phenolic plywood**	**Phenolic plywood**
VR TABLES		

Horizontal formwork	MODEL 3	MODEL 4
BEAMS	**Waler MK-120** **Waler DU-120** As main beam 	**Waler MK-120** **Waler DU-120** As main beam 
HEADS	  Latch VR (2211370) Head Waler VR (2211310)  Head Waler VR-DU120 (2211410)	 Two-Way U-Head VM-DU (1906880)
SUPPORTS	**EP Prop** **ALUPROP**	**T-60 Shoring**
BOARDS	**Phenolic plywood**	**Phenolic plywood**
VR TABLES		

Horizontal formwork	MODEL 5 – LARGE TABLES
BEAMS	**Waler MK-120** As main beam **Timber Beam VM20** As secondary beam 
WALERS CONNECTION	 Waler Connector (1990700)
HEADS	 Head Waler VR (2211310)  ALUPROP Head MK VR (2211254)
SUPPORTS	**ALUPROP Tower**
BOARDS	**Phenolic plywood**
LARGE TABLES	

Shuttering surface

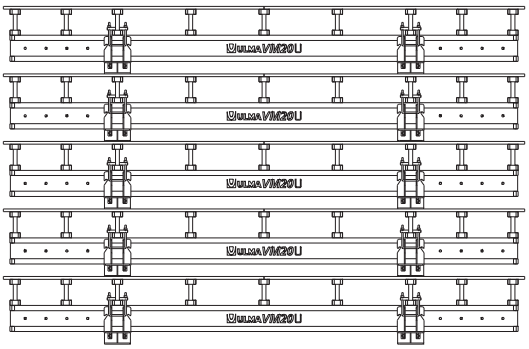


1.2.1. VR Table with timber beam VM20 as main beam (Model 1 and 2)

Light, flexible and cost-effective system

VR Table with VM20 uses beams standard components:

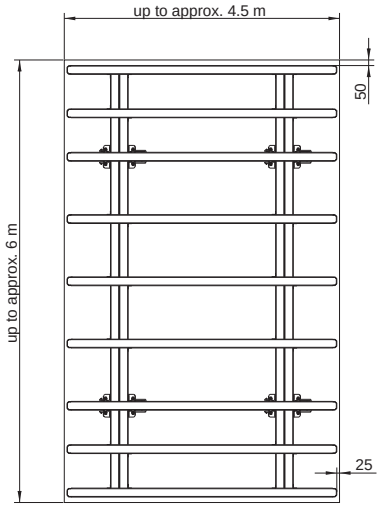
- Phenolic plywood as shuttering surface.
- VM20 as main and secondary beam.
- ALUPROP, EP or SP props supporting the horizontal structure.



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

Standard tables:

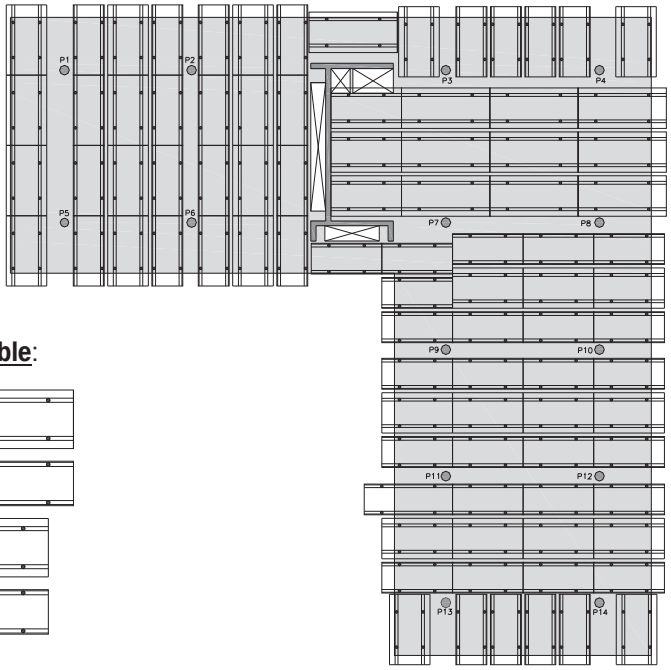
- Suitable system for rental market.
- Cost-effective especially for few number of uses (see 4.1).



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

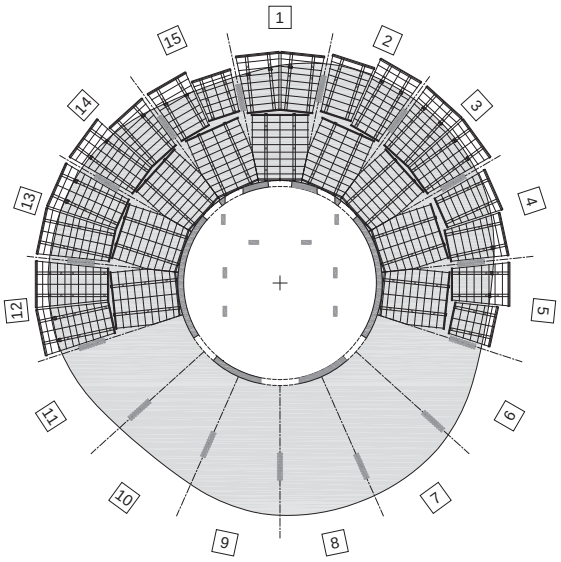
T 2.0 x 5

T 2.5 x 4

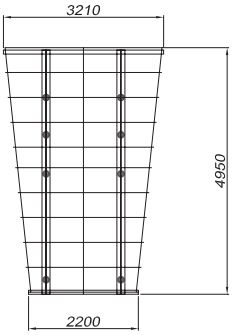
T 2.0 x 4

FIRA Hotel, Barcelona (Spain)

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



Example:
Table type 1

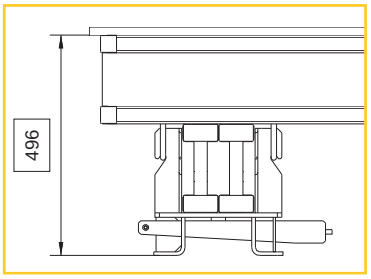


1.2.1.1 HEAD VR, SWIVEL HEAD VR AND HEAD VR- SP/EP:

Heads for VR Table with VM20 as main beam:

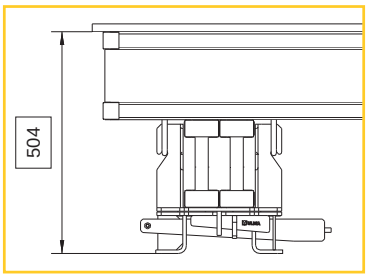
- Connect the horizontal shuttering structure and the props.
- Provide a stiff connection between timber beams and props.

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

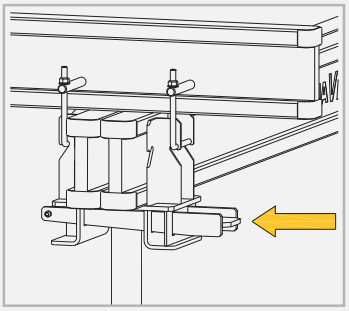


With Head VR (2211012)

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

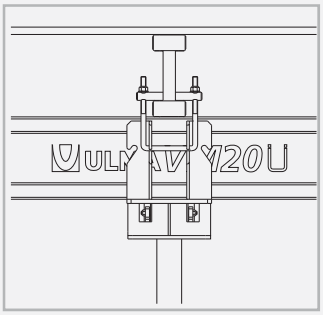


With Swivel Head VR (2211080)

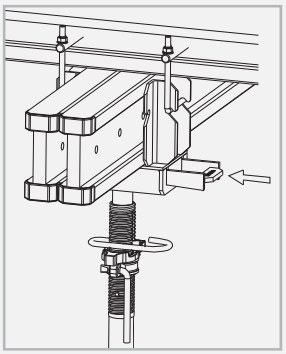


Head VR assembly

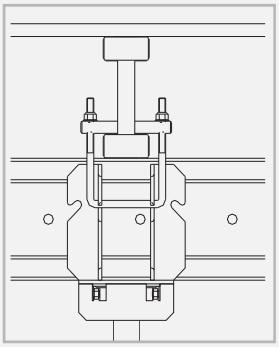
When props don't need to be folded, Head VR or Head VR-SP/EP are the right choice.



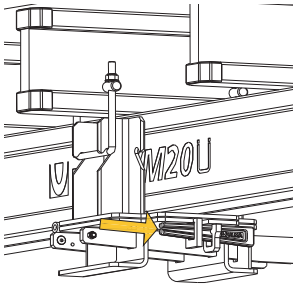
Head VR with drilled beam



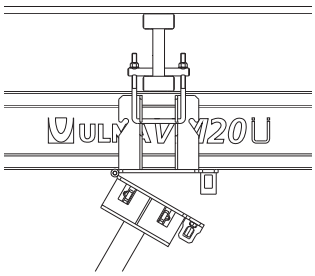
Head VR- SP/EP assembly



Head VR-SP/EP with drilled beam and with Narrow VR connection unit (2211008)

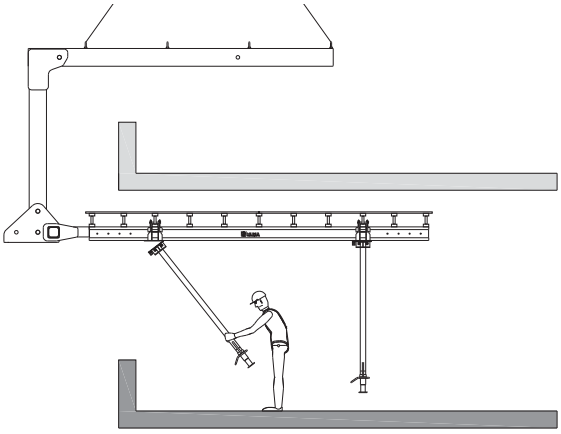


Release the wedge



Fold the prop

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

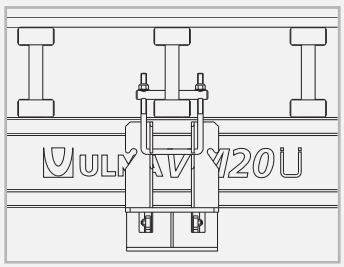


VR Table shifting with Hook VR

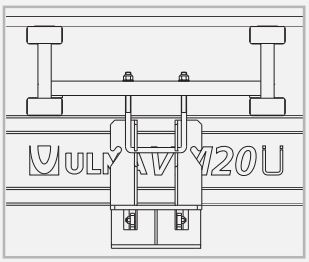
Overcoming or hanging beams when moving tables are easy with Swivel Head VR.

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

Easy to optimise props distribution thanks to head fixing options:



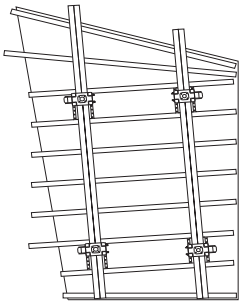
Head under drilled secondary beam with Narrow Connection Unit (2211008)



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

NOTE: The rest of the heads can be used in the same way.

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



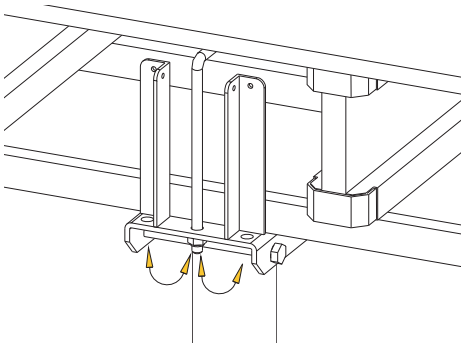
VR Tables with non-parallel secondary beams

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 Tables 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.

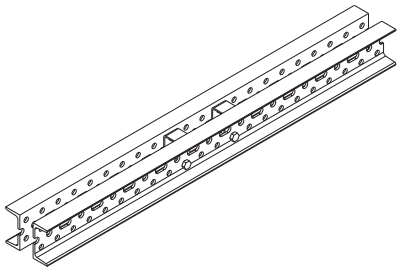
1.2.2. VR Table with waler as main beam (Model 3 and 4)

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.

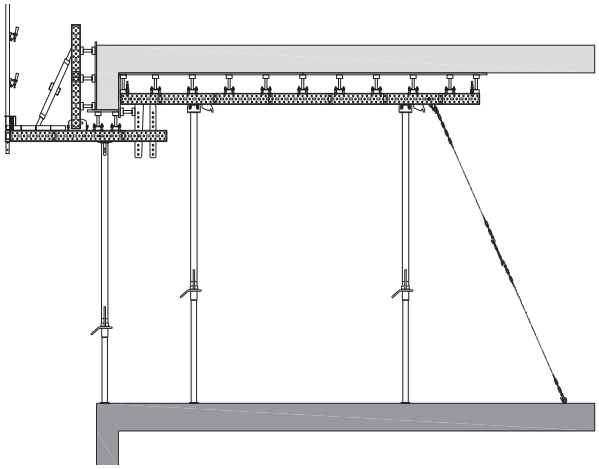


MK-120 Waler

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.

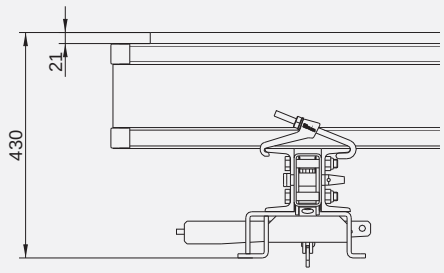
Standard tables are also available with VR Table Waler system (check your local ULMA branch standard sizes).

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



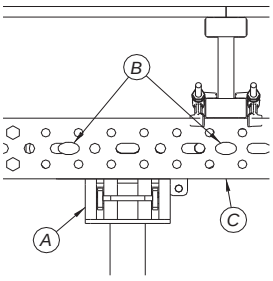
Head Waler VR

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.

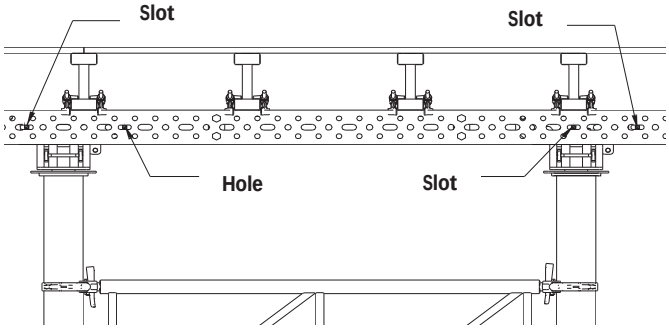
<u>Same Head, two different solutions</u>:

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

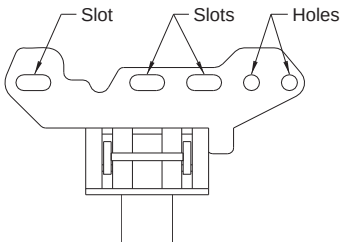


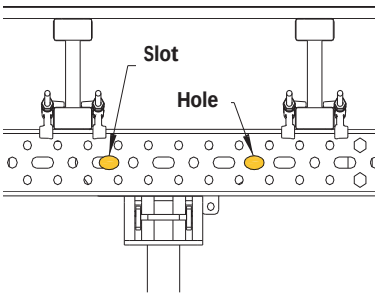
	QUANTITY	NAME	ITEM No.
A	1	HEAD WALER VR	2211310
A	1	HEAD WALER VR-DU120	2211410
B	2	PIN E20x70	0252070
C	-	WALER MK- WALER DU	-

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



Multi-fixing position head thanks to drilled plates.



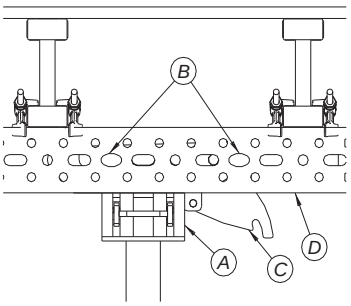


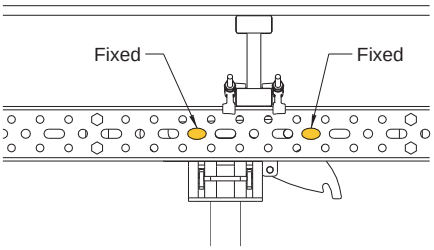
For single props also one fixed connection per prop is required (one pin through two holes).

OPTION 2: Head Waler VR

Working position:

The Latch VR locks the prop perpendicular to the main beam and transforms the Head into swivel.

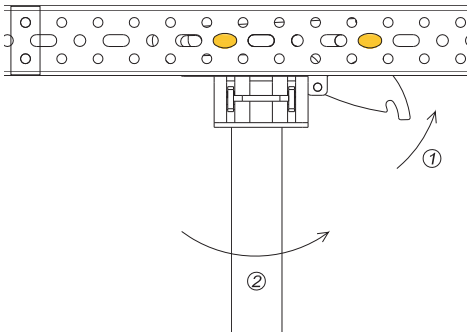




	QUANTITY	NAME	ITEM No.
A	1	HEAD WALER VR	2211310
A	1	HEAD WALER VR-DU120	2211410
B	2	PIN E20x70	0252070
C	1	LATCH VR	2211370
D	-	WALER MK- WALER DU	-

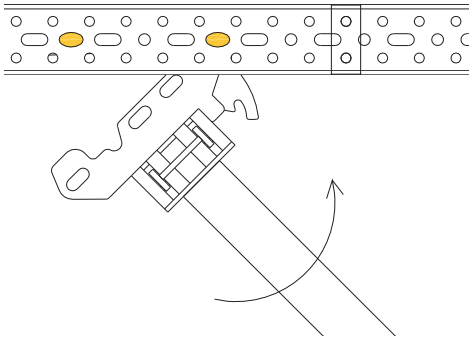
Folded position:

1



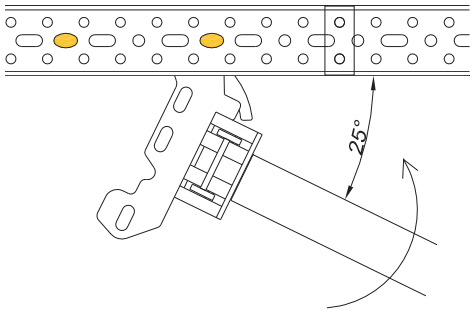
Lift the latch VR (1) to release the prop (2).

2



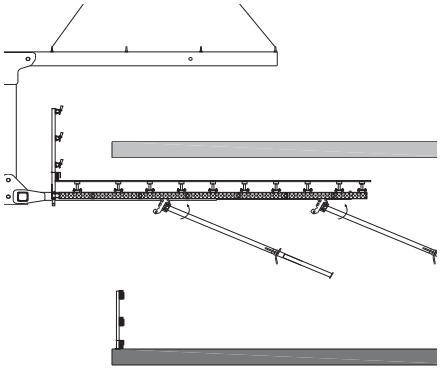
Fold the prop up. The head guides the latch VR.

3



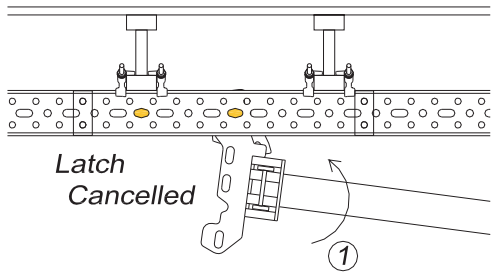
Continue folding the prop until 25° locking position.

4



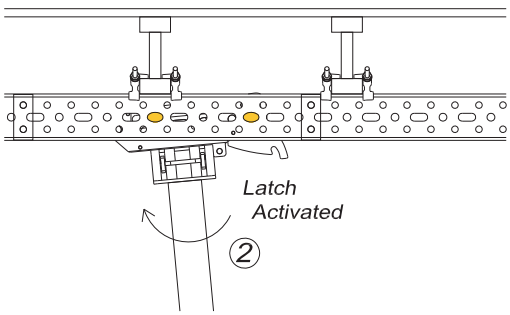
The props are safely fixed for VR Tables shifting.

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 Swivel Head Waler VR

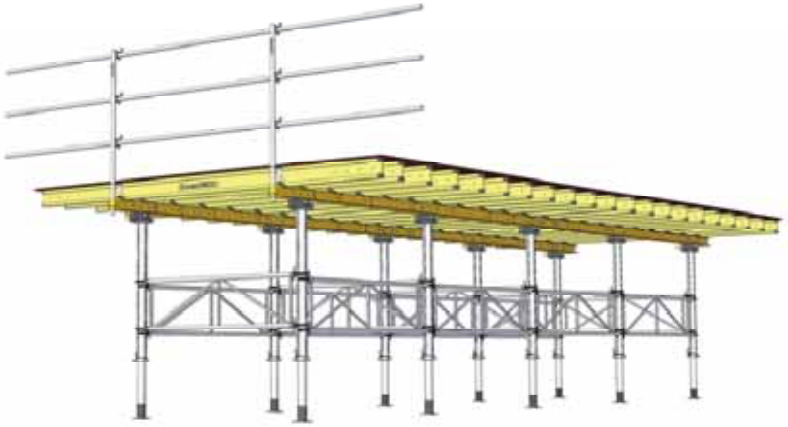
Easy and safe Swivel Head VR system: one man is enough to fold and unfold the prop.

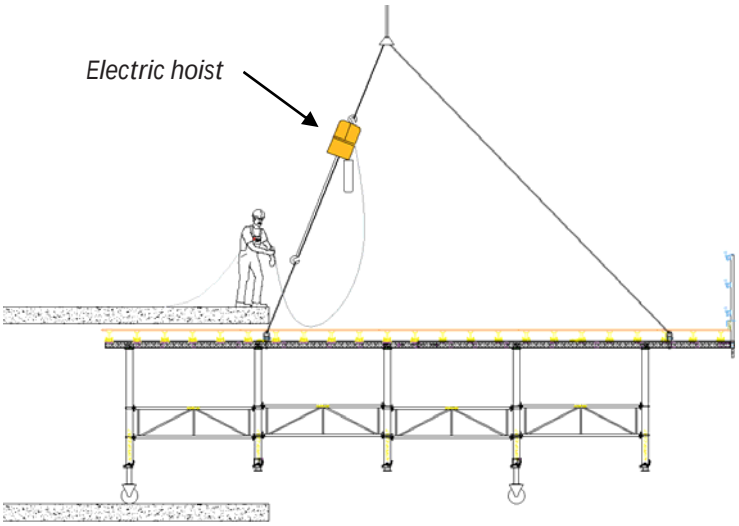
1.2.3. Large Table with waler as main beam (Model 5)

Customised solution system up to 12 m length (40 ft.)

Large Tables uses standard components:

- Phenolic plywood as shuttering surface.
- MK-120 waler as main beam.
- VM20 as secondary beam.
- ALUPROP props and Bracing Frames supporting the horizontal structure.





The Large Tables, due to their size, they are shifted to next level by crane following a specific procedure using an electric hoist.

With the help of castors or dollies the table is extracted outside the building rolling on the slab and then is leveled horizontally by an electric hoist before to be shifted to next level.

The standard setup is carried out through MK-120 walers as main beams and VM20 beams as secondary beams.

Larger tables means less quantity of tables in a jobsite, therefore less crane movements.

Large Table extraction

1.2.4. Maximum heights with VR Tables

1.2.4.1. EP PROPS: UP TO 5.35 m

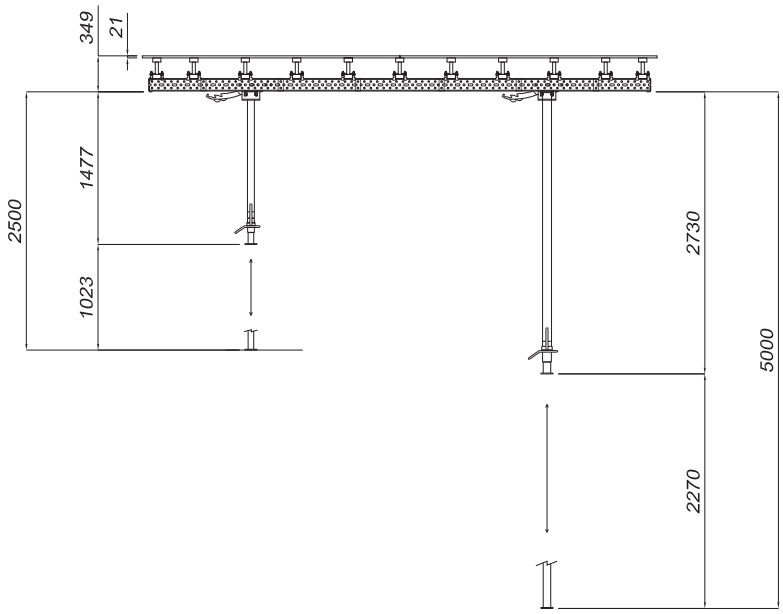
VR Table heads are specifically designed for EP props. Large range of EP props available.

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

NAME	ITEM No.	L min.	L max.	TABLE HEIGHT RANGE
EP C25	2200048	1500	2500	1849 – 2849
EP C+D30	2200000	1800	3000	2149 – 3349
EP C+E30	2200023	1800	3000	2149 – 3349
EP C+D35	2200068	2000	3500	2349 – 3849
EP C+D40	2200012	2300	4000	2649 – 4349
EP C+E40	2200033	2300	4000	2649 – 4349
EP C+D45	2200084	2500	4500	2849 – 4849
EP C+D50	2200057	2800	5000	3149 – 5349

Dimensions in mm

VR Table with MK-120: 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 *Tripod 42-87 mm, 2170355*) or prop bracings (*Prop Bracing Clamp, 2170526* or *Clamp SP-EP, 2170356*) are recommended for the first tables in a new area to be cast.

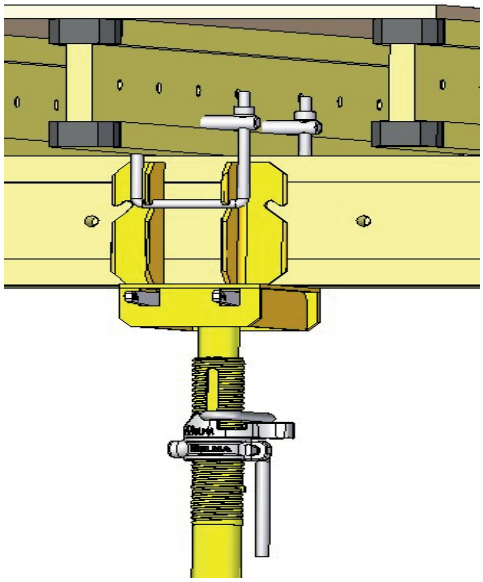
1.2.4.2. SP PROPS: UP TO 5.40 m

VR Tables are also designed for SP props. The range of SP props is of 3 m, 3.5 m, 4 m and 5 m and they are used with Head VR-SP/EP. Maximum heights can be seen in the following table:

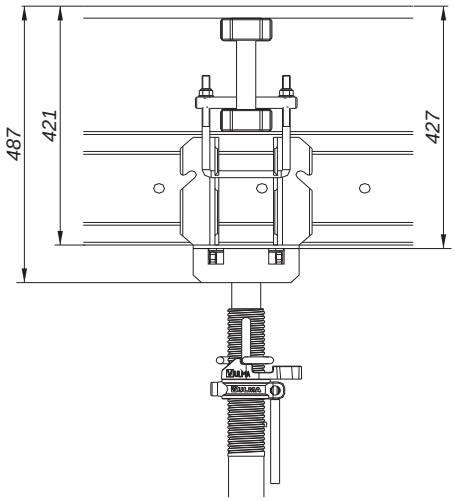
NAME	ITEM No.	L min.	L max.	TABLE HEIGHT RANGE
SP-30 SP-30 P	2170030 2170300	1750	3000	2177 – 3427
SP-35 SP-35 P	2170035 2170135	2000	3500	2427 – 3927
SP-40 SP-40 P	2170040 2170400	2500	4000	2927 – 4427
SP-50 SP-50 P	2170050 2170500	3900	5000	4327 – 5427

Dimensions in mm

VR Table with VM20: 427 mm (21 mm plywood)



Head VR-SP/EP with VM20 beam



Head under drilled secondary beam with Narrow VR Connection Unit (2211008)

Recommendations:

Additional support (*Universal Tripod, 2220090 or Tripod 42-87 mm, 2170355*) or prop bracings (*Prop Bracing Clamp, 2170526* or *Clamp SP-EP, 2170356*) are recommended for the first tables in a new area to be cast.

With higher heights than 4 m, make sure that the table is stabilized.

1.2.4.3. ALUPROP SINGLE PROPS: UP TO 6.40 m

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

Adapter with Pin (2211100)

Adapter with Screw (2211090)

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

- With Head Waler VR: head to be used with ALUPROP and MK-120 Walers.

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

VR Table with ALUPROP single prop

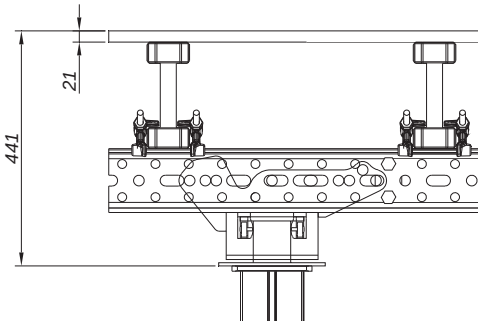
With the Adaptor with pin and ALUPROP Head bracing is necessary (with Bracing Frames or tubes). Not for the Adaptor with Screw thanks to the stiff head connection.

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

Table height ranges with Head Waler VR can be seen in the following table:

NAME	ITEM No.	L min.	L max.	TABLE HEIGHT RANGE
ALUPROP 1.65-2.8	2220010	1650	2800	2091 – 3241
ALUPROP 2.2-3.7	2220020	2200	3700	2641 – 4141
ALUPROP 3.3-4.8	2220030	3300	4800	3741 – 5241
ALUPROP 4.5-6.0	2220040	4500	6000	4941 – 6441

Dimensions in mm



VR Table with MK-120 and Head Waler VR: 441 mm

CARE with the minimum height at the time of stripping.

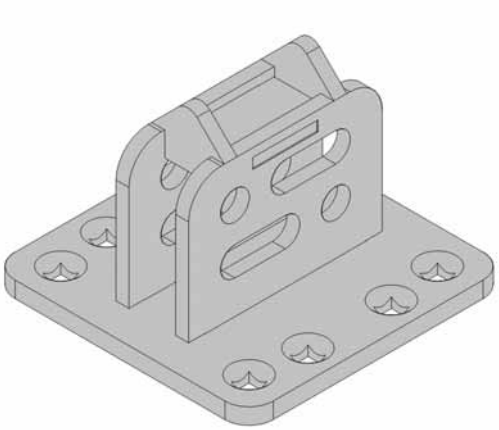
1.2.4.4. ALUPROP TOWERS: UP TO 12 m

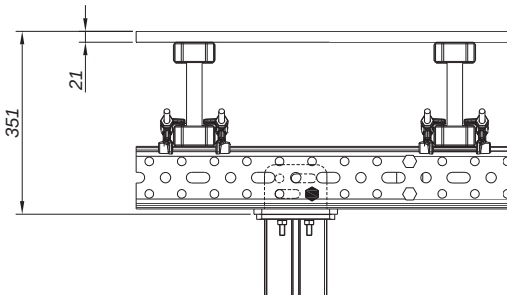
Same head options of ALUPROP single props are available for ALUPROP Towers solution.

In addition:

- With ALUPROP Head MK VR: specific head designed for Large Table with ALUPROP with Bracing Frames and MK walers.

With ALUPROP Head MK VR is necessary the assembly of Bracing Frames.





NAME	ITEM No.	L min.	L max.	TABLE HEIGHT RANGE
ALUPROP 1.65-2.8	2220010	1650	2800	2001 – 3151
ALUPROP 2.2-3.7	2220020	2200	3700	2551 – 4051
ALUPROP 3.3-4.8	2220030	3300	4800	3651 – 5151
ALUPROP 4.5-6.0	2220040	4500	6000	4851 – 6351

Dimensions in mm

VR Table with MK-120 and ALUPROP Head MK VR: 351 mm

CARE with the minimum height at the time of stripping.

Check always ALUPROP Towers load capacity.

For further information see ALUPROP User's guide.

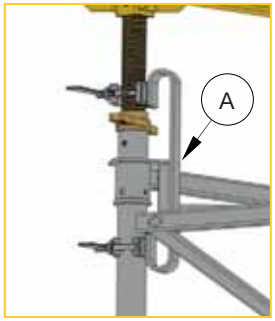
Recommendation:

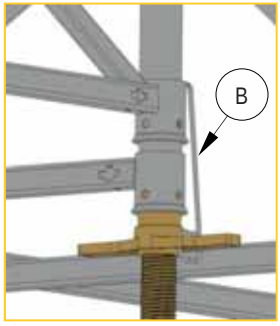
VR Table stability must be checked in both longitudinal and transversal directions, especially in tall tables.

VR Table with ALUPROP Tower

1.2.4.5. T-60 SHORING TOWERS: UP TO 12 m

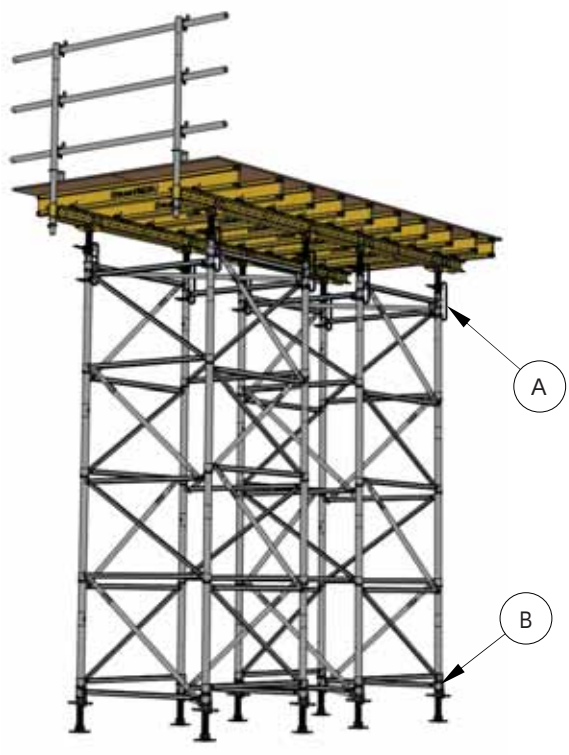
Two-Way U Head VM-DU (1906880) connects the shoring tower and the horizontal shuttering structure.





	NAME	ITEM No.
A	JACK-FRAME CONNECTION	1906210
B	SCREW JACK HOLDER	1906200

Screw Jack Holder (1906200) and Jack-Frame Connection (1906210) are necessary for table movement.



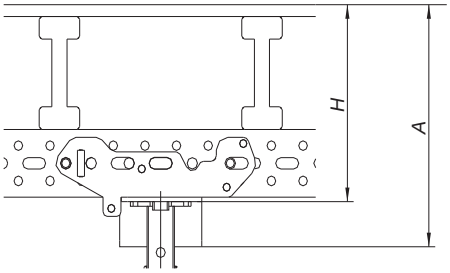
VR Table with T-60 tower shoring

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

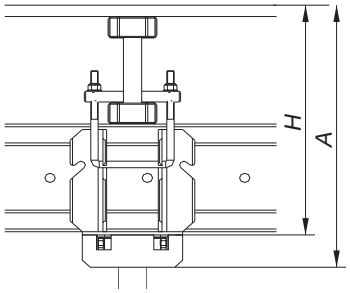
For towers higher than 6 m, bracing is required.

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

1.3. SUMMARY TABLE



Head waler VR, with VM20 beam



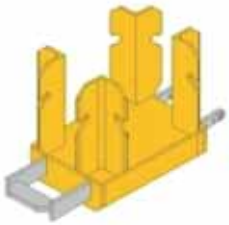
Head VR and Head VR SP/EP with VM20 beam

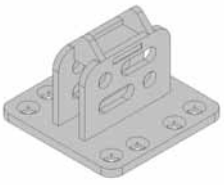
VM20 / Waler		Support				
		EP Prop	ALUPROP		SP Prop	T-60
			Prop: Head + ALUPROP Adaptor	**Towers**		
	Storage height (21 mm plywood)	▪ Head VR H=431 A=517 ▪ Swivel Head VR H=439 A=525	▪ Head VR H=523 A=517 ▪ Swivel Head VR H=531 A=525	▪ ALUPROP Head	▪ Head VR SP/EP H=427 A=487	▪ Two-Way U Head VM–DU
		▪ Head Waler VR ▪ Head Waler VR DU120 H=349 A=429	▪ Head Waler VR ▪ Head Waler VR DU120 H=441 A=429	▪ ALUPROP Head MK VR	No	▪ Two way U Head VM–DU
	Height ranges (mm)	1931 - 5431	2173 - 6523	Up to 12000	2177 - 5427	Up to 12000
		1849 - 5349	2091 - 6441	Up to 12000	----	Up to 12000
Heads	**Head VR (2211012)**	Yes	Adaptor W/Screw	Adaptor W/Screw Adaptor W/Pin	No	No
		No	No	No	No	No
	Swivel Head VR (2211080)	Yes	Adaptor W/Screw	No	No	No
		No	No	No	No	No
	Head VR-SP/EP (2211700)	Yes	Adaptor W/Screw	Adaptor W/Screw Adaptor W/Pin	Yes	No
		No	No	No	No	No
	Head Waler VR (2211310)	No	No	No	No	No
		Yes	Adaptor W/Screw	Adaptor W/Screw Adaptor W/Pin	No	No
	Head Waler VR DU120 (2211410)	No	No	No	No	No
		Yes	Adaptor W/Screw	Adaptor W/Screw Adaptor W/Pin	No	No
	ALUPROP Head (2211095)	No	No	Yes	No	No
		No	No	No	No	No
	ALUPROP Head MK VR (2211254)	No	No	No	No	No
		No	No	Yes	No	No
	Two way U Head (1906880)	No	No	No	No	Yes
		No	No	No	No	Yes

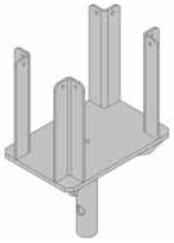
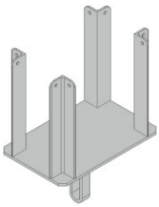
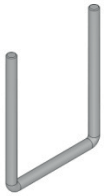
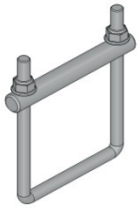
Dimensions in mm

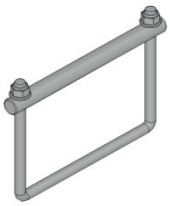
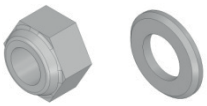
2. Components and accessories

2.1. GRAPHIC DESCRIPTION

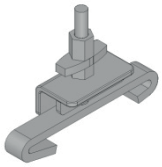
Item No.	Weight kg.	Name
		HEADS
2211012	15.5	HEAD VR  Black painted steel
2211080	20.5	SWIVEL HEAD VR  Black painted steel
2211700	9.6	HEAD VR-SP/EP  Yellow painted steel
2211310	10	HEAD WALER VR  Black painted steel

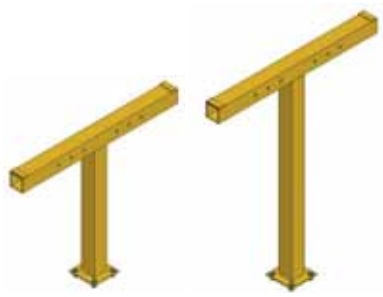
Item No.	Weight kg.	Name
2211410	9.9	HEAD VR DU120  Yellow painted steel
2211370	2.1	LATCH VR  Bichromate finished steel
2211095	4.5	ALUPROP HEAD  Black painted steel
2211254	3.0	ALUPROP HEAD MK VR  Zinc coated steel
2211000	0.73	SIMPLE HEAD VR  Hot dip galvanized

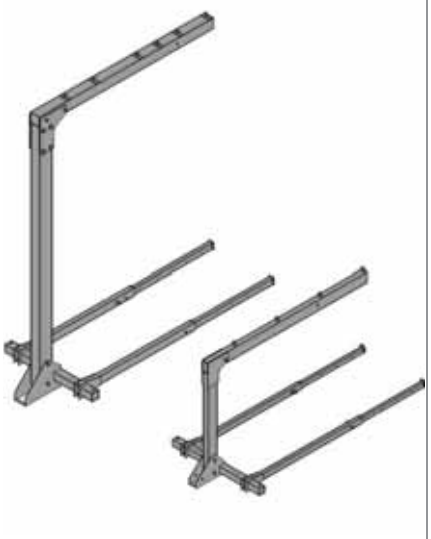
Item No.	Weight kg.	Name
2211003	4.7	DOUBLE HEAD VR  Hot dip galvanized
2211450	2.5	ECO DOUBLE HEAD  Zinc coated steel
2211300	3.1	SIMPLE HEAD WALER  Yellow painted steel
2211061	3.0	FRAME HEAD VR  Black painted steel
2211010	0.4	NARROW BEAM STRAP  Zinc coated steel
2211008	0.81	NARROW VR CONNECTION UNIT  Zinc coated steel

Item No.	Weight kg.	Name
2211005	1.0	WIDE VR CONNECTION UNIT  Zinc coated steel
2211102	0.6	ROD THREAD  Bichromate finished steel
9056900 9033000	0.022 0.010	HEXAG NUT M12 DIN985 8C WASHER B13 DIN125 ST ZINC COATED  Zinc coated steel
1861627 9370571	0.170 0.015	PIN 16x100 COTTER PIN R/3  Zinc coated steel

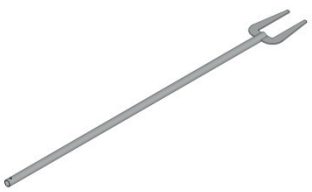
Item No.	Weight kg.	Name
		BEAMS
		VM20: Main and secondary beam
1940191	8.0	TIMBER BEAM VM 20/1.45
1940172	9.5	TIMBER BEAM VM 20/1.9
1940197	10.8	TIMBER BEAM VM 20/2.15
1950129	12.3	TIMBER BEAM VM 20/2.45
1940196	13.3	TIMBER BEAM VM 20/2.65
1940144	16.1	TIMBER BEAM VM 20/2.9
1950130	16.5	TIMBER BEAM VM 20/3.3
1940146	18.0	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
1940180	27.5	TIMBER BEAM VM 20/5.5
1940149	29.5	TIMBER BEAM VM 20/5.9
		 Melamine yellow coated
		WALER MK-120: Main beam
1990209	29.4	WALER MK-120/1.125
1990211	35.5	WALER MK-120/1.375
1990213	41.9	WALER MK-120/1.625
1990215	47.9	WALER MK-120/1.875
1990217	54	WALER MK-120/2.125
1990219	60	WALER MK-120/2.375
1990221	68	WALER MK-120/2.625
1990223	75	WALER MK-120/2.875
1990225	81	WALER MK-120/3.125
1990227	87	WALER MK-120/3.375
1990229	93	WALER MK-120/3.625
1990231	101	WALER MK-120/3.875
1990233	107	WALER MK-120/4.125
1990235	113	WALER MK-120/4.375
1990237	120	WALER MK-120/4.625
1990239	126	WALER MK-120/4.875
1990245	146	WALER MK-120/5.625
1990247	152	WALER MK-120/5.875
		 Yellow painted steel

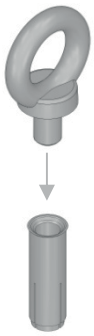
Item No.	Weight kg.	Name
		WALER DU-120: Main beam
0111100	26.5	WALER DU-120/1
0111150	39.6	WALER DU-120/1.5
0111200	53	WALER DU-120/2
0111250	66	WALER DU-120/2.5
0111300	79	WALER DU-120/3
0111350	93	WALER DU-120/3.5
0111400	106	WALER DU-120/4
0111450	119	WALER DU-120/4.5
0111500	133	WALER DU-120/5
0111600	159	WALER DU-120/6
		 Black painted steel
1960375	0.81	WALER-VM20 CLAMP 2T
		 Bichromate finished and zinc coated steel
1960350	1.4	WALER-VM20 CLAMP
		 Bichromate finished steel
1960345	1.3	WALER-VM20 ANGULAR CLAMP
		 Zinc coated steel
0252070	0.28	PIN E20X70
0250000	0.03	COTTER PIN R/5
		 Zinc coated steel and bichromate finished steel

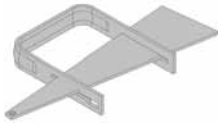
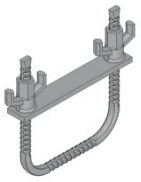
Item No.	Weight kg.	Name
		ACCESORIES
2211031	431	TROLLEY VR  Yellow painted steel
2211560 2211569	34.8 42	EXTENSION 1 EXTENSION 1.5  Yellow painted steel
2211330	250	SPT TRUCK ADAPTOR  Hot dip galvanized

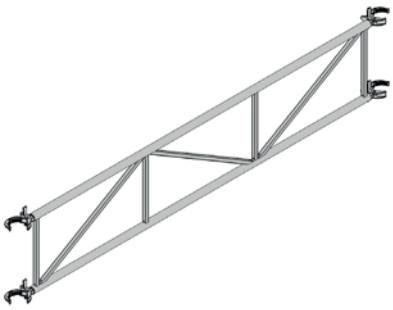
Item No.	Weight kg.	Name
2211625	252	LATERAL TROLLEY VR  Yellow painted steel
2211150 2211030	1450 770	HOOK VR 600/540 HOOK VR  Hot dip galvanized
2211190	5.1	LIFTING HOOK VR  Black painted steel

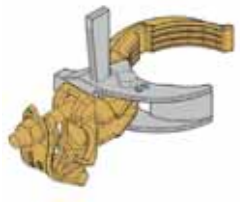
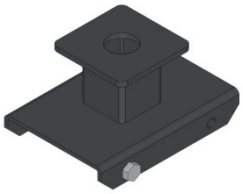
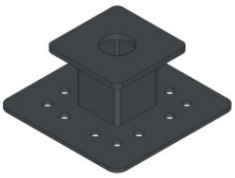
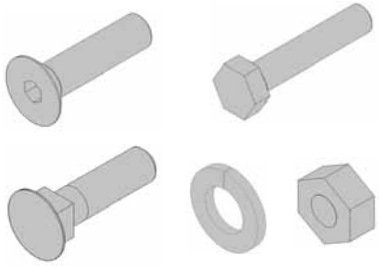
Item No.	Weight kg.	Name
1991274	5.9	LIFTING HOOK RKS  Zinc coated steel
1990700	12.2	WALER CONNECTOR MK  Yellow painted steel
2211360	17.4	HANGING BEAM PLATE 60  Yellow painted steel
2211670 2211660	7.4 4.8	VM20 HANGING BEAM SUPPORT HANGING BEAM SUPPLEMENT  Hot dip galvanized

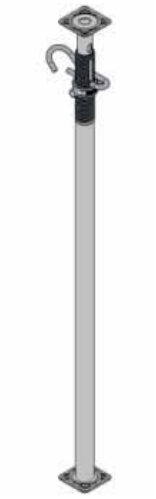
Item No.	Weight kg.	Name
9835084	133	ELECTRIC HOIST KITO 5 T 
2211270	18.8	ALUPROP CASTER  Zinc coated steel
2211246	1.2	ALUPROP FIXER VR  Zinc coated steel
2211051	2.9	FORK VR  Hot dip galvanized

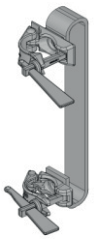
Item No.	Weight kg.	Name
2211750	6.3	CHAIN VR 7.5 KN  Zinc coated steel
9165400 9850530	0.3 0.9	EYEBOLT SCREW M16 DIN580 HKD HILTI PLUG M16  Zinc coated steel
0241690 0241608	0.17 0.03	BOLT M16x90 DIN931 8.8C NUT M16 DIN985 8C  Zinc coated steel
0242011 0242000	0.3 0.06	BOLT M20x110 DIN931 8.8C NUT M20 DIN934 8C  Zinc coated steel

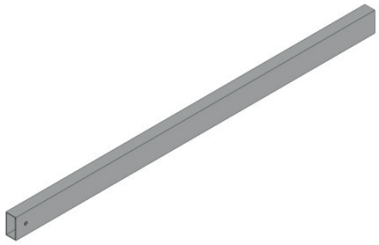
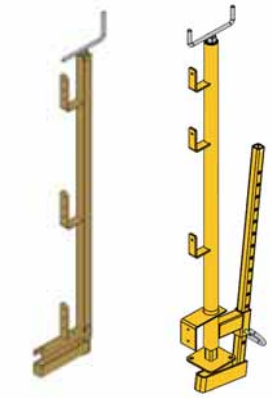
Item No.	Weight kg.	Name
		SHORING SYSTEM
		EP PROPS
2200048 2200000 2200068 2200012 2200084 2200057 2200023 2200033	14.7 16.6 21.3 23.7 29.1 31.7 19.0 26.4	EP C25 EP C+D30 EP C+D35 EP C+D40 EP C+D45 EP C+D50 EP C+E30 EP C+E40  Hot dip galvanized
2170355	7.0	TRIPOD 42-87 mm  Hot dip galvanized
2220090	11.2	UNIVERSAL TRIPOD  Hot dip galvanized
2170356	1.6	CLAMP SP-EP  Hot dip galvanized
2170526	2.3	PROP BRACING CLAMP  Hot dip galvanized

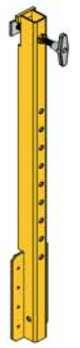
Item No.	Weight kg.	Name
		ALUPROP
2220010	17.6	ALUPROP 1.65-2.8
2220020	21.6	ALUPROP 2.2-3.7
2220030	25.4	ALUPROP 3.3-4.8
2220040	29.6	ALUPROP 4.5-6.0
		 Aluminium
2220140	10.2	BRACING FRAME 0.75
2220125	15.0	BRACING FRAME 1.5
2220130	15.4	BRACING FRAME 1.57
2220145	18.1	BRACING FRAME 2.075
2220120	19.4	BRACING FRAME 2.32
		 Hot dip galvanized
U222014	13.5	BRACING FRAME 4’
U222016	16.8	BRACING FRAME 6’
U222018	20.1	BRACING FRAME 8’
U222040	25.4	BRACING FRAME 10’
		 Hot dip galvanized

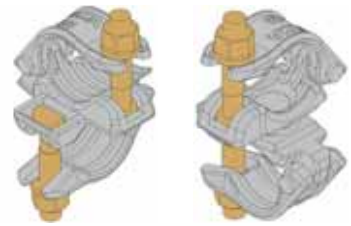
Item No.	Weight kg.	Name
2220075	2.2	FIX BRACING HOOK
		 Hot dip galvanized
2220100	2.3	SWIVEL BRACING HOOK
		 Bichromate finished and hot dip galvanized
2211100	4.2	ALUPROP ADAPTER W/PIN
		 Black painted steel
2211090	3.1	ALUPROP ADAPTER W/SCREW
		 Black painted steel
9852021	0.04	BOLT CSK M10x40 DIN7991 8.8C
0241051	0.04	HEXAG BOLT M10x50 DIN933 8.8C
0249926	0.04	CSK S CREW M10x40 DIN608 8.8C
9000001	0.003	SPRING WASHER B10 DIN127
0241004	0.01	NUT M10 DIN9 34 8C
		 Zinc coated steel

Item No.	Weight kg.	Name
		SP PROPS
2170030 2170035 2170040 2170050	11.2 15.2 16.6 23.8	SP-30 PROP SP-35 PROP SP-40 PROP SP-50 PROP  Hot dip galvanized
2170300 2170135 2170400 2170500	10.7 14.5 15.8 22.7	SP-30 PROP P SP-35 PROP P SP-40 PROP P SP-50 PROP P  Yellow painted steel
		T-60
1906880	3.5	TWO-WAY U-HEAD VM-DU  Yellow painted steel

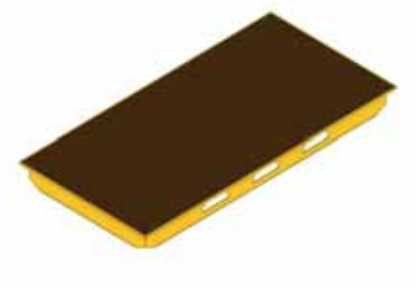
Item No.	Weight kg.	Name
2211102 2211103	0.6 0.45	ROD THREAD WALER ROD THREAD  Bichromate finished and zinc coated steel
1906200	0.12	SCREW JACK HOLDER  Zinc coated steel
1906570 9370571	0.06 0.01	PIN D10x70 COTTER PIN R/3  Bichromate finished and zinc coated steel
1906210	3.5	JACK-FRAME CONNECTION  Zinc coated steel
1906165	5.4	TOWER MOVEMENT HOOK  Hot dip galvanized

Item No.	Weight kg.	Name
1906163	13.8	MOVEMENT HOOK TUBE 1.8
1906164	18.4	MOVEMENT HOOK TUBE 2.4
		
		Hot dip galvanized
		SAFETY ELEMENTS
2211156	9.6	SAFETY HANDRAIL 1.50
2211185	8.1	SAFETY HANDRAIL 1.5 WOOD
1902210	3.4	SAFETY HANDRAIL POST
		
		Hot dip galvanized and yellow painted steel
2211240	6.0	CLAMP HANDRAIL 1 m
2211200	11.7	CLAMP HANDRAIL 1.3 m
		
		Bichromate finished steel and yellow painted steel

Item No.	Weight kg.	Name
2211165	6.9	VM HANDRAIL SUPPORT
		
		Yellow painted steel
0121004	2.9	HANDRAIL SOCKET D50
		
		Yellow painted steel
2211256	10.6	WALL HANDRAIL SUPPORT
		
		Yellow painted steel
7238000	0.73	PLATE NUT 15
		
		Bichromate finished steel
1900256	1.4	PLATE WASHER NUT 15
		
		Bichromate finished steel

Item No.	Weight kg.	Name
0230100	1.7	TIE ROD 15/1
		
2125148	1.2	RIGHT ANGLE COUPLER 48/48
2125147	1.3	SWIVEL COUPLER 48/48
		
		Hot dip galvanized
2125649	13.1	TUBE 48x4100 WITH SOCKET
2125288	1.8	TUBE 48/0.5
2125289	3.7	TUBE 48/1.1
2125290	5.5	TUBE 48/1.6
2125291	7.0	TUBE 48/2.1
2125647	8.7	TUBE 48/2.6
2125249	11.4	TUBE 48/3.1
2125648	12.1	TUBE 48/3.6
2125250	14.6	TUBE 48/4.1
2125251	18.0	TUBE 48/5
0200600	20.0	TUBE 48/6
		
		Hot dip galvanized

Item No.	Weight kg.	Name
		PLYWOOD
1940151	44.6	PLYWOOD 1.25x2.5x0.021 BIRCH
1940155	38.2	PLYWOOD 1.25x2.5x0.018 BIRCH
1940166	40.7	PLYWOOD 1.25x2.5x0.021 BETO
1940198	34.9	PLYWOOD 1.25x2.5x0.018 BETO
		
		Phenolic coated
		SCREWS
9370901	0.01	SCREW 5x50 DIN7505-A C
9371436	0.014	SCREW 6x80 DIN7505-A
		
		Bichromate finished steel
		INFILLING
2211910	3.3	VR-CC4 SUPPORT
		
		Yellow painted steel
2211916	1.2	PROFILE U 1 PANEL SUPPORT
2211907	4.7	PROFILE U 3.9 PANEL SUPPORT
2211915	5.9	PROFILE U 4.9 PANEL SUPPORT
		
		Yellow painted steel

Item No.	Weight kg.	Name
1870090 1870165 1870096	15.4 9.1 8.3	PANEL CC 1.5x0.75 PLYWOOD PANEL CC 1.5x0.375 PLYWOOD PANEL CC 0.75x0.75 PLYWOOD 
1870045 1870050	6.3 3.2	TRANSVERSAL CC TR 1.5 TRANSVERSAL CC TR 0.75 
1870105 1870150	8,9 4,4	BEAM CC W 1.5 BEAM CC W 0.75 
2211914	0.34	TIE ROD 15/0.2  Zinc coated steel

Item No.	Weight kg.	Name
1861122 7238001	0.39 0.22	PANEL BOLT HEXAGONAL NUT 15  Zinc coated steel

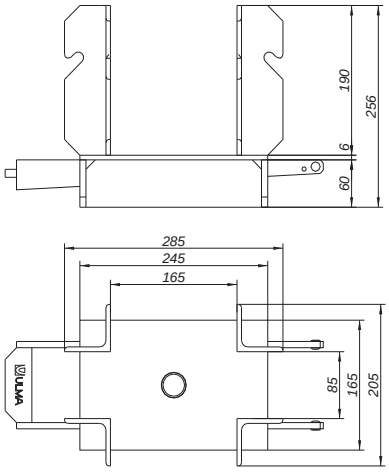
2.2. ELEMENTS DESCRIPTION

2.2.1. Heads

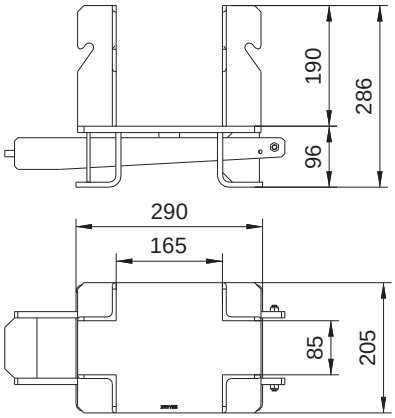
2.2.1.1. HEAD VR AND HEAD VR-SP/EP

For VR Table with VM20 as main beam:

- Connect the horizontal shuttering structure and the EP or SP Props.
- Also ALUPROP can be assembled with adaptors.



Head VR

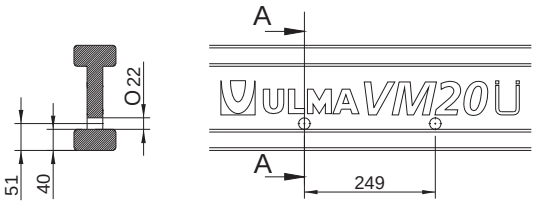


Head VR-SP/EP

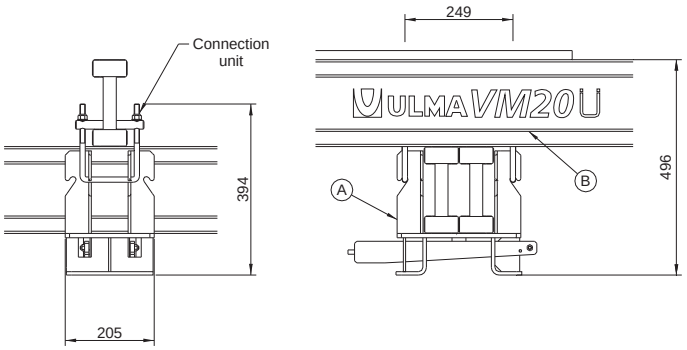
Two possible solutions:

1- Connection units:

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

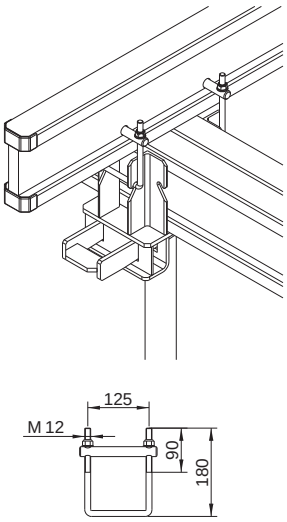


Drilled holes distances (in mm)

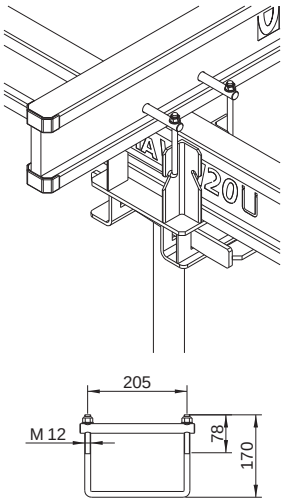


	QUANTITY	NAME	ITEM No.
A	1	HEAD VR	2211012
A	1	HEAD VR SP/EP	2211700
B	2	NARROW VR CONNECTION UNIT	2211008

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

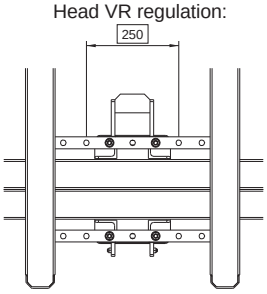


Wide beam connection unit for single VM20 main beam

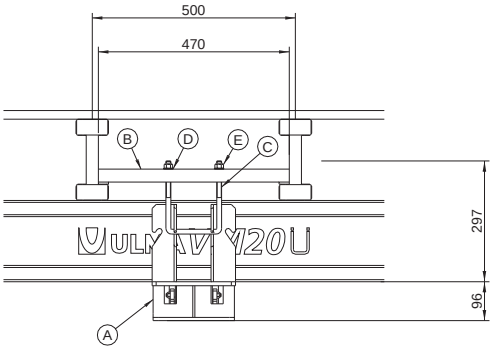
2- Frame Head:

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

Head VR regulation:

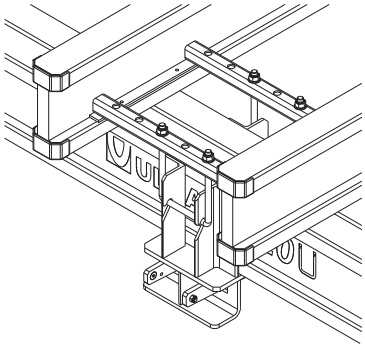


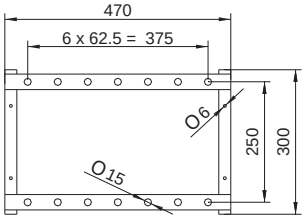
Total adjustment 250 mm



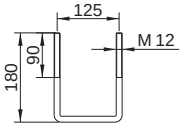
	QUANTITY	NAME	ITEM No.
A	1	HEAD VR	2211012
A	1	HEAD VR SP/EP	2211700
B	1	FRAME HEAD VR	2211061
C	2	NARROW BEAM STRAP	2211010
D	4	WASHER B13 DIN 125 ST ZINC COATED	9033000
E	4	HEXAG NUT M12 DIN985 8C	9056900

Frame Head VR connection:





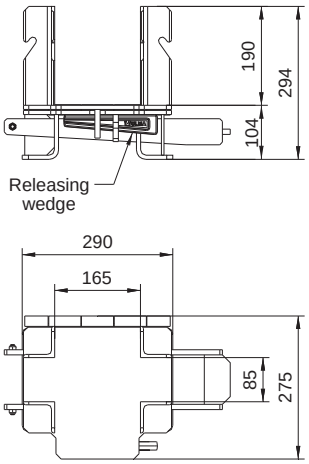
Frame Head VR

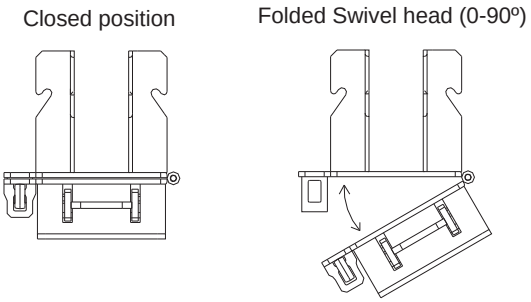


Narrow Beam Strap

2.2.1.2. SWIVEL HEAD VR

Functionally like Head VR, but allows prop swivelling.



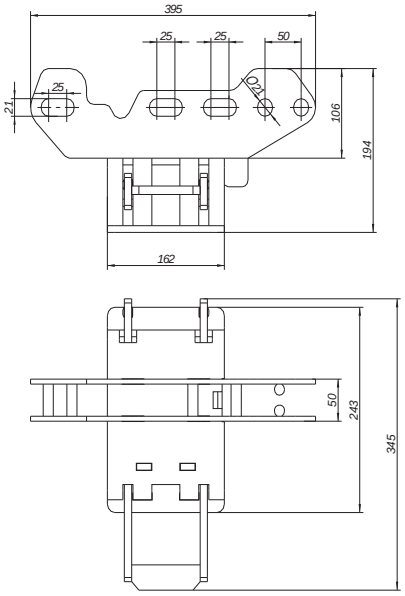


Easy handling wedge to switch from fixed to swivelled position.

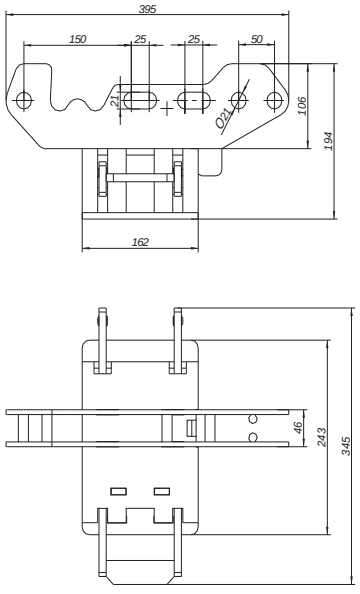
2.2.1.3. HEAD WALER VR and HEAD WALER VR-DU120

For VR Table with waler as main beam:

- Connect the horizontal shuttering structure and EP Props
- Designed for MK-120 waler: Head Waler VR
- Designed for DU-120 waler: Head Waler VR DU120



Head Waler VR (2211310)



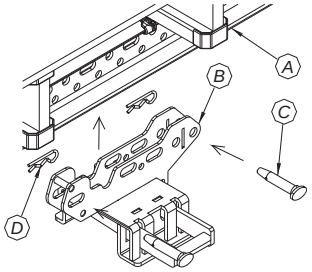
Head Waler VR-DU120 (2211410)

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

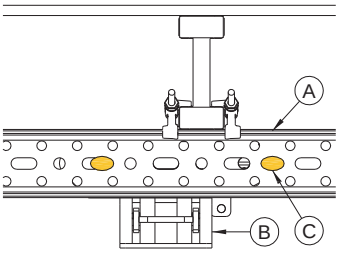
Two possible assemblies:

1- Fixed head assembly:

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



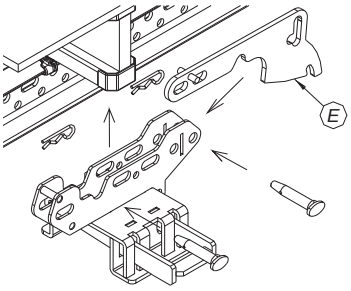
Head Waler VR assembly



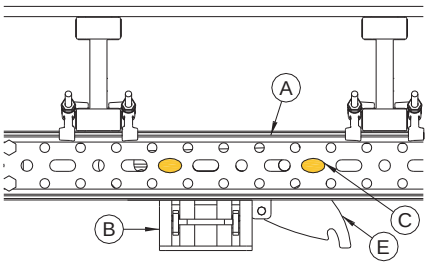
	QUANTITY	NAME	ITEM No.
A	1	MK-120	-
B	1	HEAD WALER VR	2211310
B	1	HEAD WALER VR-DU120	2211410
C	2	PIN E20x70	0252070
D	2	COTTER PIN R/5	0250000

2- Swivel head assembly:

- Latch VR is necessary to get a swivel head.



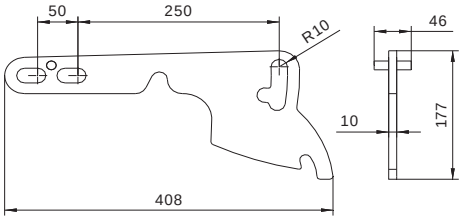
Head Waler VR and Latch VR assembly



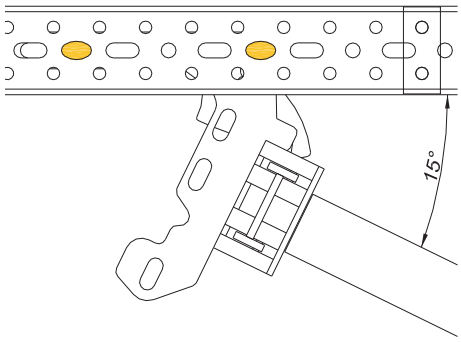
	QUANTITY	NAME	ITEM No.
E	1	LATCH VR	2211370

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

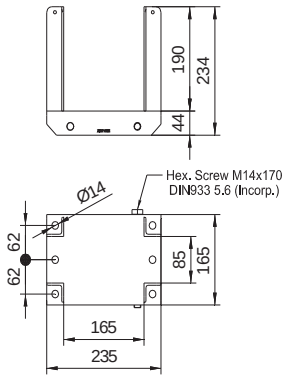


Swivel positions: 15°

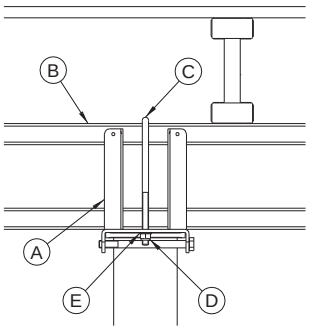
Self-lock and release activation by means of the prop fold up.

2.2.1.5. ALUPROP HEAD

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

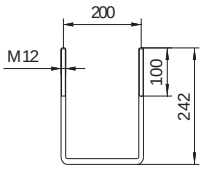


ALUPROP Head



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

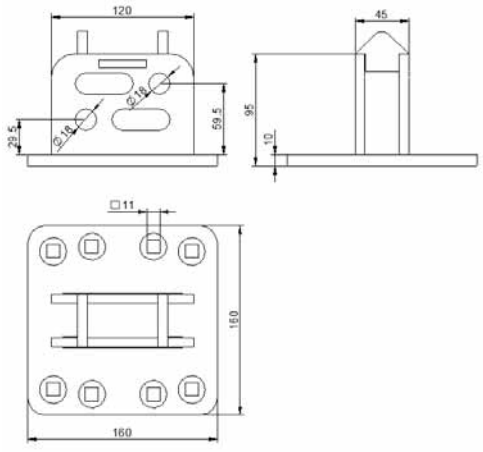
Rod Thread

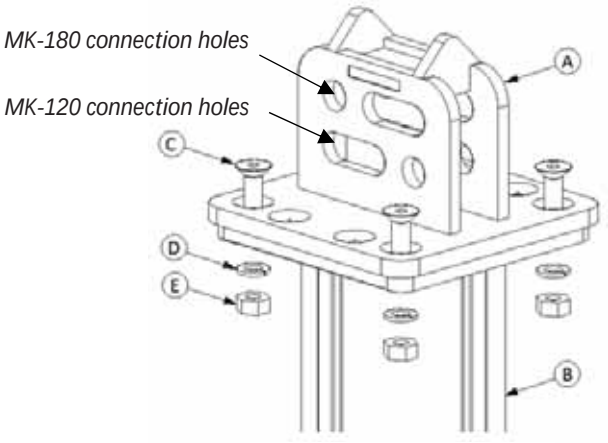


- Easy to adapt the ALUPROP tower and the horizontal shuttering structure avoiding any interference, thanks to ALUPROP head's different assembly positions.

2.2.1.6. ALUPROP HEAD MK VR

- Fix the VR Table with MK-120 or MK-180 waler as main beam with ALUPROP Props.
- With this head ALUPROP Props must be always braced with Bracing Frames.
- At least one head's round hole must fit in a waler's hole (not slot), fixed with a M16 bolt and nut.
- The head is bolted to ALUPROP Prop by four M10 countersunk bolts, spring washers and nuts.



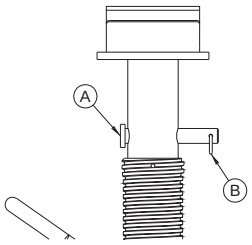


ALUPROP Head MK VR

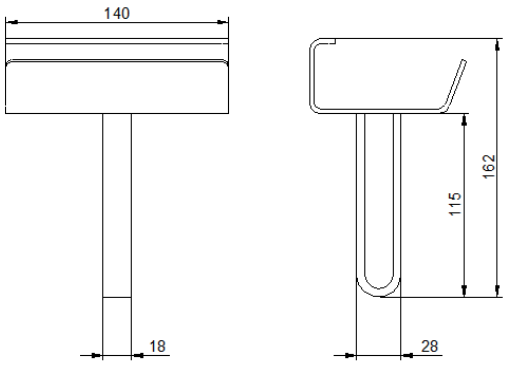
	QUANTITY	NAME	ITEM No.
A	1	ALUPROP HEAD MK VR	2211254
B	1	ALUPROP PROP	-
C	4	BOLT CSK M10x40 DIN7991 8.8C	9852021
C	4	CSK SCREW M10x40 DIN608 8.8C	0249926
D	4	SPRING WASHER B10 DIN127	9000001
E	4	NUT M10 DIN934 8C	0241004

2.2.1.7. 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.



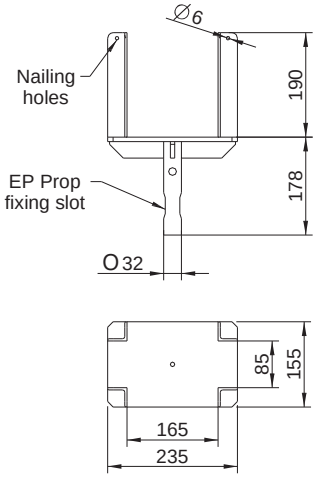
	QUANTITY	NAME	ITEM No.
A	1	PIN 16x100	1861627
B	1	COTTER PIN R/3	9370571



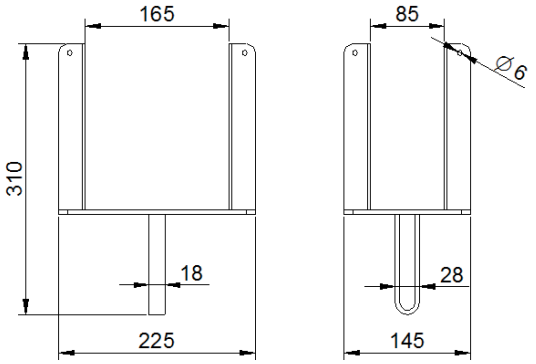
Simple Head VR

2.2.1.8. DOUBLE HEAD VR and ECO DOUBLE HEAD

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



Double Head VR

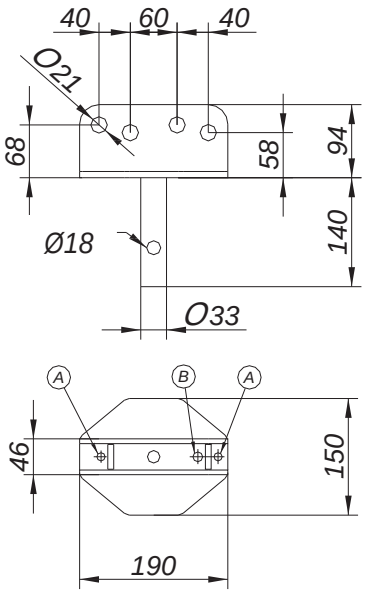


Eco Double Head

2.2.1.9. 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. BOLT M12x30 DIN933 8.8C	0241230
B	ALUPROP	HEX. BOLT M10x50 DIN933 8.8C	0241051

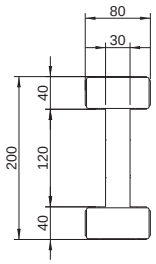


Simple Head Waler

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.

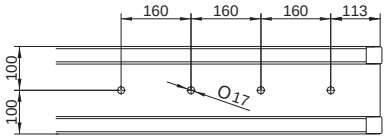


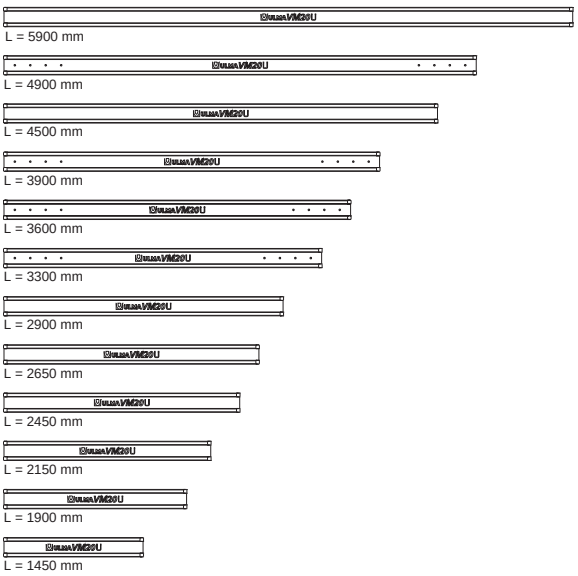
VM20 beam cross section

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.

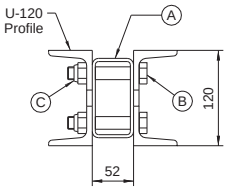


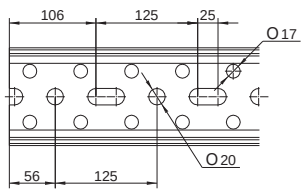


- ➢ Wide range of Standard Beam lengths.
- ➢ Special lengths up to 12 m available.

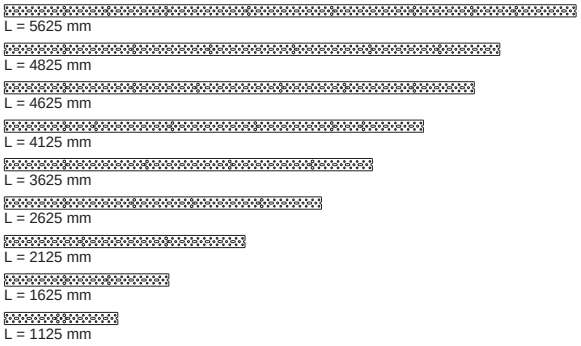
2.2.2.2. WALER: MK-120

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





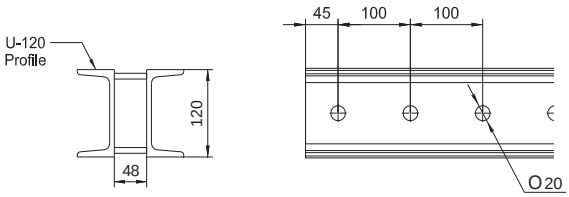
	QUANTITY	NAME	ITEM No.
A	-	SPACER	1990200
B	2	HEXAG BOLT M16x90 DIN931 8.8C	0241690
C	2	HEXAG NUT M16 DIN985 8C	0241608



- ➢ Wide range of Standard lengths available.

2.2.2.3. WALER: DU-120

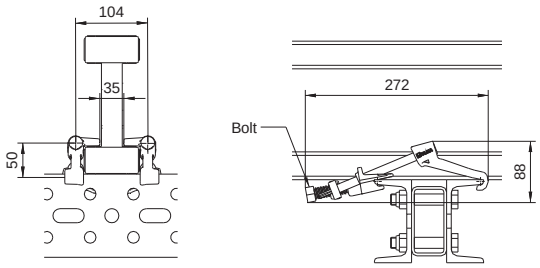
- Two U-120 profiles brought face to face.
- Profile drilled all along its length.



➢ Wide range of lengths available.

2.2.2.4. WALER-VM20 CLAMP

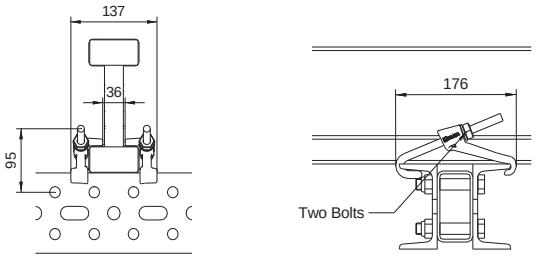
- Joins VM20 beam and waler with an only bolt.
- Faster and best accesibility below the table.
- Keeps VM20 beam perpendicular to the waler.
- Only for DU-120, not for MK-120.



Waler-VM20 Clamp

2.2.2.5. WALER-VM20 CLAMP 2T

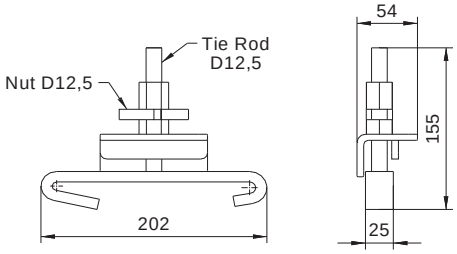
- Joins VM20 beam and waler with two bolts.
- Clamp accesibility above the table: suitable for horizontal template assembly.
- Keeps VM20 beam perpendicular to the waler.

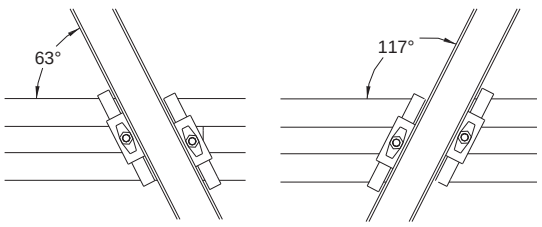


Waler-VM20 Clamp 2T

2.2.2.6. WALER-VM20 ANGULAR CLAMP

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





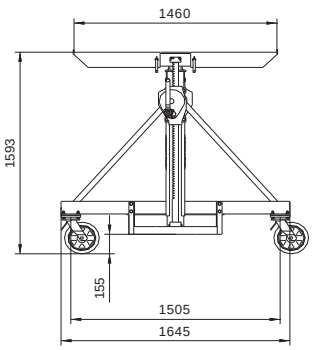
Minimum and maximum connection angles: 63° to 117°

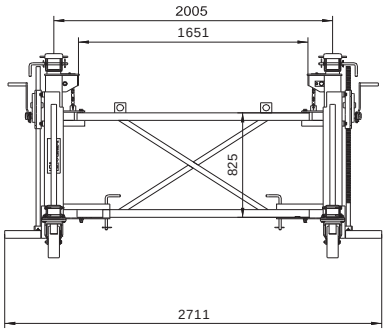
2.2.3. Accessories

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.

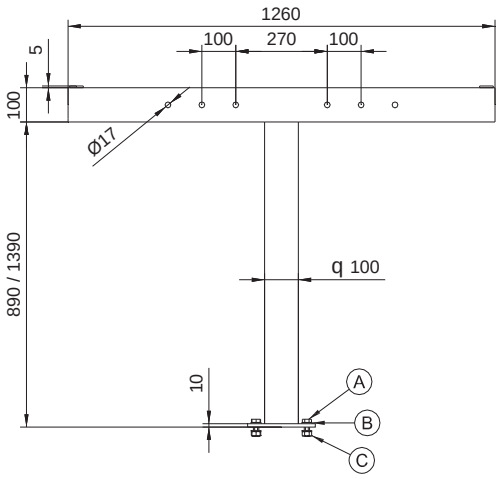
For further information see TROLLEY VR User's guide.

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

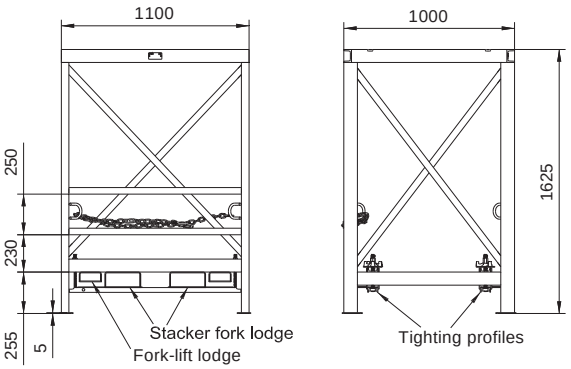
- 2 units are necessary for each trolley.
- Telescopic arms must be reused.

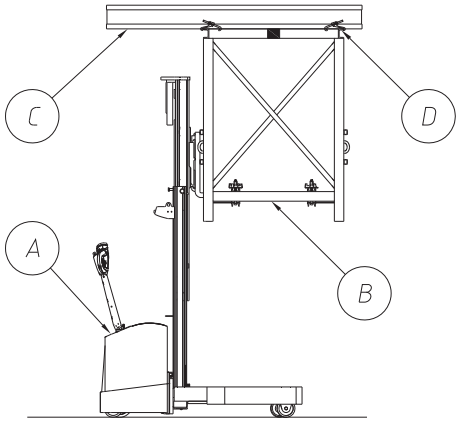


	CUANTITY	NAME	ITEM No.
A	4	HEXAG BOLT M16x40 DIN933 8.8C	0241640
B	4	WASHER A16 DIN125	0241601
C	4	HEXAG NUT M16 DIN934 8C	0241600

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.



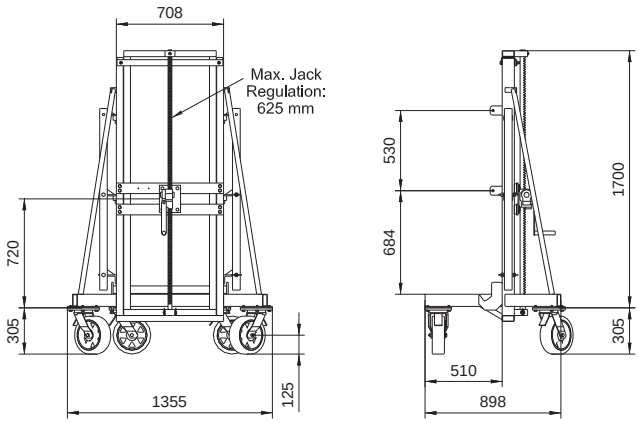


	QUANTITY	NAME	ITEM No.
A	1	FORKLIFT	-
B	1	SPT TRUCK ADAPTOR	2211330
C	2	LOAD DISTRIBUTION VM20 BEAMS	-
D	4	WALER-VM20 CLAMP 2T	1960375

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

2.2.3.4. LATERAL TROLLEY VR

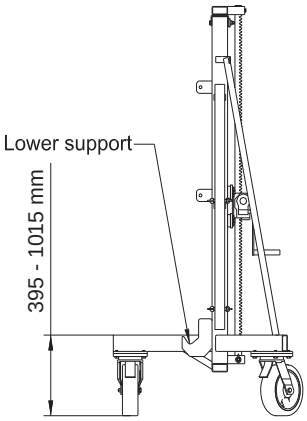
- For moving ULMA VR Tables with shoring towers. Two trolleys are necessary for moving one table.
- Load bearing capacity: 10 kN.
- Not approved for personnel transporting.
- Only move on clean, level and sufficiently strong surface.



Two different working positions:

1-Lower support:

- Height range: 395 mm – 1015 mm



Lower position of the Lateral Trolley

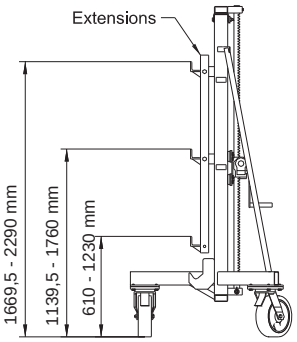
2-Lateral trolley extensions:

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

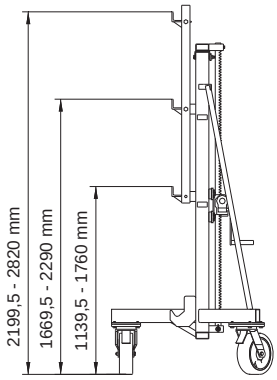
- Upper position:
  - Min. height range: 1140 – 1760 mm
  - Med. height range: 1670 – 2290 mm
  - Max. height range: 2200 – 2820 mm

Bolts for Extensions assembly are included.

Extension Lower position



Extension Upper position



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

2.2.3.5. HOOK VR

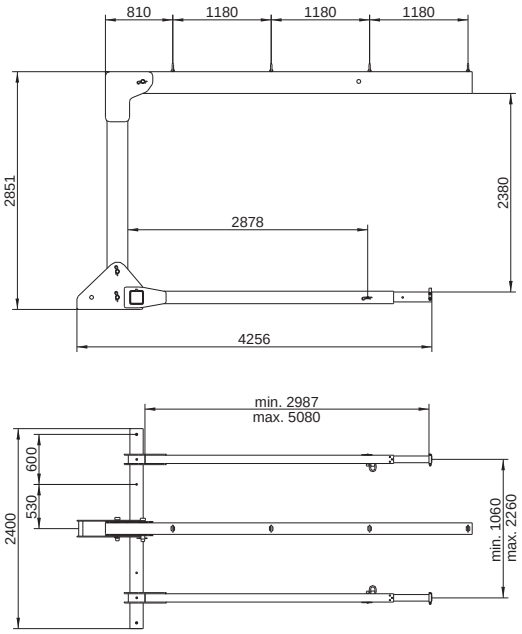
HOOK VR 600/540

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

Hook VR

- Load bearing capacity: 10 kN
- Table length: up to 5 m
- Table width: up to 2.5 m

For further information see User's guide HOOK VR.

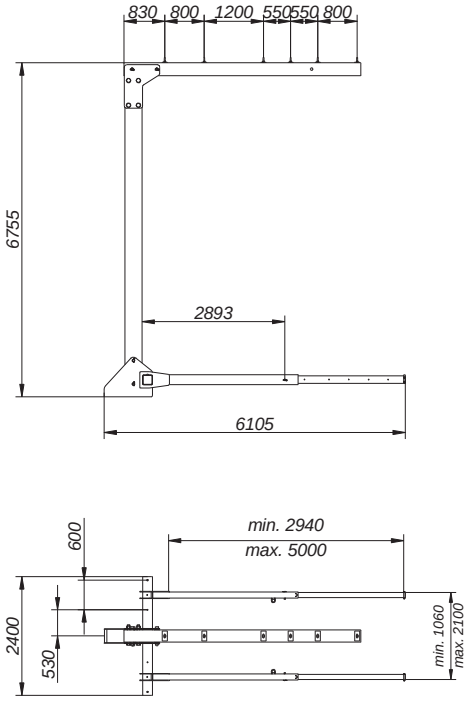


Hook VR

Hook VR 600/540

- Load bearing capacity: 15 kN
- Table length: up to 5 m
- Table width: up to 2.5 m

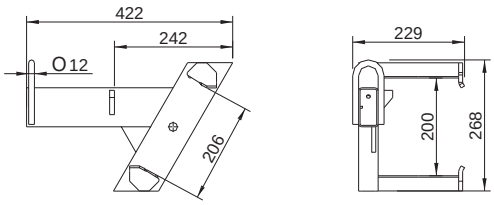
For further information HOOK VR 600/540 User's guide.



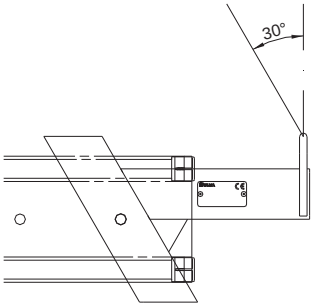
Hook VR 600/540

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.



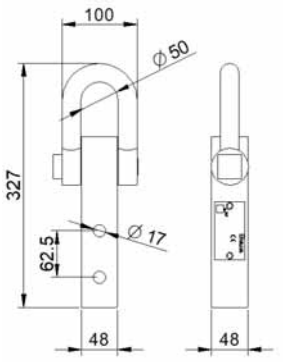
Lifting Hook VR



Maximum sling angle: 30°

2.2.3.7. LIFTING HOOK RKS

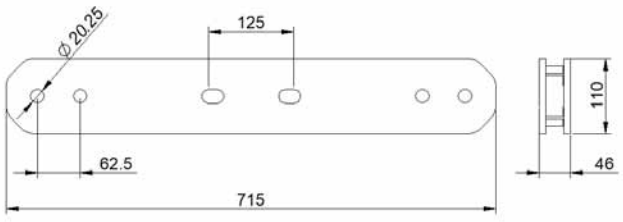
- Lifting component for Large Tables with MK-120 or MK-180 Waler as main beam.
- Load bearing capacity: 31 kN (maximum sling angle 30°)
- 4 units required for Large Table lifting.
- It is attached to the MK walers with a pair of M16 bolts and self-locking nuts.



Lifting Hook RKS

2.2.3.8. WALER CONNECTOR MK

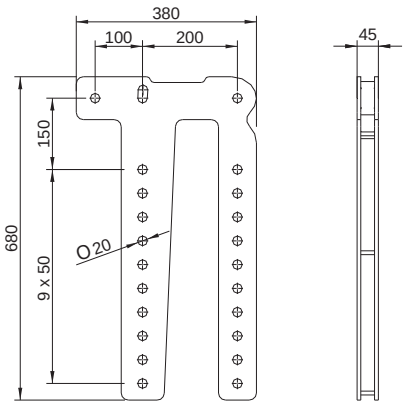
- Element to join MK walers longitudinally end-to-end to make a longer one.
- The resulting waler is equal to the sum of the two joined walers and maintains the 125 mm distance between waler holes.
- The join is fastened with 4 E20x70 pins or preferably with M20 bolts and nuts.



Waler Connector MK

2.2.3.9. HANGING BEAM PLATE 60

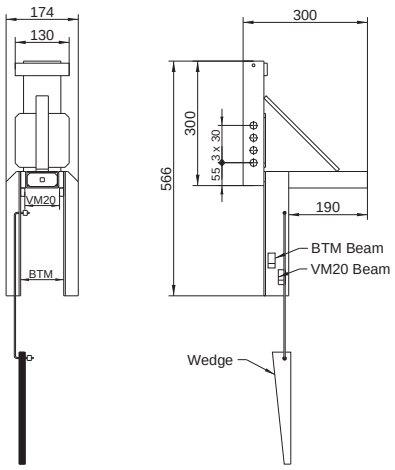
- For VR Table with waler as main beam.
- Standardised solution for slab edge hanging beams.
- From 150 mm up to 600 mm, every 50 mm.
- Valid for MK-120 and DU-120 walers.



Hanging Beam Plate 60

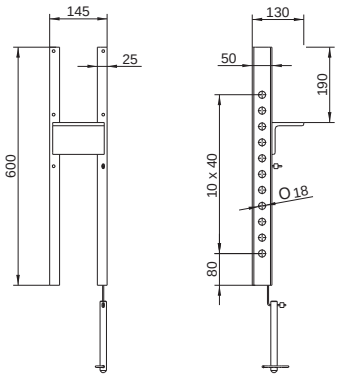
2.2.3.10. VM20 HANGING BEAM SUPPORT
HANGING BEAM SUPPLEMENT

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



VM20 Hanging Beam Support

Hanging Beam Supplement

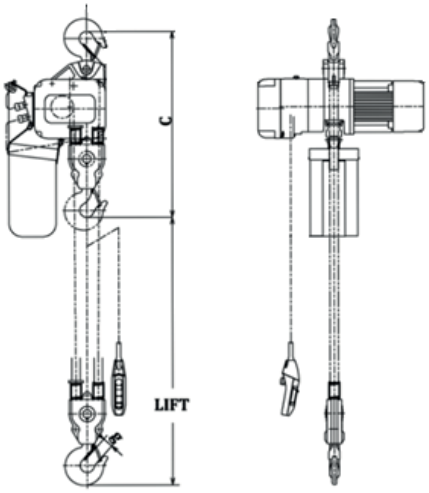


- Accessory to combine with the Support for hanging beams up to 90 cm.

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

2.2.3.11. ELECTRIC HOIST KITO 5 T

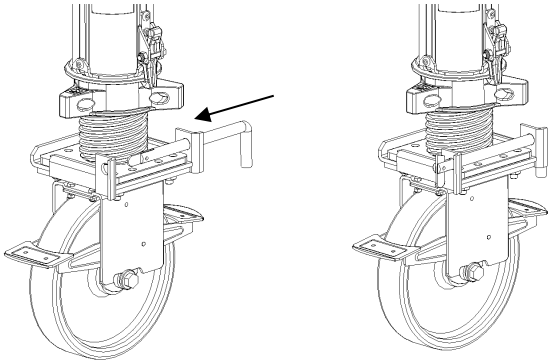
- Electric chain hoist for stabilize Large Tables during the lifting phase.
- Remote control (optional).
- Load bearing capacity: 5 t
- Reference: KITO ER2050S (single speed)
- Supply voltage: Several options available.
- LIFT: To specify when purchasing.
- C = 838.2 mm



Electric Hoist KITO 5 t

2.2.3.12. ALUPROP CASTER

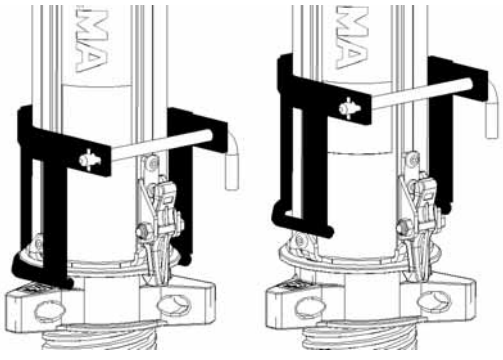
- Swivel caster for ALUPROP Prop to permit rolling of tables.
- Easy and fast fixation by gravity pin.
- Wheel diameter: 250 mm (10")
- Base height: 328 mm
- Brake system included.
- Cast iron wheel with rubber tread.
- Working load: 908 kg (2000 lbs)



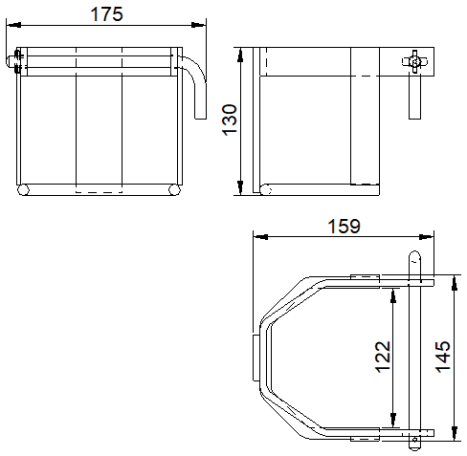
ALUPROP Caster

2.2.3.13. ALUPROP FIXER VR

- Accessory to assure the inner tube fixation of ALUPROP during the lifting process of tables.
- They are assembled on props which are installed the ALUPROP caster (holds the nut).
- Easy and fast fixation by gravity pin.



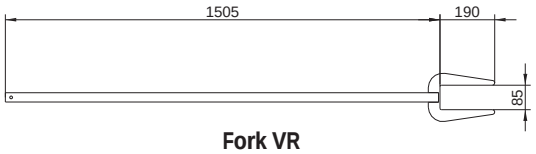
Inner tube fixed *Fixer in rest position*



ALUPROP Fixer VR

2.2.3.14. FORK VR

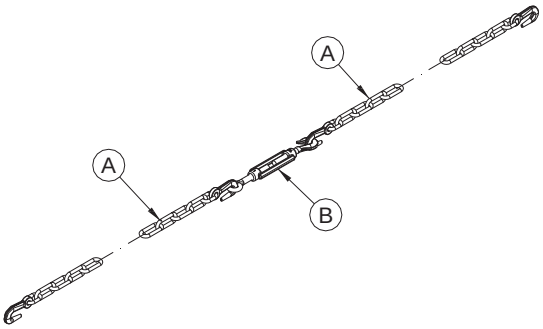
- Erection and dismantling accessory.



Fork VR

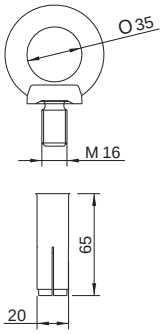
2.2.3.15. CHAIN VR 7.5 kN

- 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

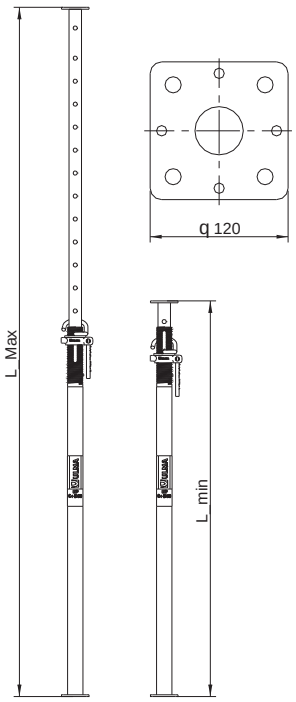
For further information see CHAIN VR Instructions for use.

2.2.4. Shoring system

2.2.4.1. EP PROPS

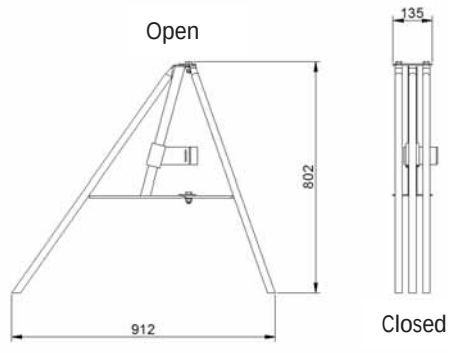
- Designed according EN1065.

	ITEM No.	L min.	L max.	WEIGHT (kg)
EP C25	2200048	1500	2500	14.6
EP C+D30	2200000	1800	3000	16.5
EP C+E30	2200023	1800	3000	18.9
EP C+D35	2200068	2000	3500	21.2
EP C+D40	2200012	2300	4000	23.7
EP C+E40	2200033	2300	4000	26.4
EP C+D45	2200084	2500	4500	29.1
EP C+D50	2200057	2800	5000	31.7

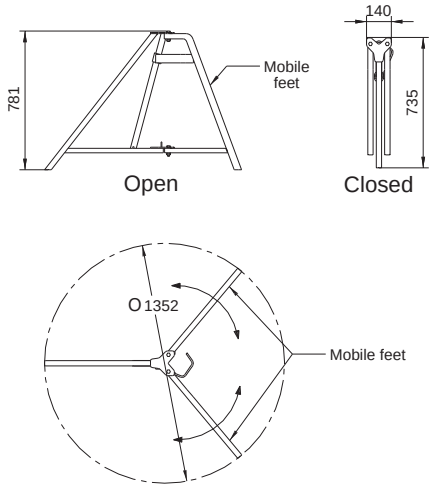


2.2.4.2. TRIPOD 42-87 mm and UNIVERSAL TRIPOD

- Stabilises and ensures correct assembly.
- Suitable for all ULMA props:
  - TRIPOD 42-87 mm: From 42 to 87 mm diameter tubes.
  - UNIVERSAL TRIPOD: From 40 to 120 mm diameter tubes.
- High tripod flexibility due to mobile legs.



Tripod 42-87 mm

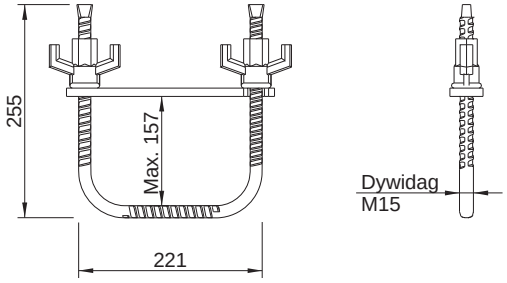


Universal tripod

2.2.4.3. PROP BRACING CLAMP

- Braces and stabilises all Ulma props with wood planks.
- Wood plank maximum width: 150 mm.

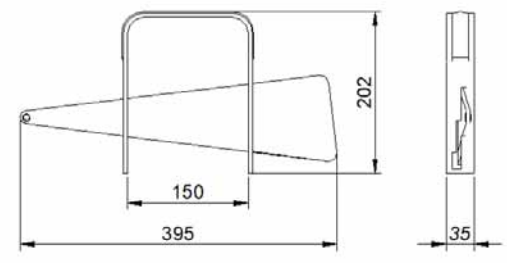
For further information see PROP BRACING CLAMP Instructions for use.



Prop Bracing Clamp

2.2.4.4. CLAMP SP-EP

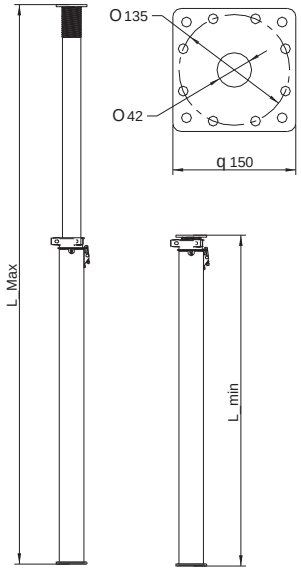
- Braces and stabilises EP and SP props with wood planks.
- Fixation by wedge system.
- Wood plank maximum width: 120 mm.



Clamp SP-EP

2.2.4.5. ALUPROP

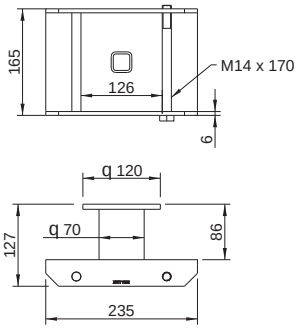
- Light and high load capacity aluminium prop.
- Towers can be easily built with bracing frames.
- Approved product.



NAME	ITEM No.	WEIGHT (kg)
ALUPROP 1.65-2.8	2220010	17.7
ALUPROP 2.2-3.7	2220020	21.6
ALUPROP 3.3-4.8	2220030	25.5
ALUPROP 4.5-6.0	2220040	29.6

2.2.4.6. ALUPROP ADAPTER W/PIN

- 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.



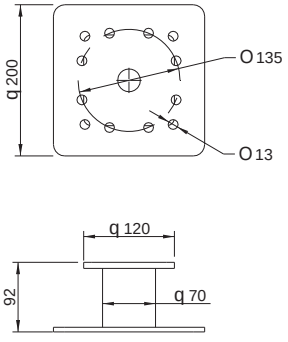
ALUPROP Adapter w/Pin

2.2.4.7. 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 must not be braced.

Complete with:

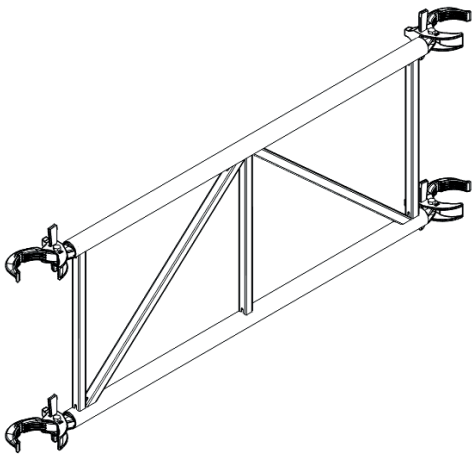
QUANTITY	NAME	ITEM No.
3	HEXAG BOLT M10x50 DIN933 8.8C	9521592
3	HEXAG NUT M10 DIN934 8C	0241000
3	SPRING WASHER B10 DIN127	9000001



ALUPROP Adapter w/Screw

2.2.4.8. BRACING FRAMES

- Steel bracing frame for ALUPROP
- Includes 4 hooks that brace the outer tube of ALUPROP with a wedge system.
- They are used to join ALUPROP props so as to form grids.
- Range of length in metric and imperial measures.

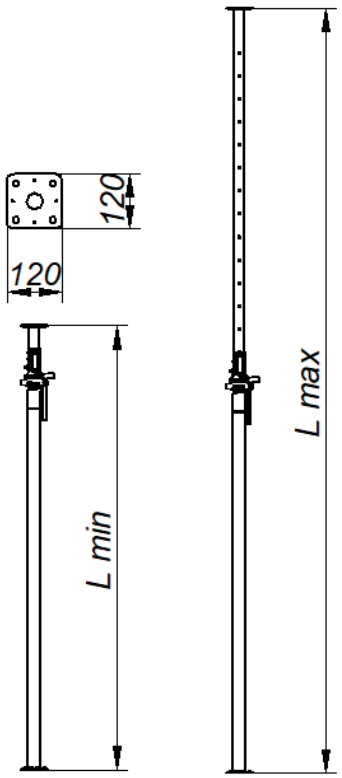


Bracing Frame

2.2.4.9. SP PROPS

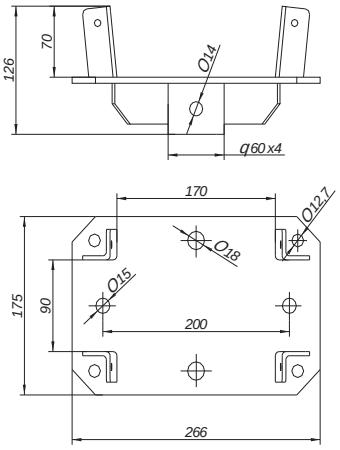
- The inner tube is independent to the outer tube.
- Anti hand trap: Provides hand protection when handling the inner tube.
- Fast striking system: facilities formwork stripping.
- Self-cleaning nut: evacuates dirt and concrete and quick fitting and release thanks to its double-start thread.
- Light weight, strong and high load capacity.
- Hot dip galvanized and yellow painted versions.

NAME	ITEM No.	L min.	L max.	WEIGHT (kg)
SP-30 SP-30 P	2170030 2170300	1750	3000	11.2 10.7
SP-35 SP-35 P	2170035 2170135	2000	3500	15.2 14.5
SP-40 SP-40 P	2170040 2170400	2500	4000	16.6 15.8
SP-50 SP-50 P	2170050 2170500	3900	5000	23.8 22.7



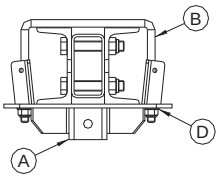
2.2.4.10. TWO-WAY U-HEAD VM-DU

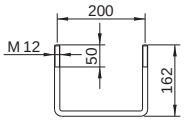
- VR Table and T-60 shoring connection head for VM20 and Waler main beams.



Two options:

Waler:

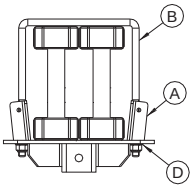


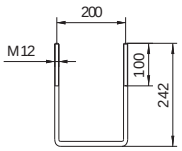


Waler Rod Thread

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

VM20 Beam:



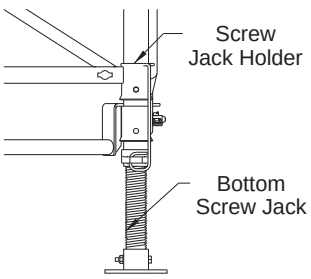


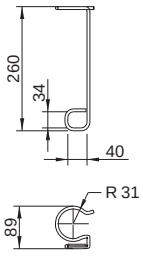
Rod Thread

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

2.2.4.11. SCREW JACK HOLDER

- Fixes bottom screw jack to the tower during lifting.



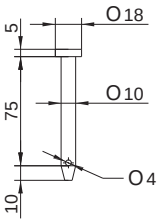


Screw Jack Holder

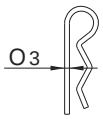
2.2.4.12. PIN D10x90

COTTER PIN R/3

- Fixes T-60 frames during lifting.



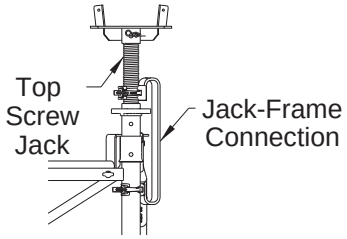
Pin D10x90

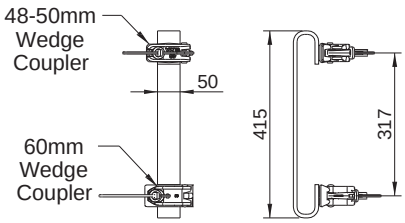


Cotter Pin R/3

2.2.4.13. JACK FRAME CONNECTION

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



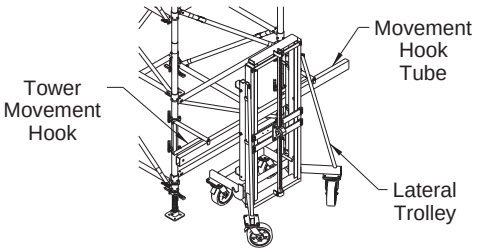


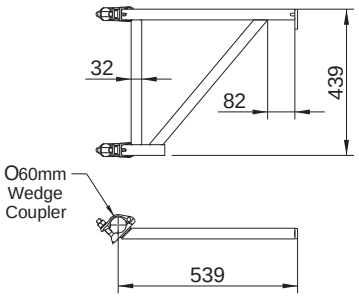
Jack Frame Connection

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

2.2.4.14. TOWER MOVEMENT HOOK

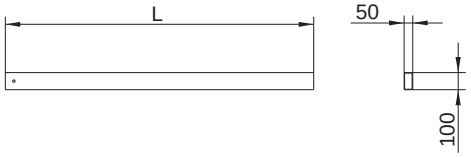
- Accessory for moving towers with Lateral Trolleys.





Tower Movement Hook

Complete with:



ITEM No.	NAME	L (mm)
1906163	MOVEMENT HOOK TUBE 1.8	1800
1906164	MOVEMENT HOOK TUBE 2.4	2400

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

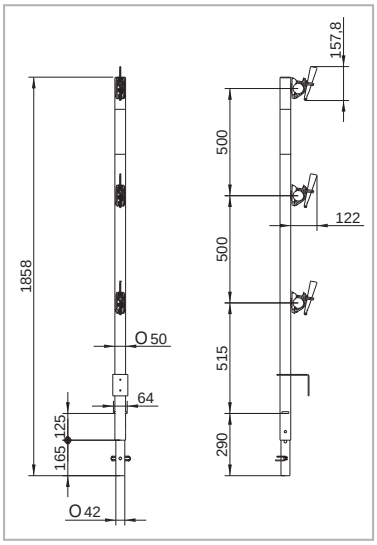
2.2.5. Safety elements

2.2.5.1. SAFETY HANDRAIL 1.5

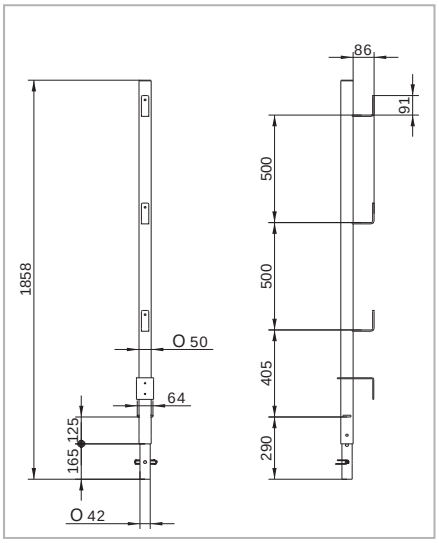
SAFETY HANDRAIL 1.5 m WOOD

SAFETY HANDRAIL POST

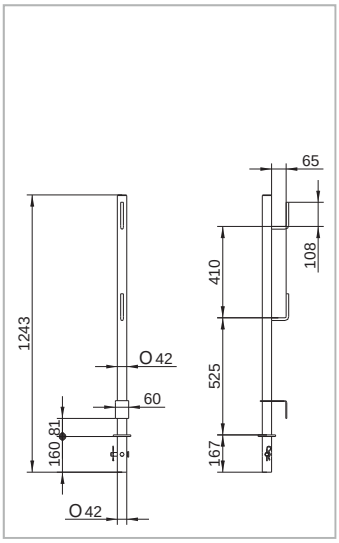
- 1.5 m high handrail post for 48 or 50 mm diameter tube and wood plank.
- 1 m high handrail post for wood plank.



Safety handrail 1.5



Safety handrail 1.5 m Wood

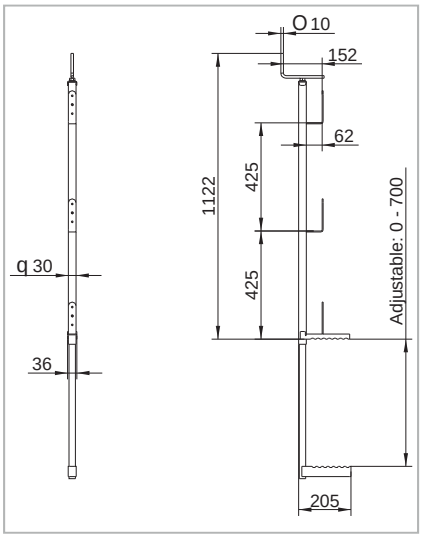


Safety handrail 1 m

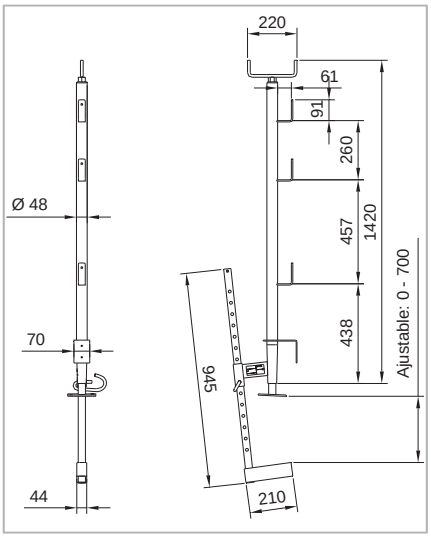
2.2.5.2. CLAMP HANDRAIL 1 m

CLAMP HANDRAIL 1.3 m

- Designed according to EN 13374.
- 1 m or 1.3 m high adjustable clamp for European Board of 30x150 mm.
- The 1.3 m handrail can also be used with Ø48.3 mm tubes.
- Adjustable from 0 to 700 mm.



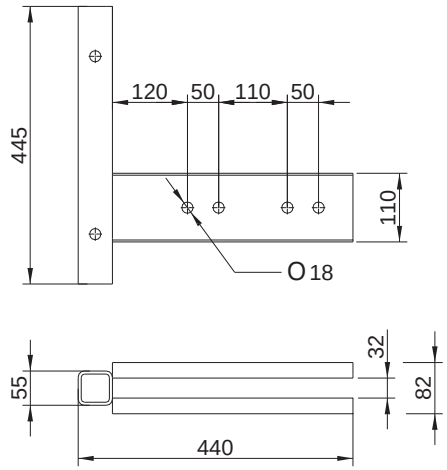
Clamp Handrail 1 m



Clamp Handrail 1.3 m

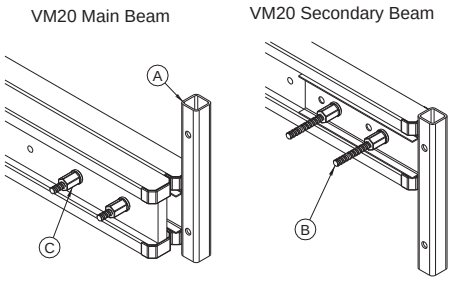
2.2.5.3. VM HANDRAIL SUPPORT

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



Two assembly positions are possible:

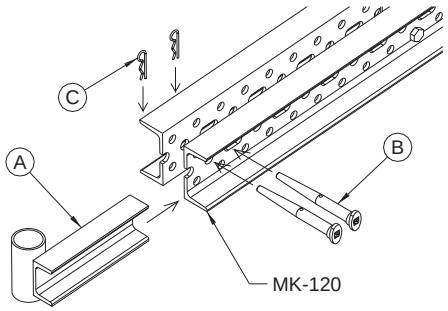
On main beam On secondary beam:



	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

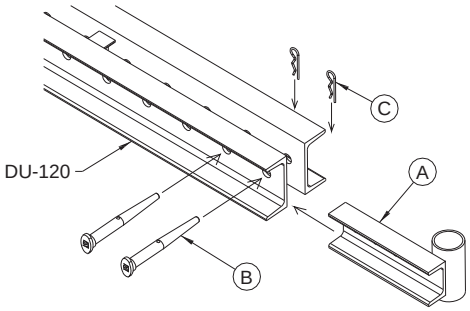
- Accessory for Waler MK-120 and DU-120.
- Solution certified by AIDICO according EN13374 with Safey handrail 1.5 (2211156).



Handrail Socket with waler MK-120

Complete with:

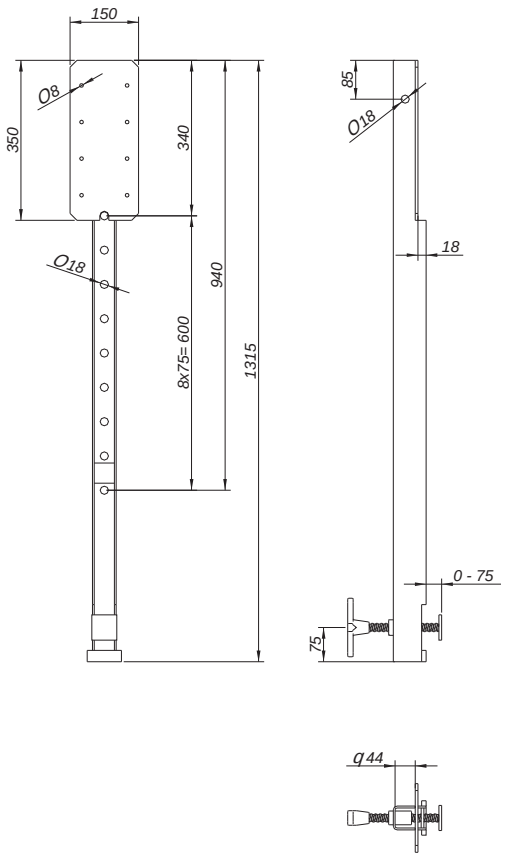
	QUANTITY	NAME	ITEM No.
A	1	MK-120 / DU-120	-
B	2	PIN E20x70	0252070
C	2	COTTER PIN R/5	0250000



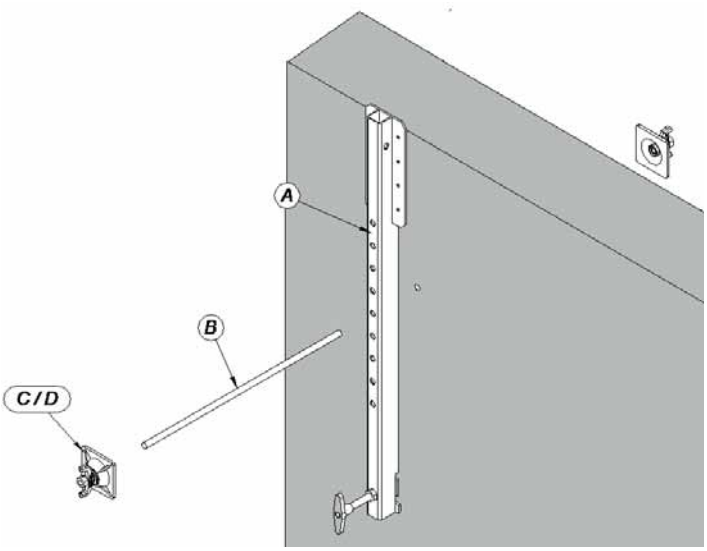
Handrail Socket with waler DU-120

2.2.5.5. WALL HANDRAIL SUPPORT

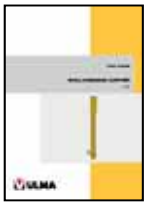
- The wall handrail support is used to fix a handrail post to the external surface of an existing wall and/or to set the stopend.
- The tie rod hole created during wall pouring is used to fix the element to the wall.



	QUANTITY	NAME	ITEM No.
A	1	WALL HANDRAIL SUPPORT	2211256
B	1	TIE ROD 15/1	0230100
C	2	PLATE WASHER NUT 15	1900256
D	2	PLATE NUT 15	7238000



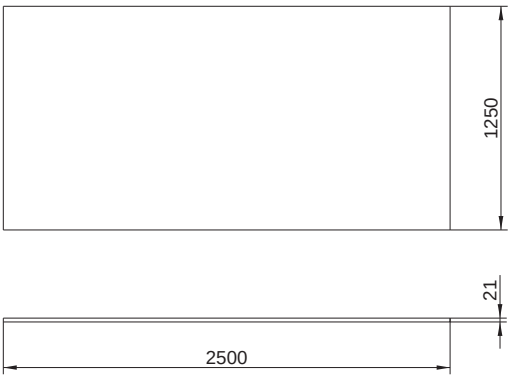
For further information see User's guide WALL HANDRAIL SUPPORT.



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

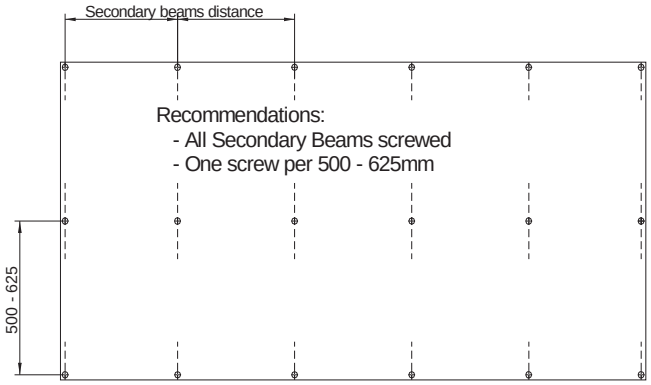
- Phenolic film Plywood for excellent concrete finish with best mechanical properties.
- Any other type of wood can be used with the VR Tables.



2.2.7. Screws

2.2.7.1. SCREW 5x50 DIN7505-A C

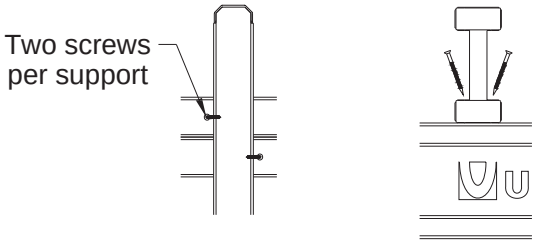
- To fix the plywood over the secondary beam.
- For VR Tables follow recommendations shown in the drawing.



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

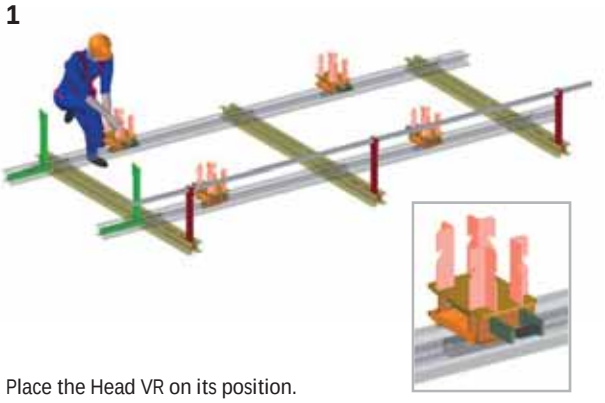
3.1. VR TABLES ASSEMBLY

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.

For further information see the Technical instruction for Tables VR Assembly.

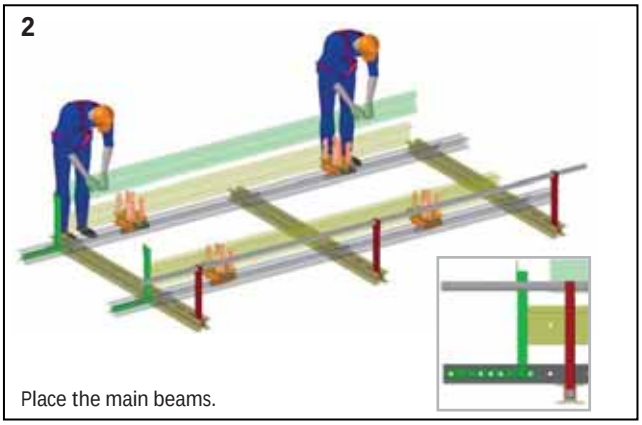
STANDARD VR TABLES ASSEMBLY SEQUENCE

1



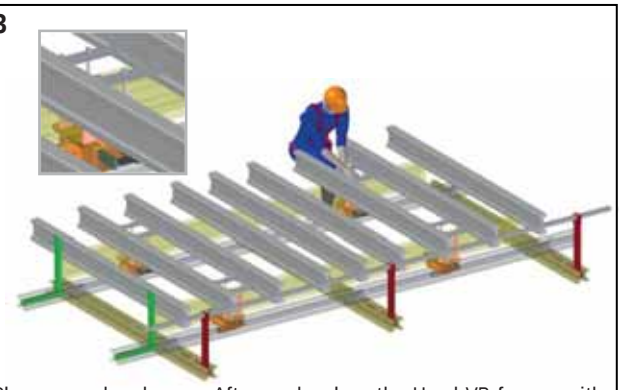
Place the Head VR on its position.

2



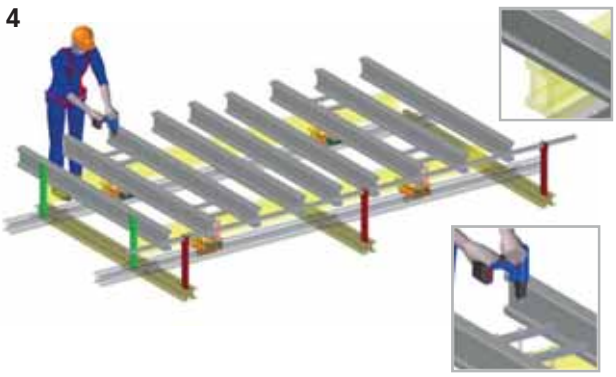
Place the main beams.

3



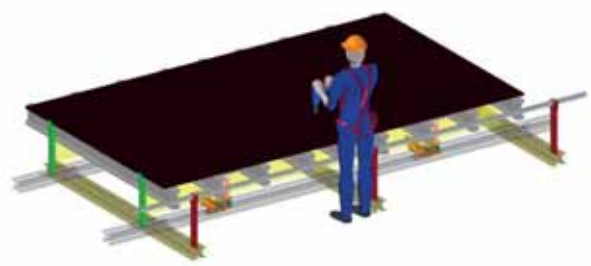
Place secondary beams. Afterwards, place the Head VR frames with the rod or with the connection units.

4



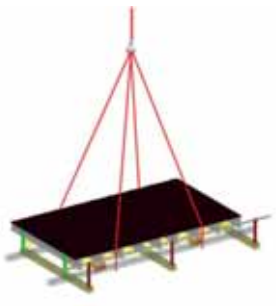
Fix the main and secondary beams with lag screws 6x80 (9371436) and tight the nuts of the Head VR frames.

5



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

6



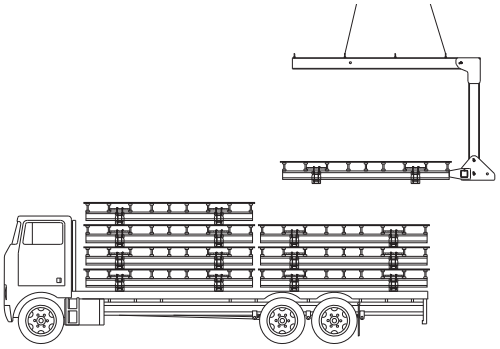
Shift and stack the assembly on the corresponding place using the crane. Be careful not to damage the plywood edges.

3.2. VR TABLES AT SITE

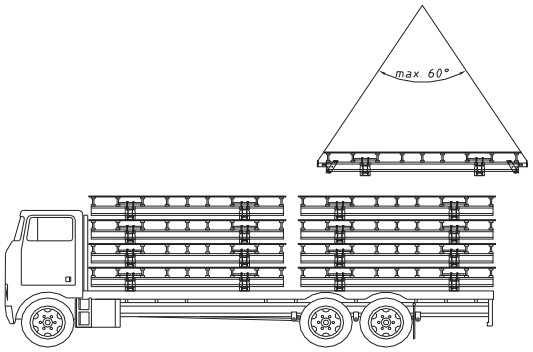
3.2.1. Site delivery

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

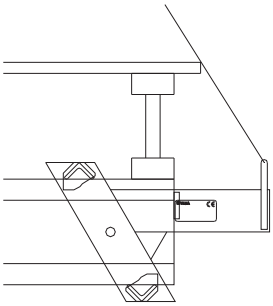
1- Unload VR pre-assembled Tables straight from the lorry with Hook VR (2211030):



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



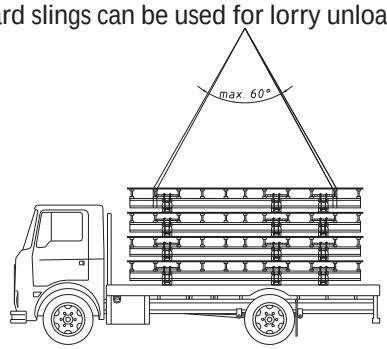
For Tables shifting, 4 Lifting Hooks VR are necessary.



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. 60° pulling angle. Prevent plywood damaging.

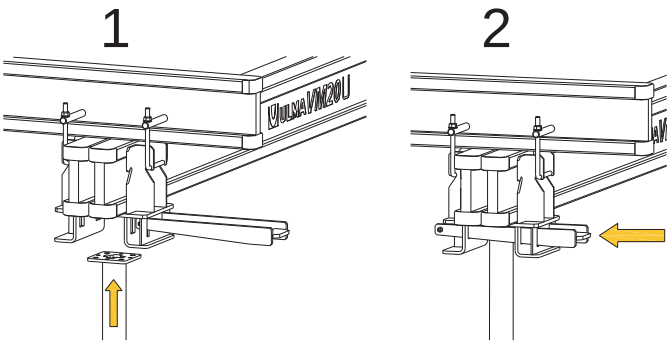
- VR Table dimensions must always be checked to avoid additional transport over costs.
- Unloading area must be delimited assuring crane accessibility.
- Good synchronization between unloading and supports assembling process can save crane time.
- Hook VR and Lifting Hook VR can also be used for:
  -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

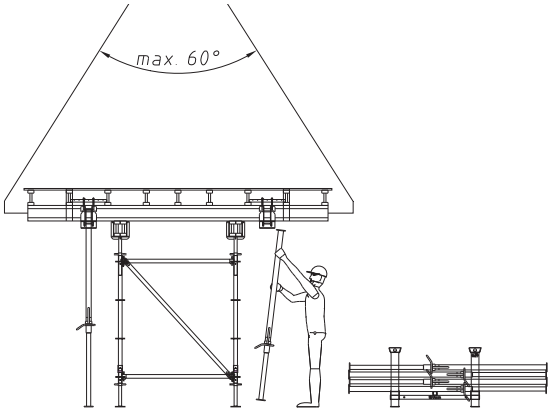
3.2.2. Support system assembly

For VR Tables solutions different support systems are available:

3.2.2.1. EP/ SP PROPS

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

NOTE: When SP props are used, the inner tube must always be positioned upwards. Never downwards.

3.2.2.2. ALUPROP

ALUPROP Adapter w/screw (2211090) must be assembled on the ALUPROP. 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

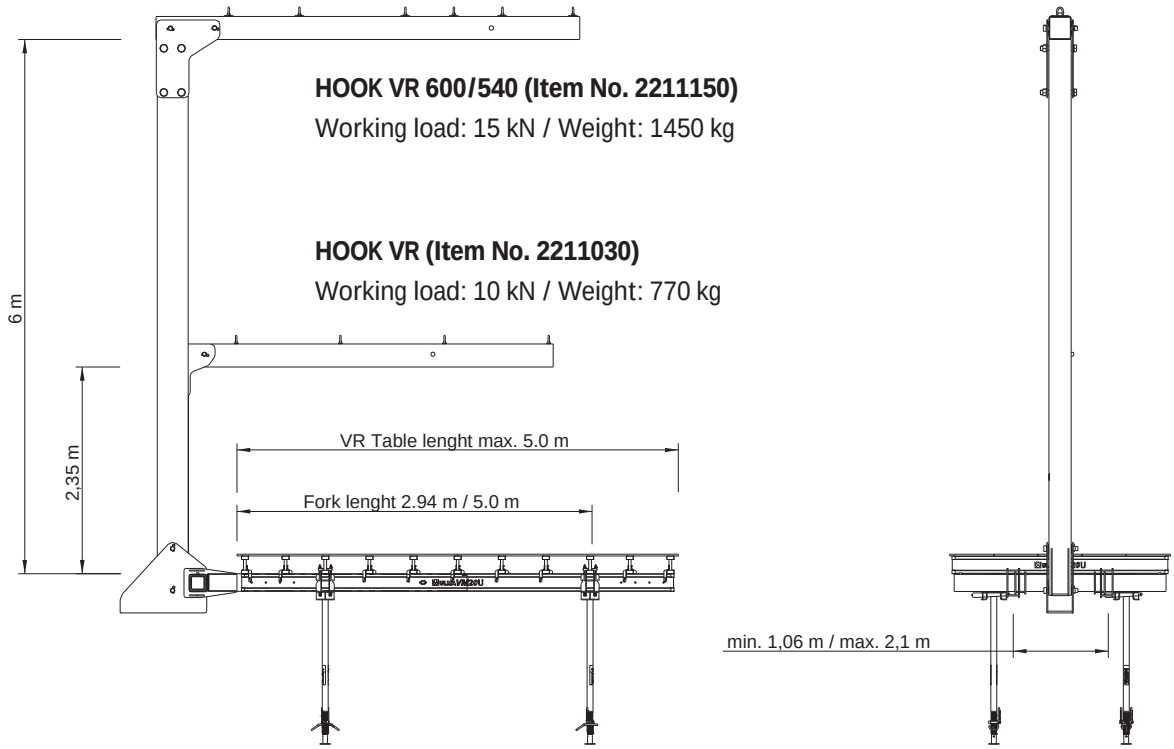
With the Hook, VR Tables can be shifted by crane. Designed to remove VR Tables from a story when four rope slings cannot be used.

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

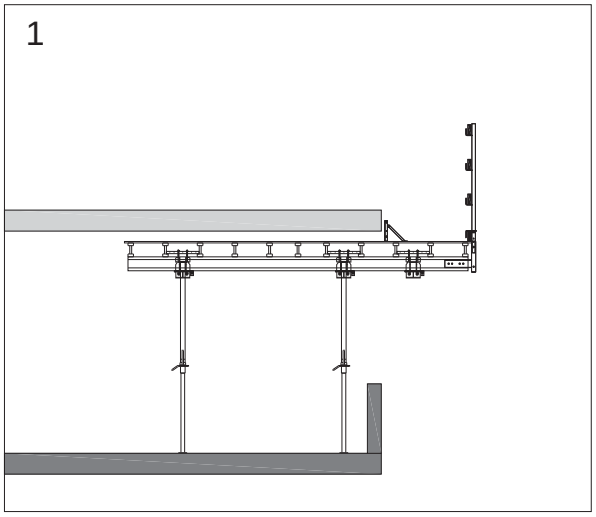
For further information see HOOK VR or HOOK VR 600/540 User's guide.

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

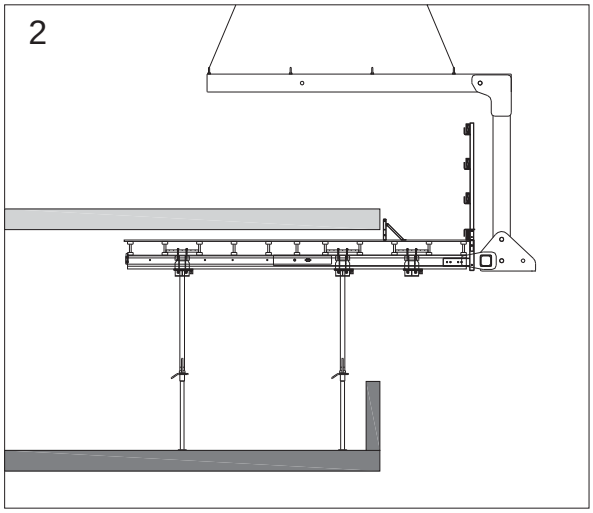
VR Table shifting with Hook VR



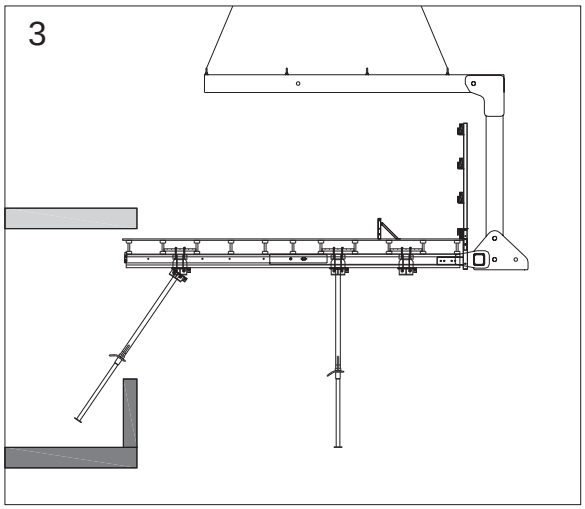
- Choose the correct crane eye to balance the VR Table.
- VR Tables shifting must be programmed to avoid Table interferences and crane overloading.
- Hooks VR are delivered properly folded. At the site, follow User's guide to unfold them.



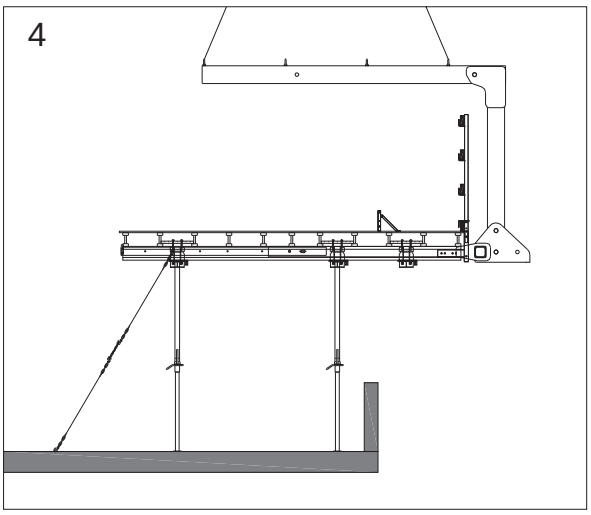
Once the concrete reaches the required strength, strip the VR Table and lower it at least 150 mm. Remove auxiliary elements like Chain VR, nets and intermediate props.



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

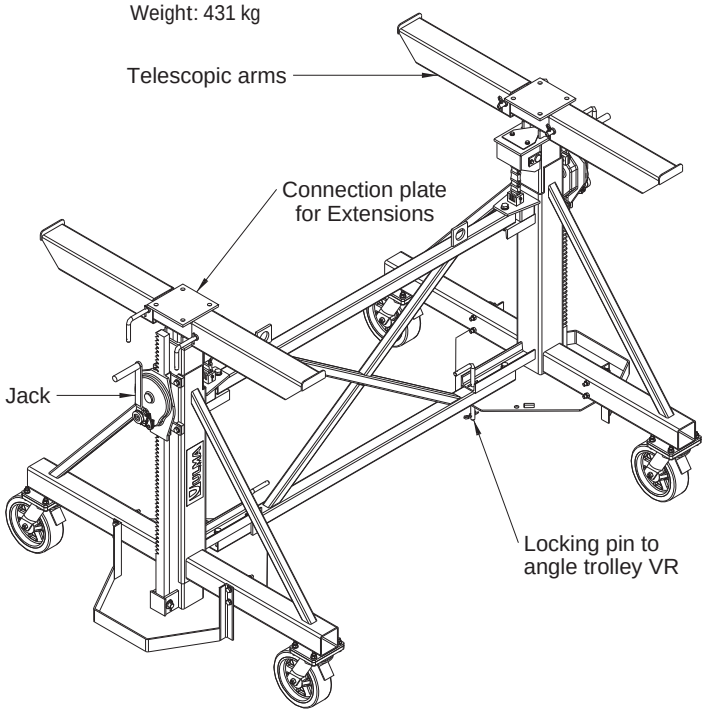
Working load: 15 kN
(with and without extension)

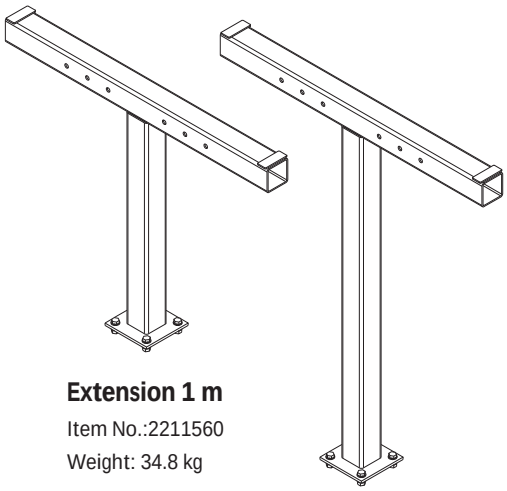
Trolley VR application height:
- Without extension: 1.45 m – 3.2 m
- With extension 1 m: 2.45 m – 4.2 m
- With extension 1.5 m: 2.95 m – 4.7 m

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

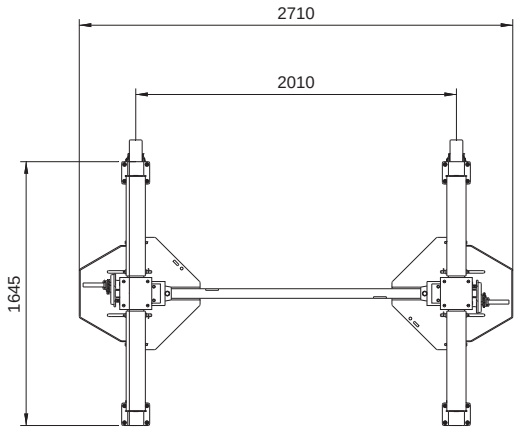




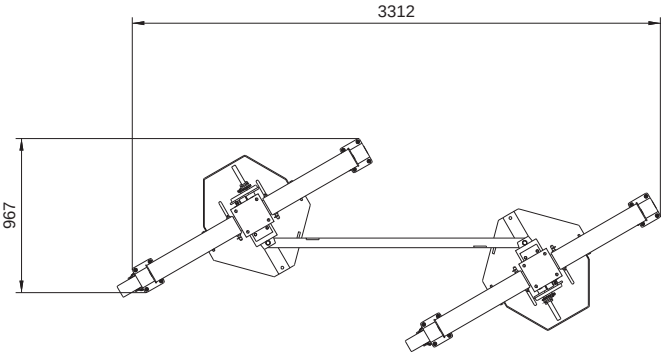
Extension 1 m
Item No.:2211560
Weight: 34.8 kg

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

Working position:



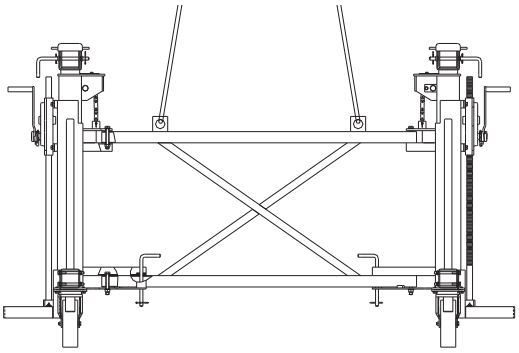
Angled position:



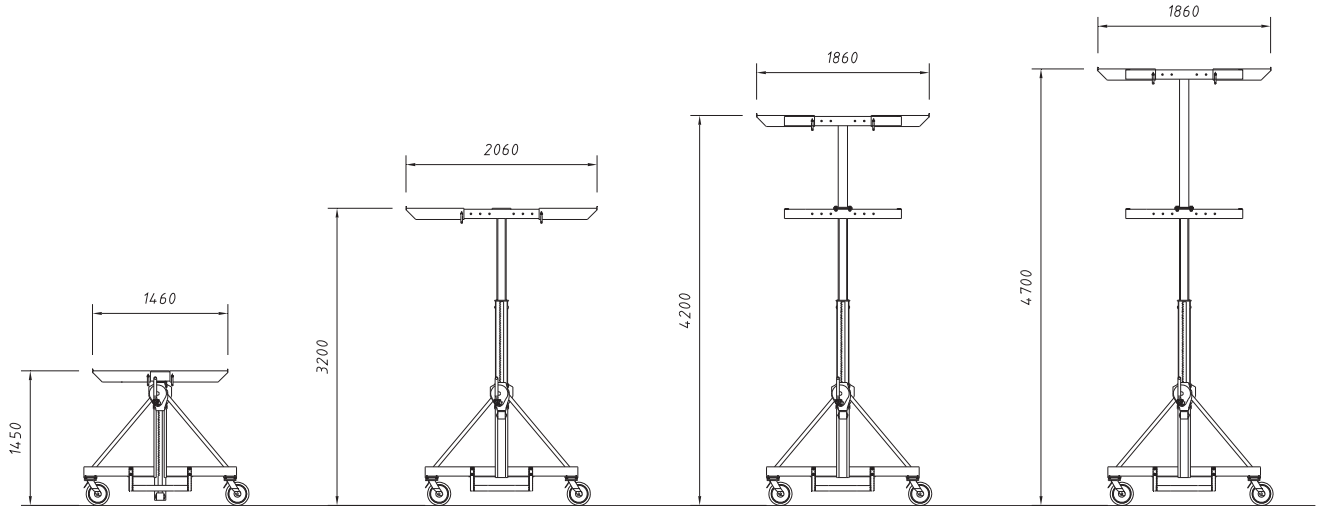
Instructions for use of the Trolley VR:

- 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.

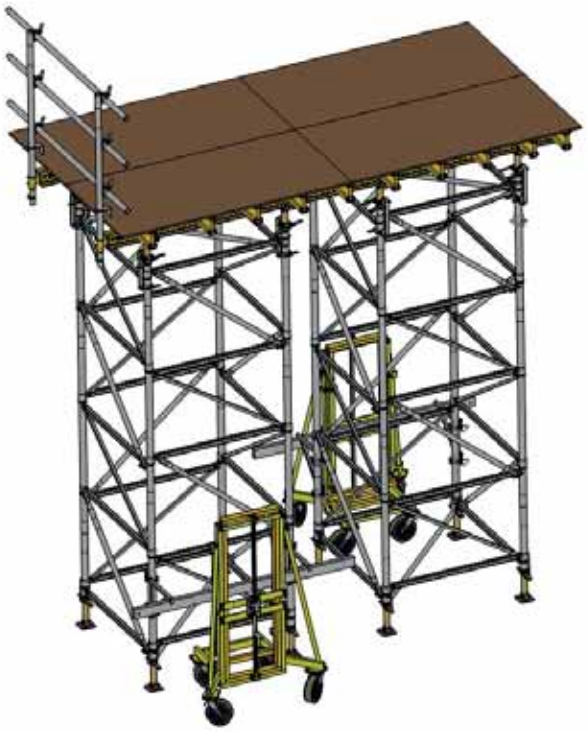
Working load: 10 kN
(2 Trolleys necessary for the travelling)

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

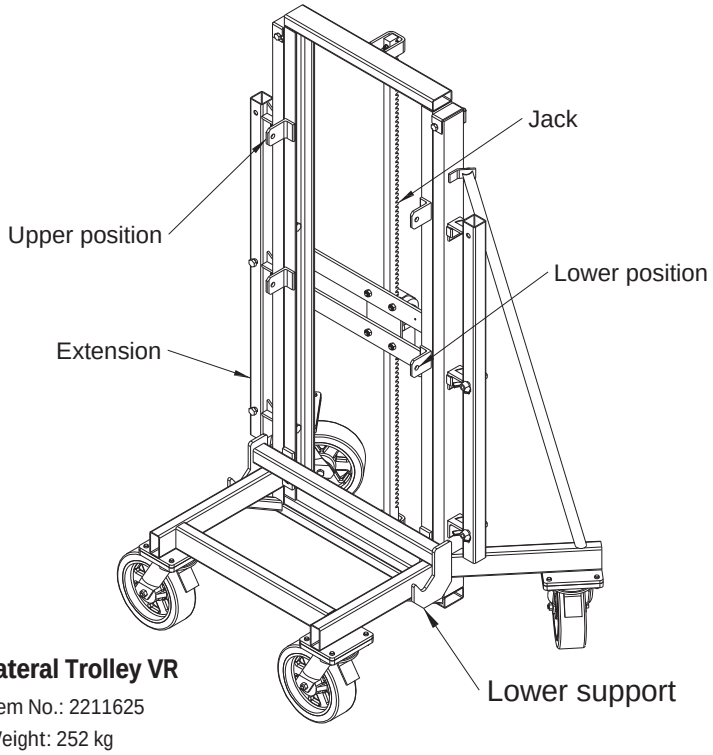
- ALUPROP shoring towers.
- T-60 shoring towers.

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

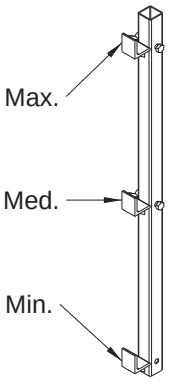


VR Table movement with Lateral Trolley VR



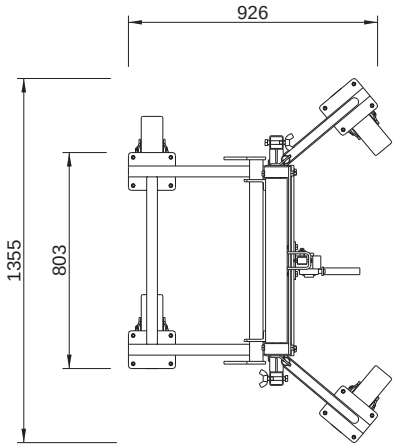
Lateral Trolley VR
Item No.: 2211625
Weight: 252 kg

Extension
Item No.: 2211638
Weight: 6.7 kg

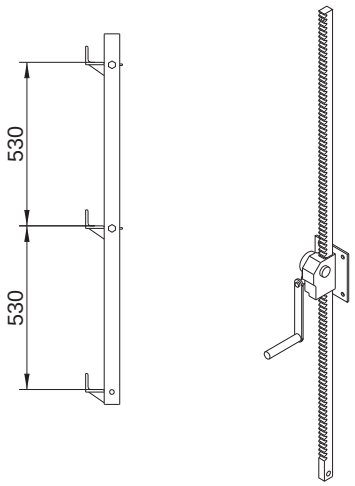


Bolt for extensions assembly included.
Both extensions are included in the Lateral Trolley VR.

General dimensions:



Extension and Jack regulations:



Jack regulations:

- 625 mm

Instructions for use of the Lateral Trolley VR:

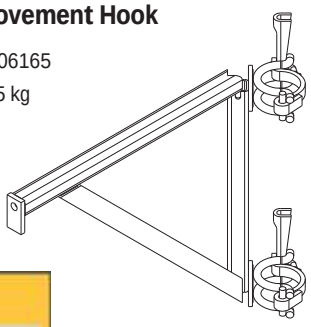
- Not approved for transporting personnel.
- Load over Lateral Trolley must be uniformly distributed.
- Operate both Lateral Trolleys uniformly.
- Before VR Tables movement, check the required height range and adapt Lateral Trolley's extensions position accordingly.
- Only move on clean, level and sufficiently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

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

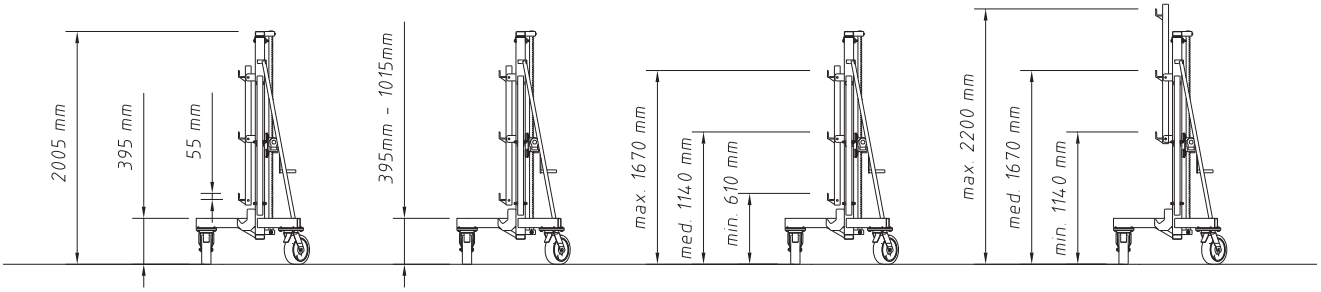
T-60 shoring application:

Tower Movement Hook

Item No.:1906165
Weight: 5.45 kg



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.

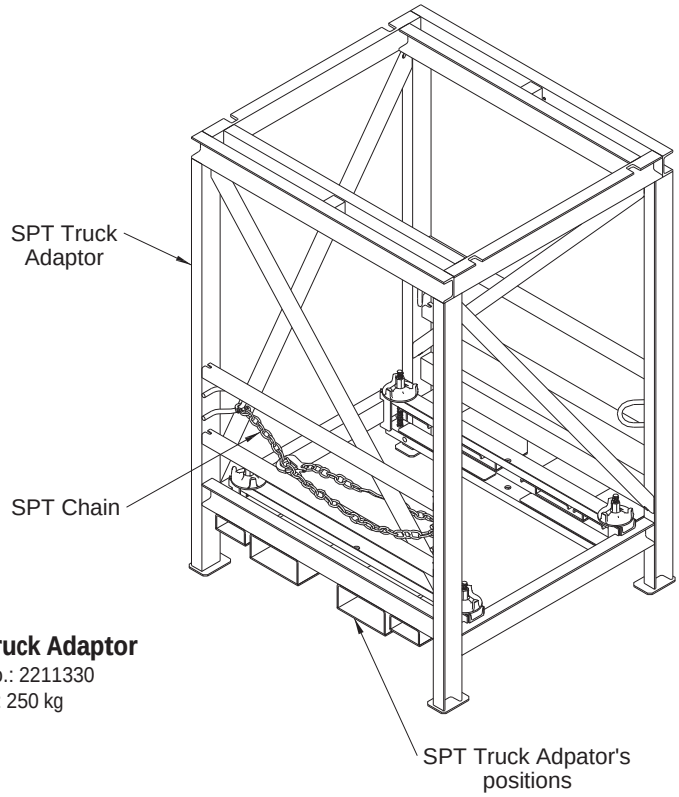
The following ULMA slab supports can be moved with SPT Truck Adaptor:

- EP Props
- ALUPROP
- SP Props

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.

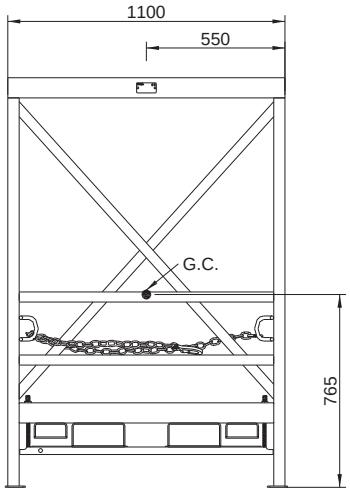
VR Table movement with SPT Truck Adaptor

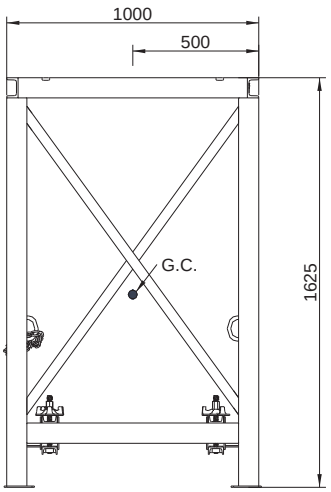
For further information see SPT TRUCK ADAPTOR User's guide.



SPT Truck Adaptor
Item No.: 2211330
Weight: 250 kg

SPT Truck general dimensions and gravity centre:

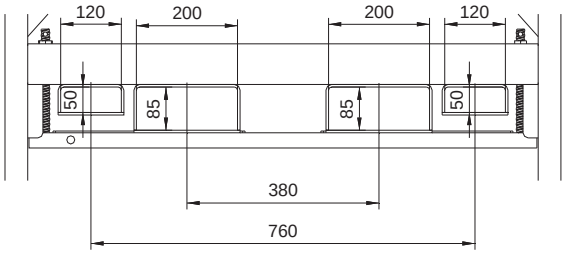




Instructions for use of the SPT Truck Adaptor:

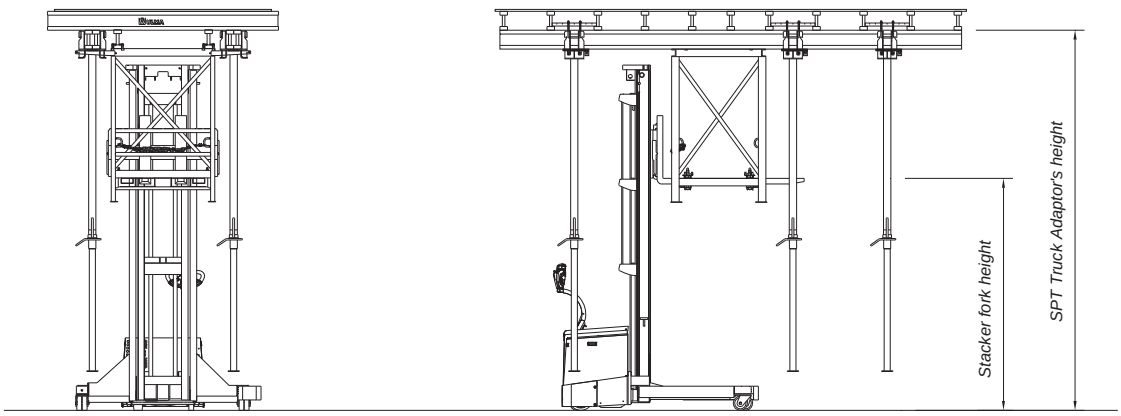
- It is totally forbidden to use the Truck without calculations of the residual working loads.
- Not approved for transporting personnel.
- Load over the Adaptor must be uniformly distributed. G.C. position must be considered.
- Only move on clean, level and sufficiently strong surfaces.
- Move the VR 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:

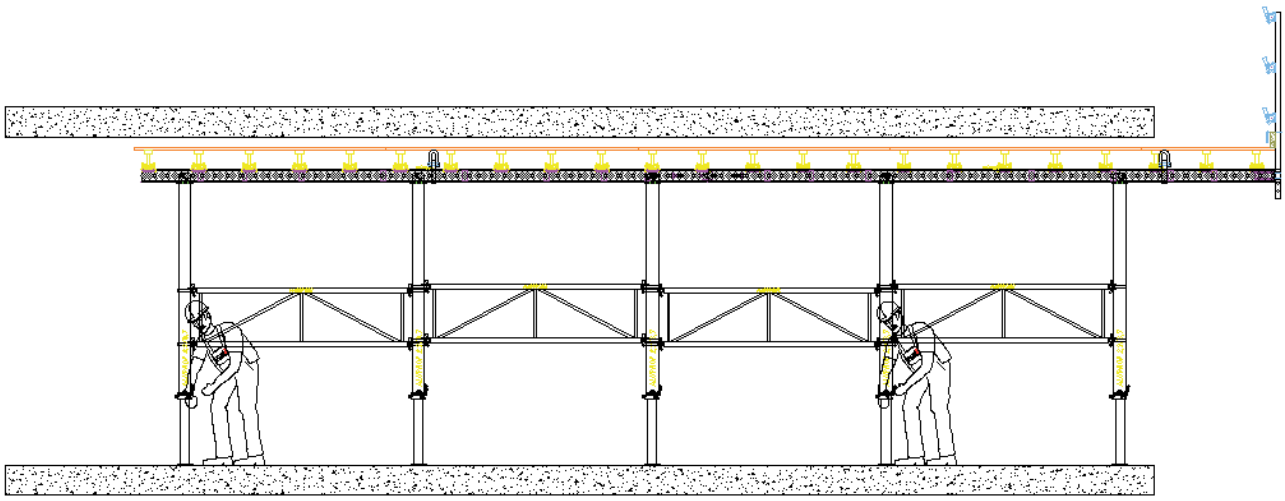


3.3. LARGE TABLES FLYING

This procedure is necessary when the table dimensions do not permit table lifting with the HOOK VR 600/540.

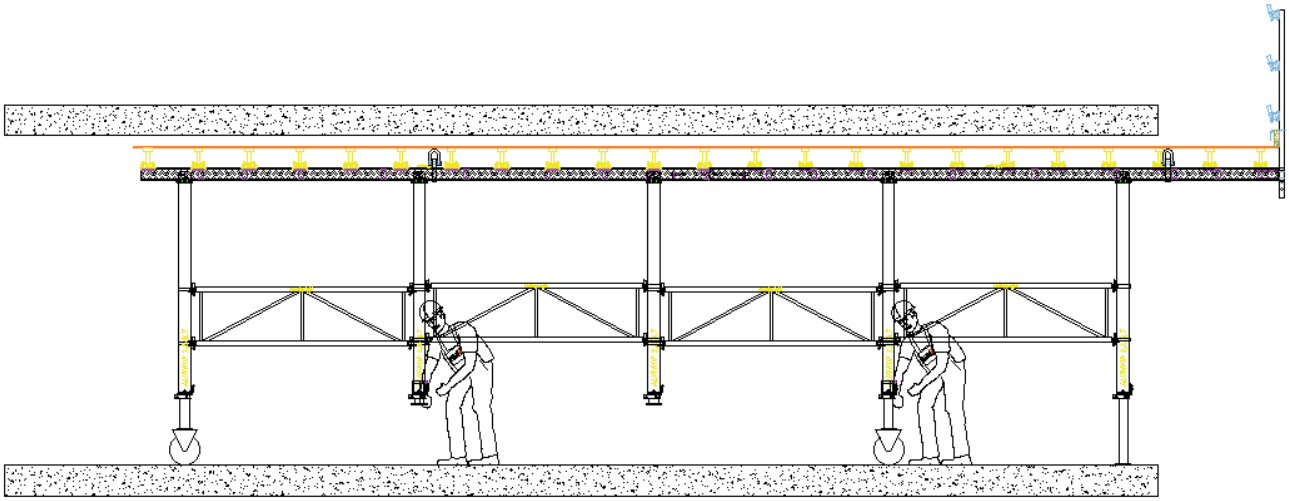
There may be occasions when it is necessary for workers to work adjacent to unguarded slab edges. In all such cases operatives should wear suitable anchored safety harnesses.

1



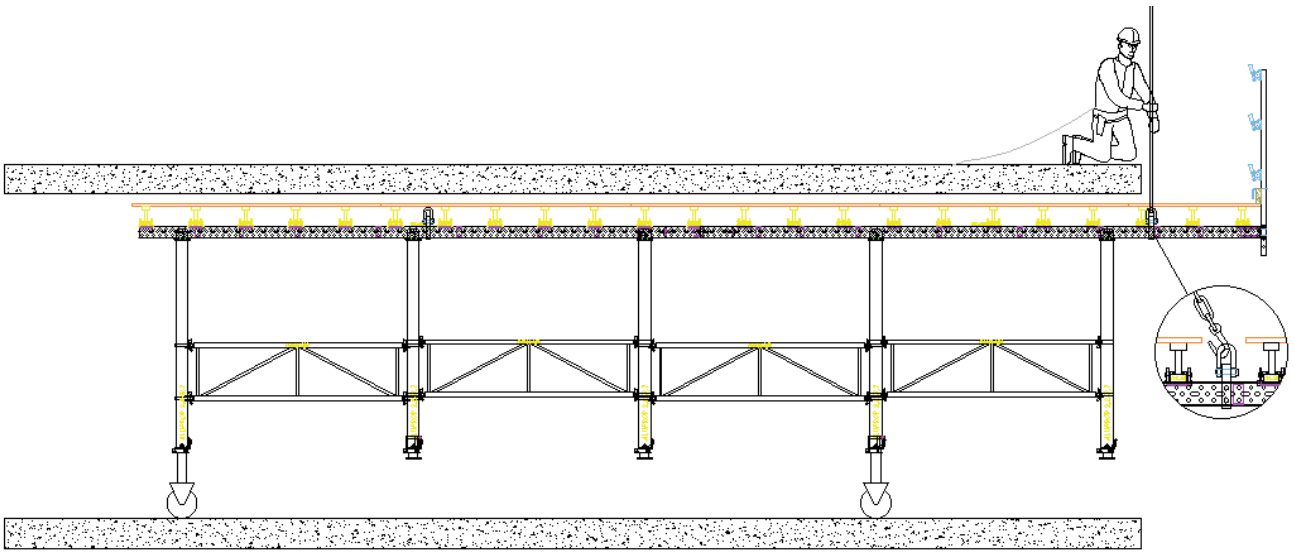
Strip the table by lowering the ALUPROP prop nuts uniformly. ALUPROP Spanner is recommended for this action.

2



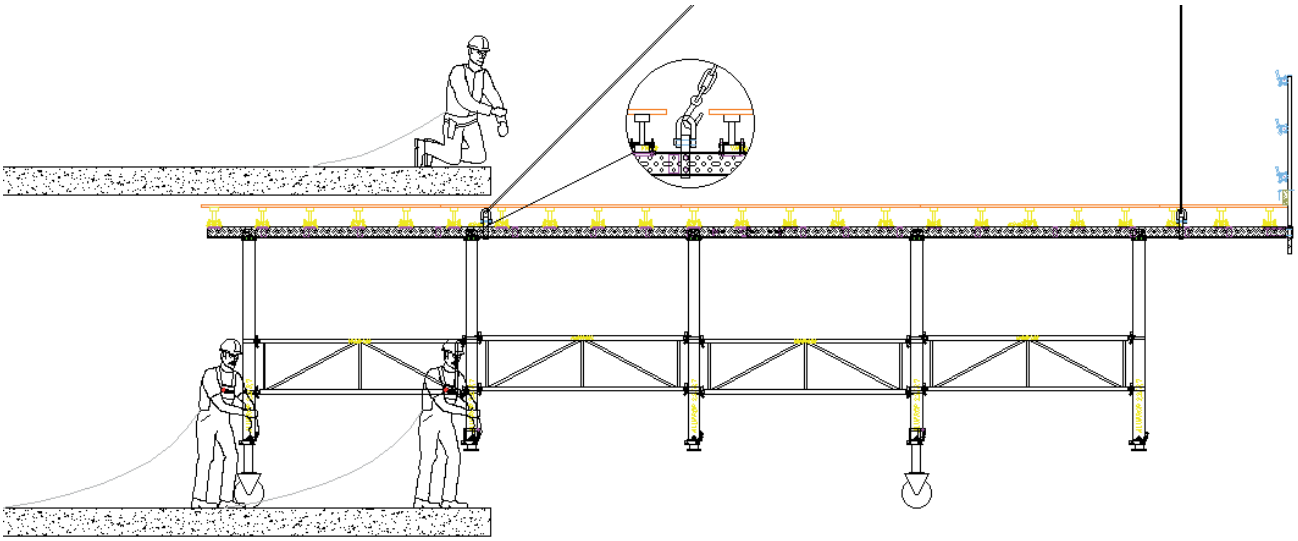
Place ALUPROP Casters on four ALUPROP props and retract remaining props to provide enough clearance for moving. Assure the props which have casters with ALUPROP Fixer VR to avoid accidental extraction of the inner tube during the flying. Assure the correct assembly of the Bracing Frames in each table movement.

3



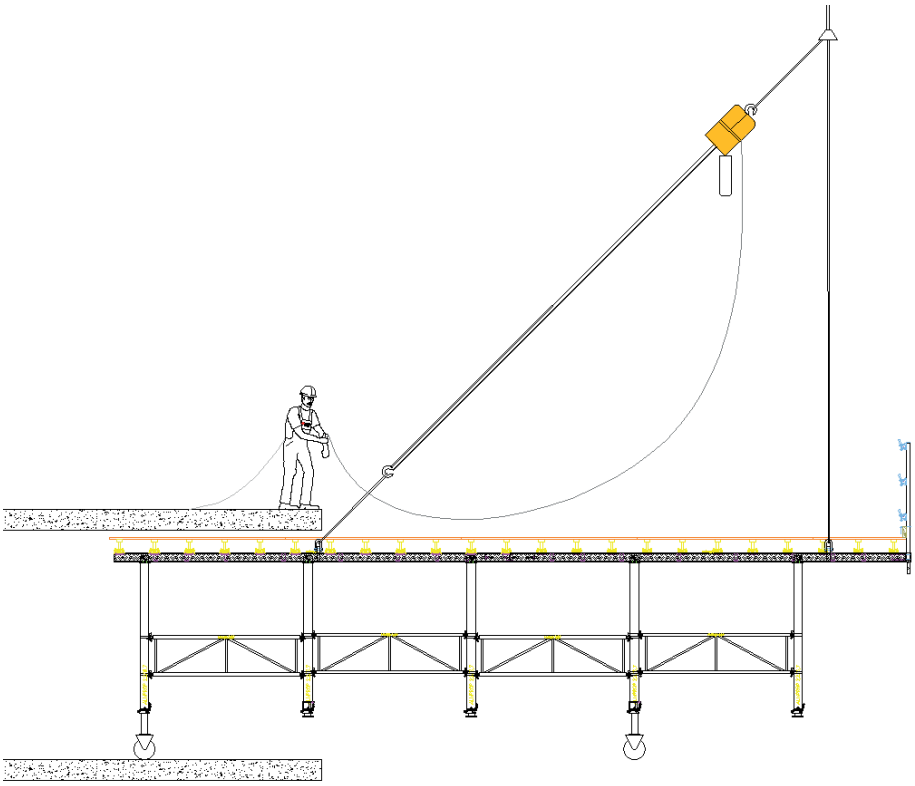
Attach crane's two branches of chains in the Lifting Hooks. Make holes in the plywood to access the hooks.
Workers should be tied off to a safety point of the building with the harness.

4

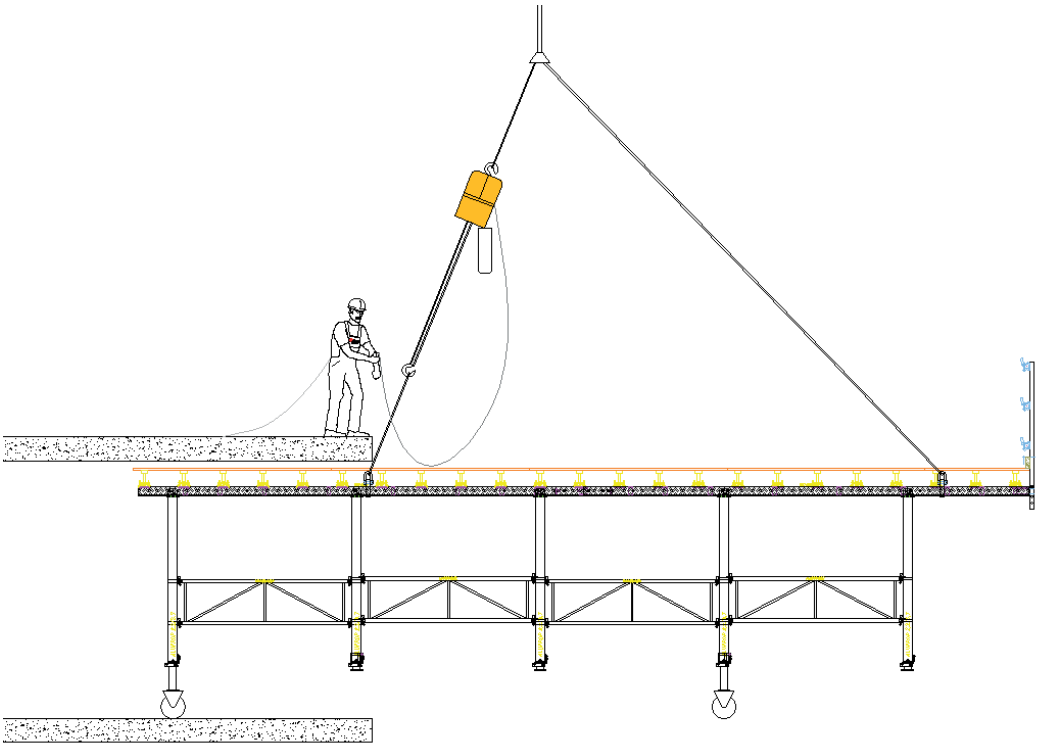


Push the table helped by pulling action of crane until second pair of hooks can be attached. Attach de second branches of the crane in the hooks.
Do not place additional material in the table during the flying process.

5

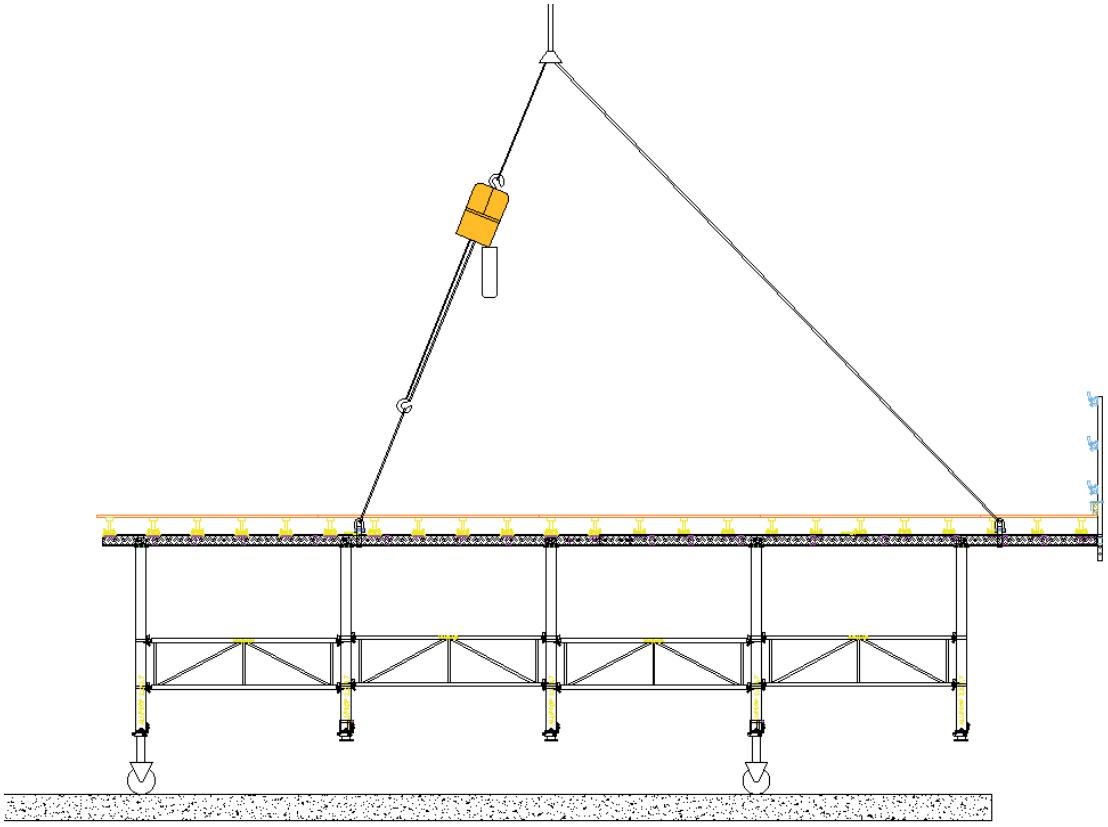


With the control command of the electric hoist level the table horizontally aligning the C.G. of the table with the crane's main hook.



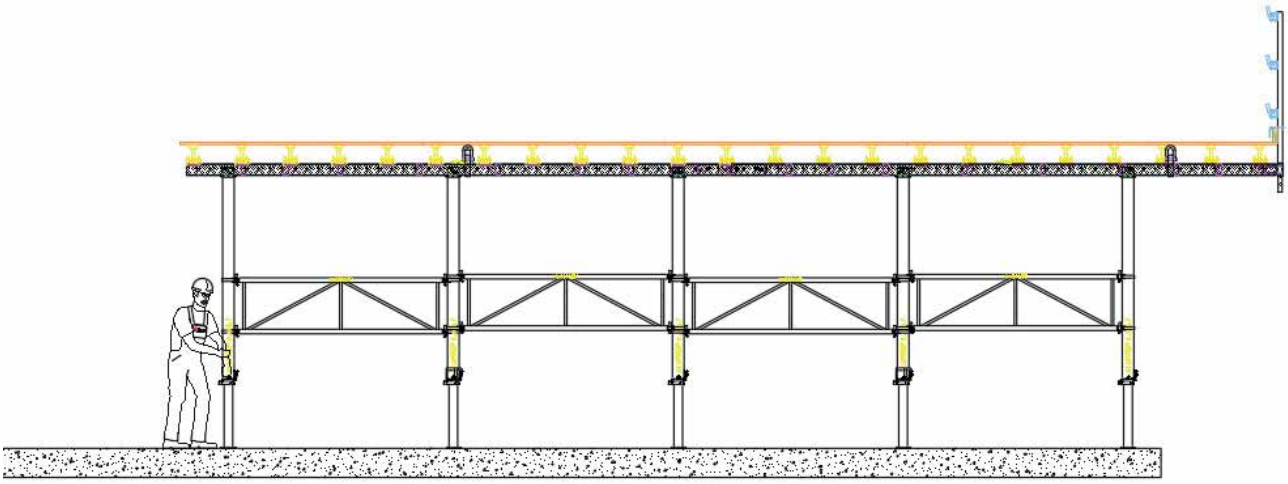
When the table is leveled is ready to be cleared completely from the slab and lifted to next floor above.

6



Lift the table to the next floor and place in the required position.

7



Adjust ALUPROP prop nuts uniformly to the pour height. ALUPROP Spanner is recommended for this action. Finally, dismantle the ALUPROP Casters.

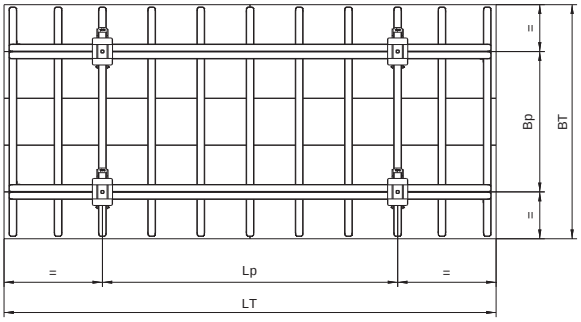
4. Solutions

4.1. STANDARD VR TABLES

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.

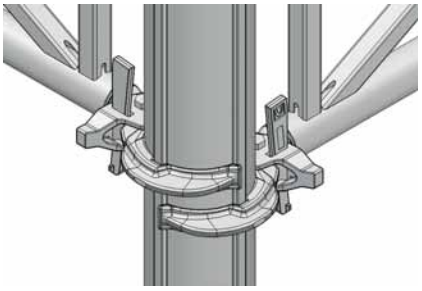
The whole range of EP Props is available to support Standard VR Tables system, up to 5.4 m.

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

4.2. LARGE TABLES

Large Tables, up to 12 m length differ from the others by having a special procedure for the shifting.

In this solution of tables is very important the correct assembly of the Bracing Frames, because also have the function of stiffening the table for the flying phase.



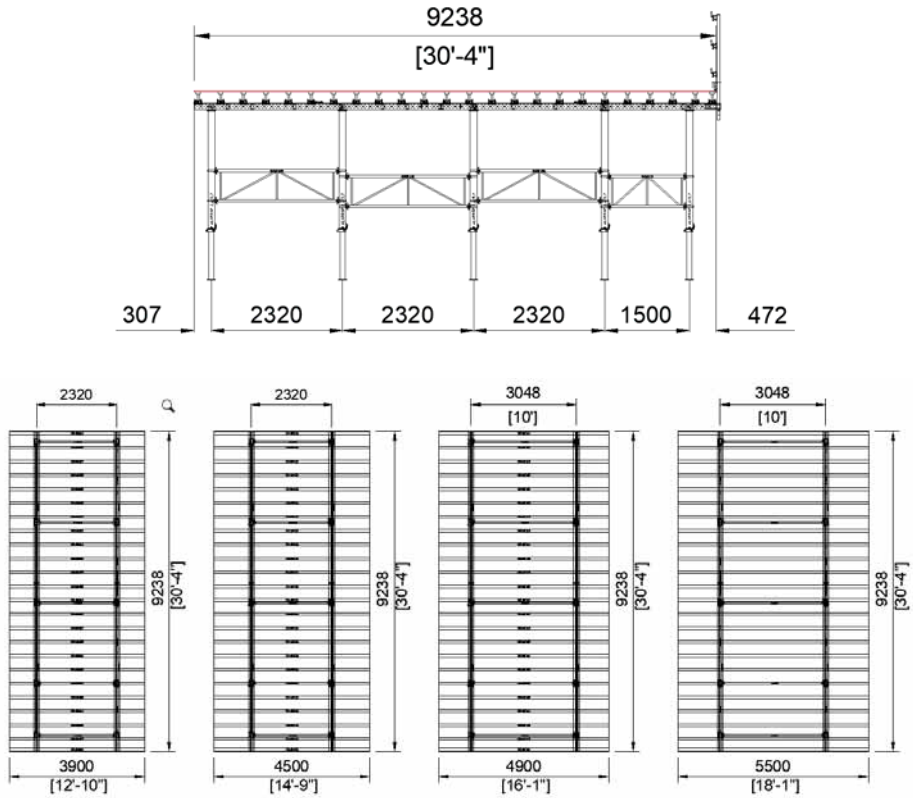
Mission Hospital, Atlanta (USA)

Frames of different sizes could be combined to adjust to required table length.

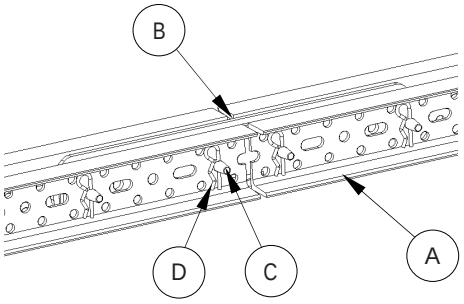
To configure the main beam length, the MK walers will be combined.

It must be taken into account that the joints between the walers must not coincide with the heads to avoid interferences in the assembly process.

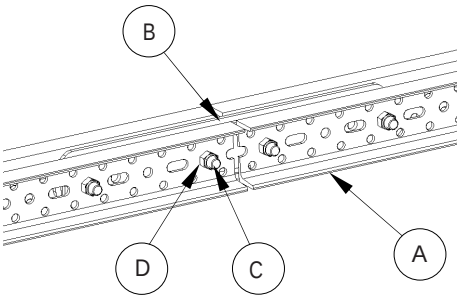
Standard Large Table dimensions:



The MK walers connection must be done with Waler Connector MK and four E20x70 pins or alternatively with M20 bolts and nuts (stiffener and recommended solution).



	NAME	ITEM No.
A	WALER MK-120	-
B	WALER CONNECTOR MK	1990700
C	PIN E20x70	0252070
D	COTTER PIN R/5	0252000

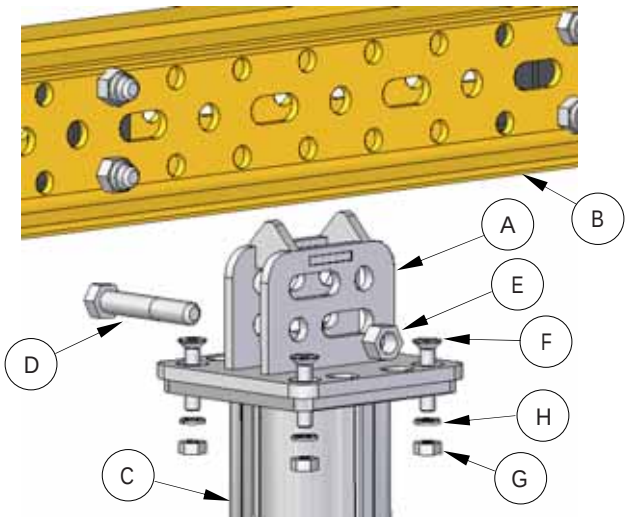


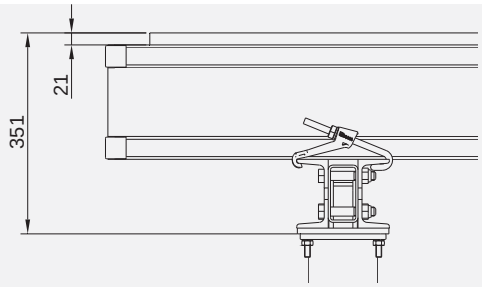
	NAME	ITEM No.
A	WALER MK-120	-
B	WALER CONNECTOR MK	1990700
C	BOLT M20x100 DIN931 8.8C	0242010
D	NUT M20 DIN934 8C	0242000

The ALUPROP Head MK VR is the head to connect ALUPROP prop with MK-120 or MK 180 walers.

- The connection with the waler with one M16 bolt must be made.
- At least one fixed connection (bolt through two round holes) is required.

	NAME	ITEM No.
A	ALUPROP HEAD MK VR	2211254
B	WALER MK-120	-
C	ALUPROP PROP	-
D	BOLT M16x90 DIN931 8.8C	0241690
E	NUT M16 DIN934 8C	0241600
F	BOLT CSK M10x40 DIN7991 8.8C	9852021
F	CSK SCREW M10x40 DIN608 8.8C	0249926
G	NUT M10 DIN934 8C	0241004
H	SPRING WASHER B10 DIN127	9000001

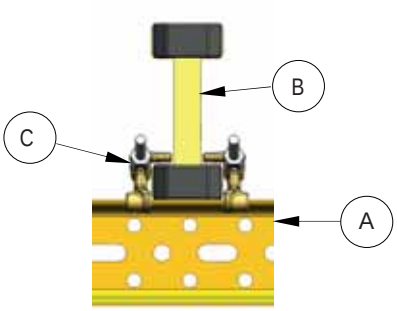




The overall height of the table is minimum with the ALUPROP Head MK VR.

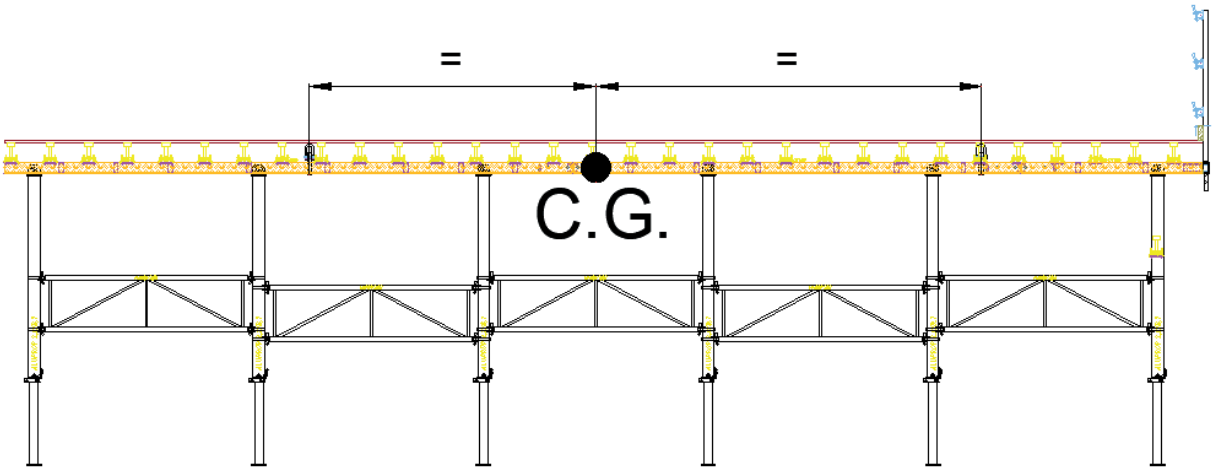
The head is bolted directly to the ALUPROP with four countersunk bolts, spring washers and nuts.

The Timber Beam VM 20's will be joined to the MK-120 walers with Waler-VM20 Clamp 2T.

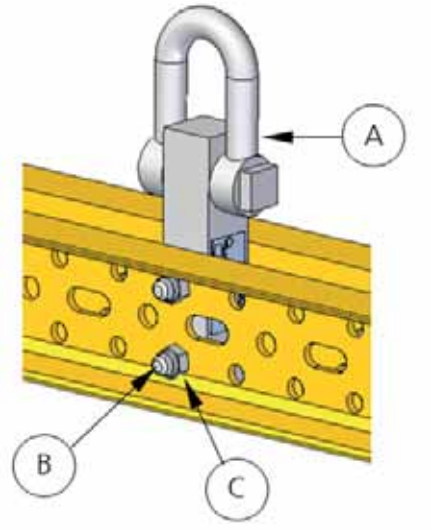


	NAME	ITEM No.
A	MK-120 WALER	-
B	TIMBER BEAM VM20	-
C	WALER-VM20 CLAMP 2T	1960375

The Lifting Hook RKS is attached to the MK-120 or the MK-180 walers with a pair of M16 bolts and self-locking nuts. The position of the hooks is very important and should be analysed to be the optimum for the lifting phase. They should be placed as equidistant as possible from the center of gravity of the table.

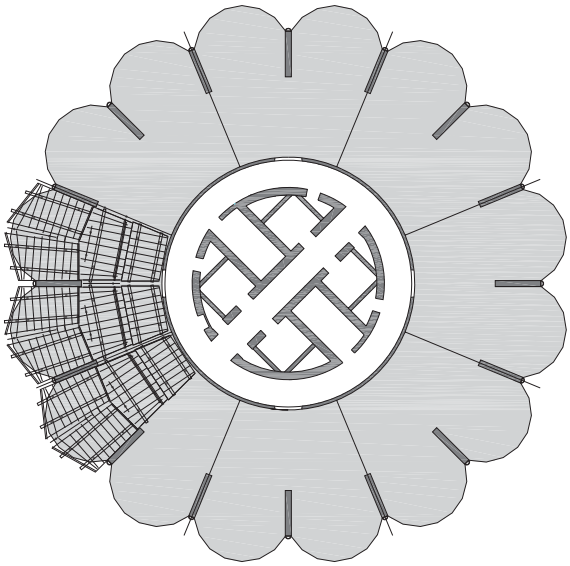


	NAME	ITEM No.
A	LIFTING HOOK RKS	1991274
B	BOLT M16x90 DIN931 8.8C	0241690
C	NUT M16 DIN985 8C	0241608



4.3. CUSTOMISED VR TABLES

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

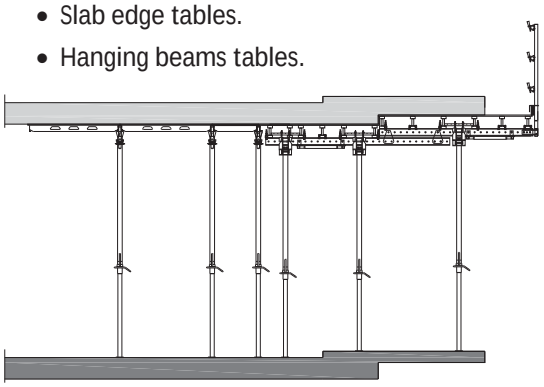
With Customised VR Tables.

- 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

4.4. 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.

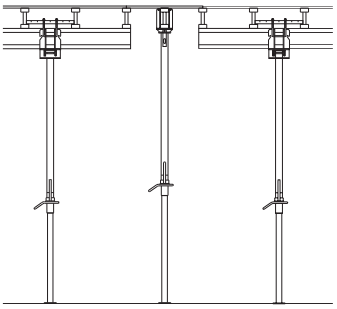
4.5. INFILLINGS

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

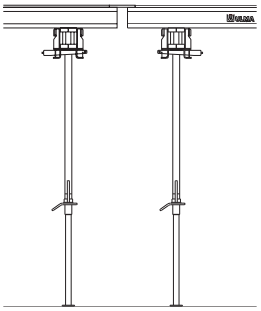
Transversal infilling areas between VR tables and columns

- 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



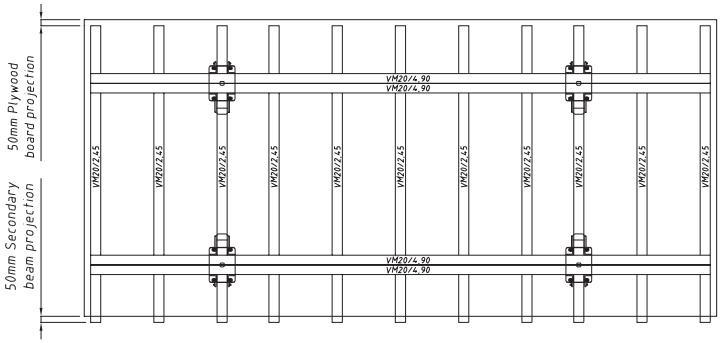
Transversal infilling



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

4.5.1. Standard solution:

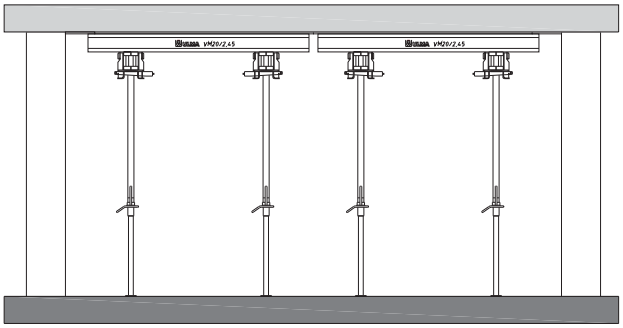
- Suggested table configuration:



Suggested standard solution

Standard solution

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

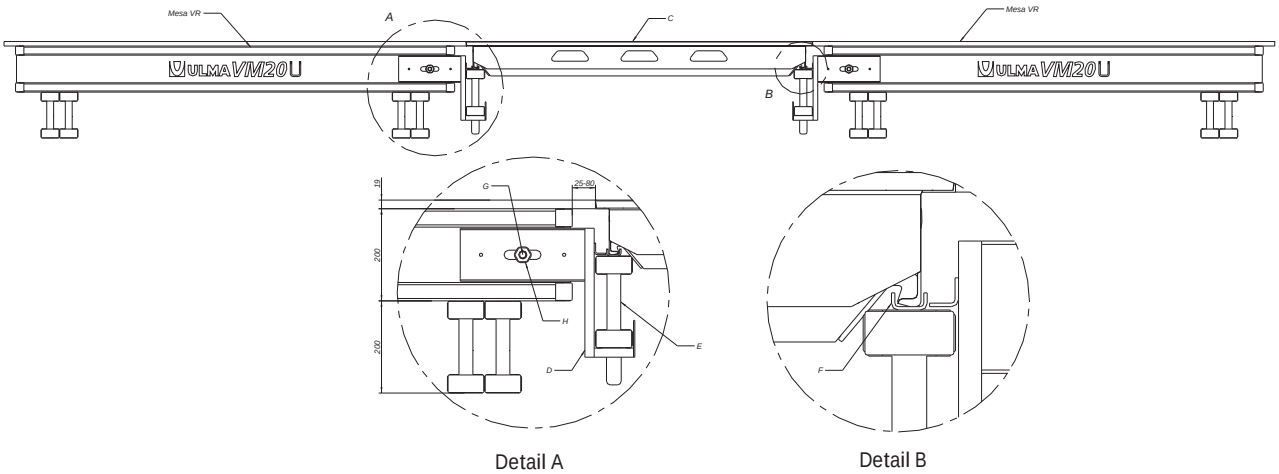


For early formwork removal, reshoring is required

4.5.2. Solution to the Tables VR gaps with PANEL CC, VR-CC4 SUPPORT and VM-20 beam

Panels CC can be used in order to fill the gaps between VR Tables. Panels CC are supported on the VR-CC4 Support and are guided by a “U” profile that goes above the VM20 beam. The regulation between the VM20 beam and the Panel CC varies between 25 and 80 mm.

VR Tables should be fixed in both directions before pouring the concrete. Infillings and perimeter tables will be responsible for this.



VR TABLE with VR-CC4 SUPPORT and VM20 Beams

Detail of the Table VR gap solution with Panel CC, supported on a VM20 beam and VR-CC4 support.

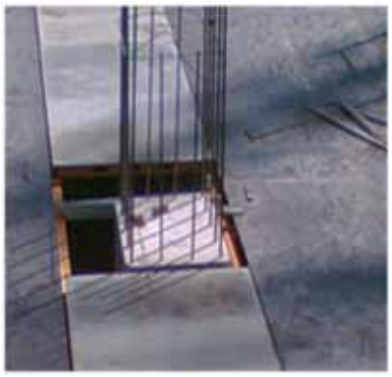
	ITEM No.	NAME	Weight (kg)
C	1870090	PANEL CC 1.5x0.75 PLYWOOD	15.40
C	1870165	PANEL CC 1.5x0.375 PLYWOOD	9.10
C	1870096	PANEL CC 0.75x0.75 PLYWOOD	8.30
D	2211910	VR-CC4 SUPPORT	3.30
E	1950112	TIMBER BEAM VM 20/3.9	19.50
E	1950113	TIMBER BEAM VM 20/4.9	24.50
F	2211916	PROFILE U 1m PANEL SUPPORT	1.20
F	2211907	PROFILE U 3.9m PANEL SUPPORT	4.70
F	2211915	PROFILE U 4.9m PANEL SUPPORT	5.90
G	2211914	TIE ROD 15/ 02	0.34
H	7238001	HEXAGONAL NUT 15	0.22

Panel CC between tables

VR-CC4 Support with VM20 beam

VR-CC4 Support with a prop

With columns, TRANSVERSAL CC TR and BEAM CC W should be used, fixing them around the columns. The rest of the gaps will be filled with plywood.

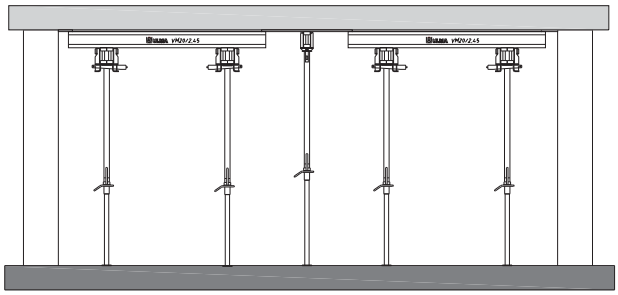


Infilling on column

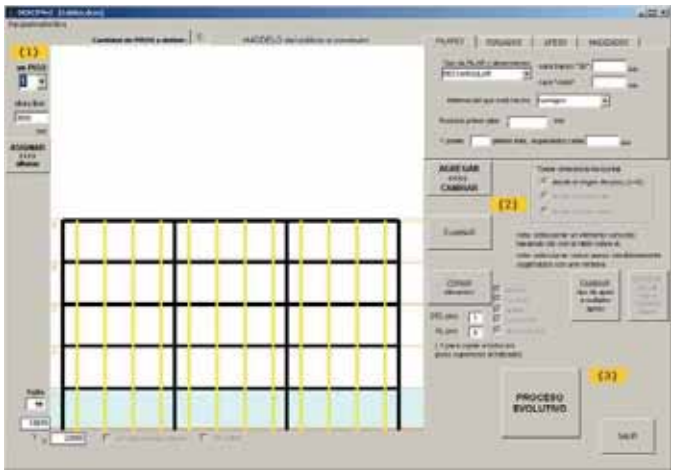
ITEM No.	NAME	Weight (kg)
1870045	TRANSVERSAL CC TR 1.5	6.30
1870050	TRANSVERSAL CC TR 0.75	3.20
1870105	BEAM CC W 1.5	8.90
1870150	BEAM CC W 0.75	4.40

4.5.3. 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.



DESCIM, ULMA Construction's calculation software

Early formwork removal solution

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

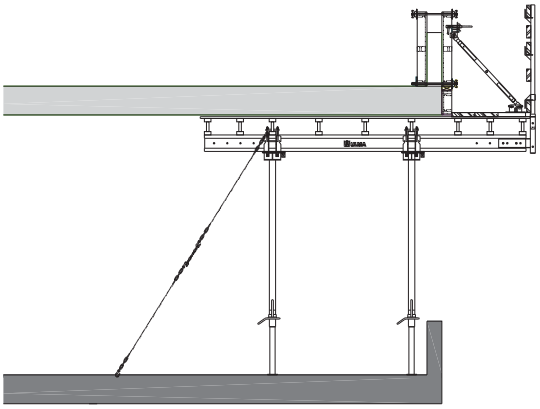
4.6. SAFE SLAB EDGE SOLUTION

Slab edge VR Tables solution

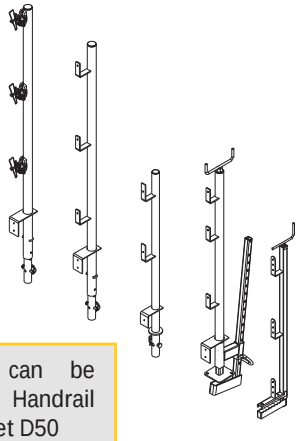
- VR Table system provides a safe slab edge solutions with:
  - Handrails
  - Anchoring system
  - Edge stopends
  - Working platform

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

- Slab edge tables must incorporate an anchoring system to prevent overturning. Different options are available:
  - Chain VR 7.5 kN
  - Push-Pull props and Brace Heads

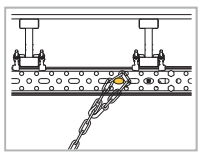
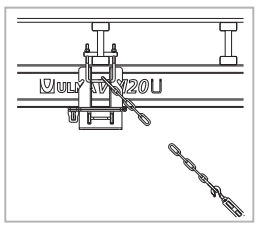
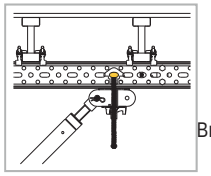


VR Table slab edge solution.



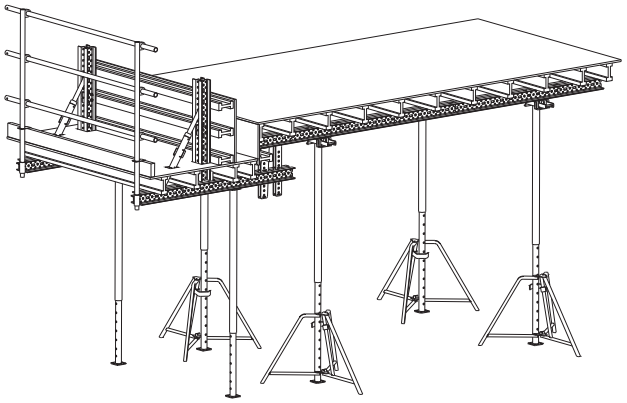
All safety handrails can be assembled with VM Handrail Support or Handrail socket D50

- 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 1 / 1.3 m

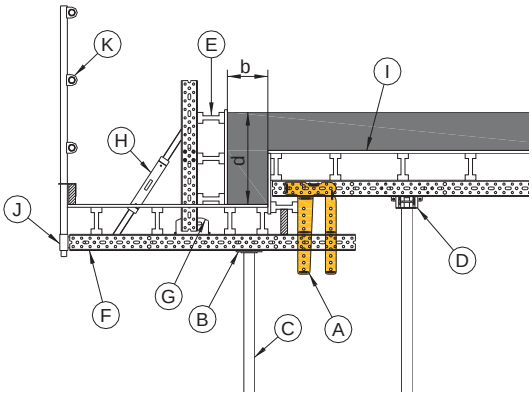
For Waler:	For VM20:
1  Chain VR 7,5kN (2211750)	1 
2  Push-Pull prop and Brace Heads (1960275)	

4.7. 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.



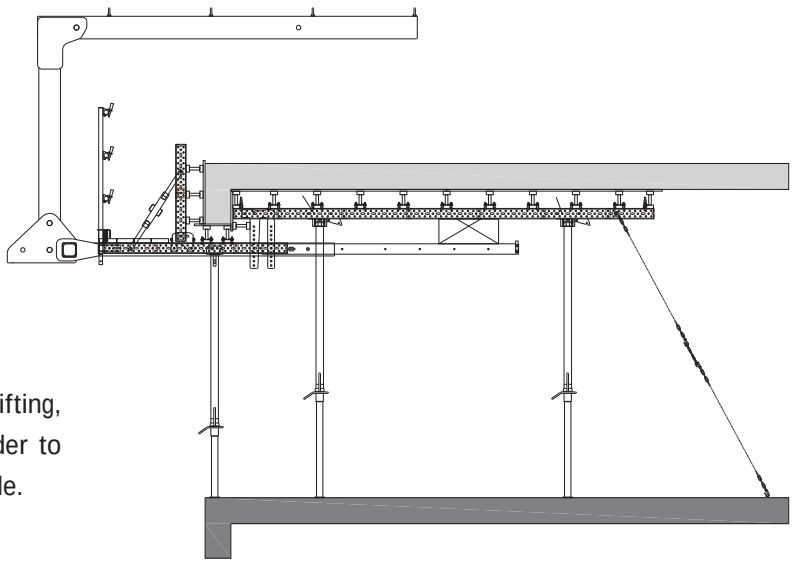
Perimeter slab edge hanging beam solution with VR Tables



	NAME	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 length of the waler (vertical and horizontal), and props load carrying capacity.



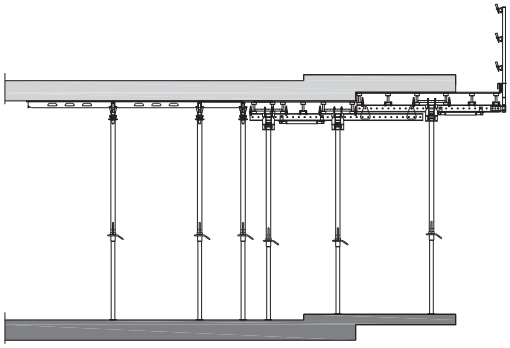
Slab edge hanging beam table lifting

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

4.8. COMBINING WITH OTHER ULMA SYSTEMS

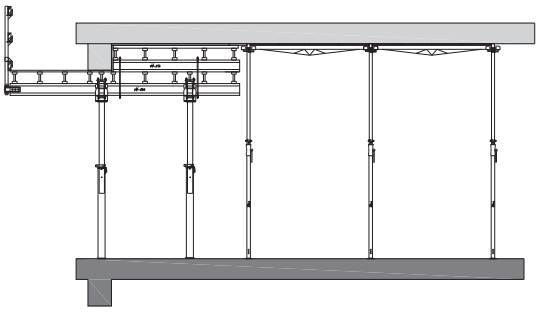
VR Tables system can be easily combined with other ULMA systems like:

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 Configurations			
	M 2.5 x 5	M 2.5 x 4	M 2.0 x 5	M 2.0 x 4
Max. Slab Thickness (m)	0.40	0.52	0.52	0.66
Props max. load (kN)	38.23	38.82	38.88	38.26

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

- Permissible slab thicknesses and props maximum loads considering 400 mm between secondary beams and deformation criteria L/300.

STANDARD LARGE TABLES WITH MK-120 WALER AS MAIN BEAM

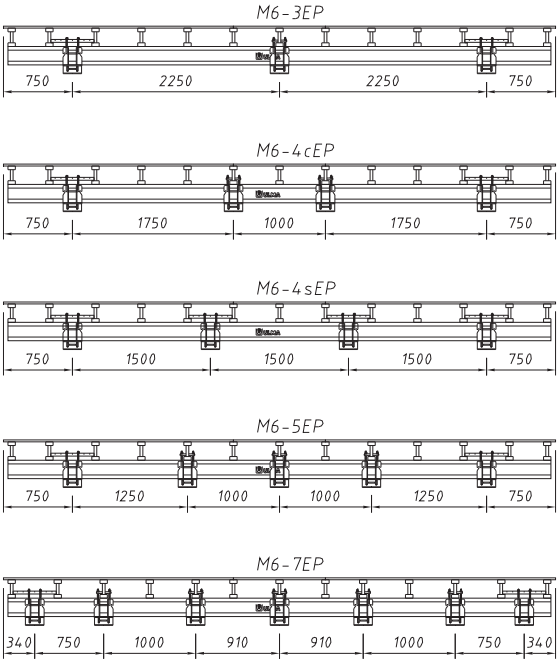
LARGE TABLES (with MK-120 as main beam)	Standard Configurations			
	30' x 18'	30' x 16'	30' x 14'	30' x 12'
Max. Slab Thickness (m)	0.35	0.40	0.43	0.50
Props max. load (kN)	75.21	75.78	74.36	74.10

- Permissible slab thicknesses and props maximum loads for Standard Large Tables defined in 4.2.

- Permissible slab thicknesses and props maximum loads considering 400 mm between secondary beams and deformation criteria L/360.
- For special configurations check with ULMA technical department.

NON-STANDARD VR TABLES

- For non-standard VR Tables, ULMA Construction 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.
- Multiple types of Tables are available with different shoring systems. See beside suggested 6 m long tables with EP Props.



6 m long table types

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, Head Waler VR and Head VR DU120.

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 single props (kN).

5.3.1. AMERICAN CRITERIA

WORKING LOADS (kN - kips) - SINGLE PROP ANSI/ASSE A10.9 (AMERICAN CRITERIA)									
Total height		ALUPROP 1.65-2.8		ALUPROP 2.2-3.7		ALUPROP 3.3-4.8		ALUPROP 4.5-6.0	
m	ft	kN	kips	kN	kips	kN	kips	kN	kips
1.65	5.4	104.8	23.6						
1.70	5.6	104.4	23.5						
1.80	5.9	103.6	23.3						
1.90	6.2	102.8	23.1						
2.00	6.6	102.0	22.9						
2.10	6.9	99.6	22.4						
2.20	7.2	97.3	21.9	101.4	22.8				
2.30	7.5	94.9	21.3	99.9	22.5				
2.40	7.9	92.5	20.8	98.4	22.1				
2.50	8.2	90.2	20.3	96.8	21.8				
2.60	8.5	87.9	19.8	95.3	21.4				
2.70	8.9	85.6	19.2	93.8	21.1				
2.80	9.2	83.3	18.7	91.5	20.6				
2.90	9.5			89.1	20.0				
3.00	9.8			86.8	19.5				
3.10	10.2			84.4	19.0				
3.20	10.5			82.1	18.5				
3.30	10.8			79.4	17.8	78.8	17.7		
3.40	11.2			76.7	17.2	78.2	17.6		
3.50	11.5			73.9	16.6	77.5	17.4		
3.60	11.8			71.2	16.0	76.9	17.3		
3.70	12.1			68.5	15.4	76.2	17.1		
3.80	12.5					75.6	17.0		
3.90	12.8					72.8	16.4		
4.00	13.1					70.0	15.7		
4.10	13.5					67.1	15.1		
4.20	13.8					64.3	14.5		
4.30	14.1					61.5	13.8		
4.40	14.4					59.5	13.4		
4.50	14.8					57.5	12.9	61.4	13.8
4.60	15.1					55.4	12.5	59.8	13.4
4.70	15.4					53.4	12.0	58.2	13.1
4.80	15.7					51.4	11.6	56.7	12.7
4.90	16.1							55.1	12.4
5.00	16.4							53.5	12.0
5.10	16.7							52.0	11.7
5.20	17.1							50.5	11.4
5.30	17.4							49.0	11.0
5.40	17.7							47.5	10.7
5.50	18.0							46.0	10.3
5.60	18.4							44.6	10.0
5.70	18.7							43.2	9.7
5.80	19.0							41.9	9.4
5.90	19.4							40.5	9.1
6.00	19.7							39.1	8.8

Note:
- A safety factor 3:1 is regarded. Head and base are fixed, props are aligned vertically not out of plumb more than 1/8" in three feet and the slab formwork is secured at deck level in all directions.
- For different conditions, working loads should be reduced by 20%.

5.3.2. EUROPEAN CRITERIA

WORKING LOADS (kN) - SINGLE PROP EN 16031 (EUROPEAN CRITERIA)								
Total height (m)	ALUPROP 1.65-2.8		ALUPROP 2.2-3.7		ALUPROP 3.3-4.8		ALUPROP 4.5-6.0	
	IT above	IT below	IT above	IT below	IT above	IT below	IT above	IT below
1.65	151.2	106.9						
1.70	148.6	106.9						
1.80	143.4	106.9						
1.90	138.2	106.6						
2.00	132.8	105.7						
2.10	127.3	104.4						
2.20	121.7	102.7	132.4	115.5				
2.30	116.1	100.5	126.7	110.8				
2.40	110.3	97.9	121.0	106.3				
2.50	104.4	94.8	115.5	101.9				
2.60	98.5	91.4	110.1	97.7				
2.70	92.4	87.4	104.7	93.6				
2.80	86.3	83.1	99.4	89.7				
2.90			94.2	86.0				
3.00			89.1	82.4				
3.10			84.1	79.0				
3.20			79.1	75.7				
3.30			74.3	72.6	89.6	75.7		
3.40			69.5	69.7	85.2	73.4		
3.50			64.8	66.9	80.9	71.2		
3.60			60.2	64.3	76.8	68.9		
3.70			55.7	61.8	72.8	66.7		
3.80					69.0	64.4		
3.90					65.3	62.2		
4.00					61.8	59.9		
4.10					58.4	57.6		
4.20					55.2	55.3		
4.30					52.1	53.0		
4.40					49.2	50.7		
4.50					46.4	48.4	51.9	47.1
4.60					43.8	46.1	50.1	45.7
4.70					41.3	43.7	48.4	44.2
4.80					38.9	41.4	46.6	42.8
4.90							44.8	41.4
5.00							42.9	40.0
5.10							41.1	38.6
5.20							39.2	37.2
5.30							37.4	35.8
5.40							35.5	34.4
5.50							33.6	33.0
5.60							31.7	31.6
5.70							29.8	30.2
5.80							27.8	28.8
5.90							25.9	27.5
6.00							23.9	26.1

IT: Inner Tube

5.3.3. USA CRITERIA

ALUPROP prop - Working loads (pounds) *SAFETY FACTOR IS 3:1*					
HEIGHT	**ALUPROP 1.65 - 2.8 (5'-5" TO 9'-2") PART # 2220010 WEIGHT 39 LBS.**	**ALUPROP 1.95 - 3.4 (6'-5" TO 11'-2") PART # U222003 WEIGHT 45 LBS.**	**ALUPROP 2.20 - 3.7 (7'-3" TO 12'-1") PART # 2220020 WEIGHT 47 LBS.**	**ALUPROP 3.3 - 4.8 (10'-10" TO 15'-9") PART # 2220030 WEIGHT 56 LBS.**	**ALUPROP 4.5 - 6.0 (14'-5" TO 19'-8") PART # 2220040 WEIGHT 65 LBS.**
5'5"	20,700				
6'-10"	20,500	20,700			
7'-3"	20,300	20,600	20,700		
8'-2"	19,300	19,800	20,500		
8'-10"	18,400	19,000	20,000		
9'-2"	17,900	18,600	19,600		
9'-6"		18,100	19,200		
9'-10"		17,600	18,800		
10'-2"		17,000	18,300		
10'-6"		16,300	17,700		
10'-10"		15,700	17,000	15,700	
11'-2"		15,000	16,300	15,200	
11'-6"			15,000	14,700	
11'-10"			14,700	14,200	
12'-2"			13,800	13,800	
12'-6"				13,400	
12'-10"				12,900	
13'-1"				12,600	
13'-5"				12,200	
13'-9"				11,800	
14'-1"				11,500	
14'-5"				11,200	
14'-9"				10,900	11,500
15'-1"				10,600	11,200
15'-5"				10,400	10,800
15'-9"				10,100	10,500
16'-1"					10,100
16'-5"					9,800
16'-9"					9,500
17'-1"					9,200
17'-5"					8,900
17'-9'					8,600
18'-1"					8,300
18'-4"					8,100
18'-8"					7,800
19'-0"					7,600
19'-4"					7,300
19'-8"					7,100

Note: **A safety factor 3:1 is regarded. Props are aligned vertically not out of plumb more than 1/8" in three feet.**

5.4. SP PROP

Working loads for SP Props (kN)

WORKING LOAD (kN) – SP PROPS				
Total height (m)	SP PROP			
	SP-30	SP-35	SP-40	SP-50
1,75	30,00			
1,80	30,00			
1,90	30,00			
2,00	30,00	30,00		
2,10	30,00	30,00		
2,20	30,00	30,00		
2,30	30,00	30,00		
2,40	30,00	30,00		
2,50	28,00	30,00	30,00	
2,60	26,00	30,00	30,00	
2,70	24,00	30,00	30,00	
2,80	22,00	29,00	30,00	
2,90	21,00	28,00	30,00	
3,00	20,00	27,00	30,00	
3,10		26,00	30,00	
3,20		25,50	30,00	
3,30		25,00	29,00	
3,40		24,50	28,00	
3,50		24,00	27,00	
3,60			26,00	
3,70			24,50	
3,80			23,00	
3,90			21,50	26,00
4,00			20,00	26,00
4,10				26,00
4,20				26,00
4,30				26,00
4,40				26,00
4,50				25,00
4,60				24,00
4,70				23,00
4,80				22,00
4,90				21,00
5,00				20,00

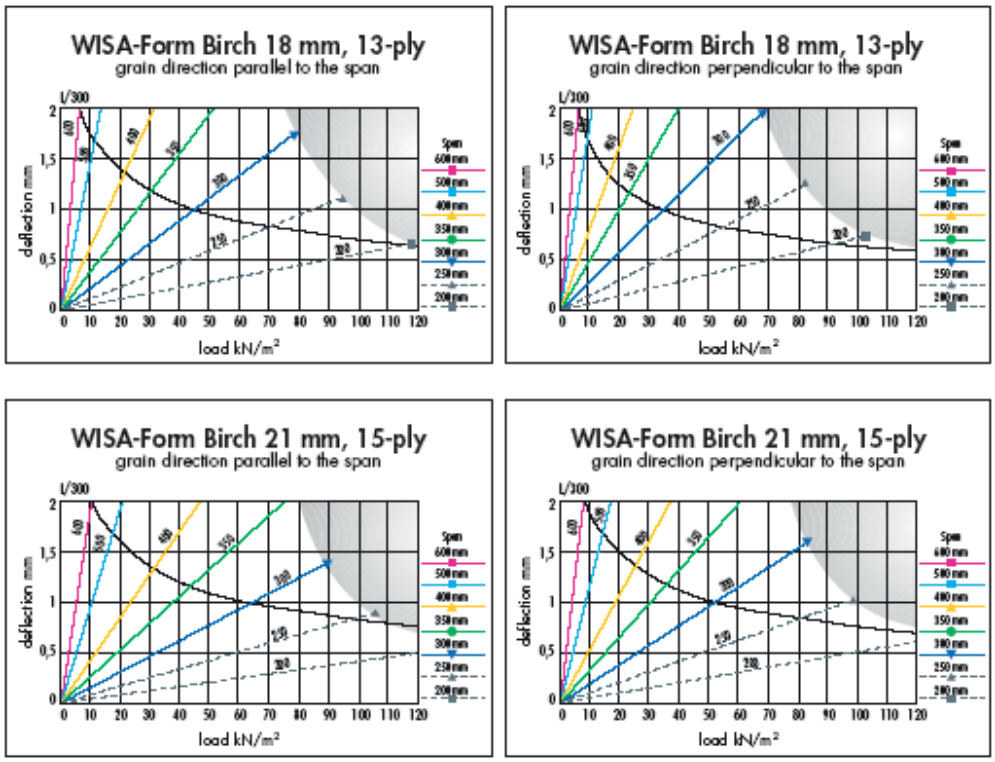
5.5. PLYWOOD

- 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‖	Em⊥	fm‖	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

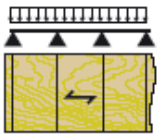
BETO PLYWOOD:

- 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)	
	$E_{m\parallel}$	$E_{m\perp}$	$f_{m\parallel}$	$f_{m\perp}$
18	7864	7158	31.5	25.3
21	7621	7338	30.5	25.3

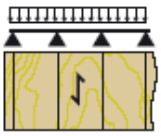
Face grain parallel to the span

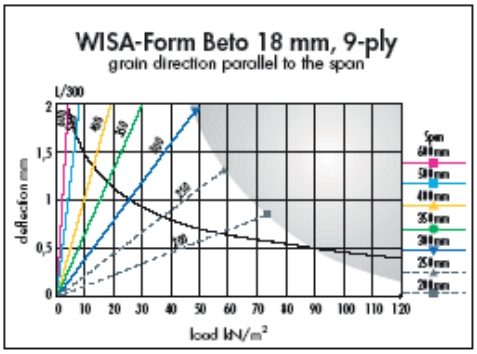
grain direction of surface veneers

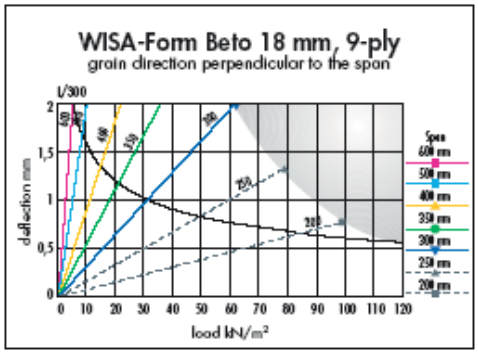


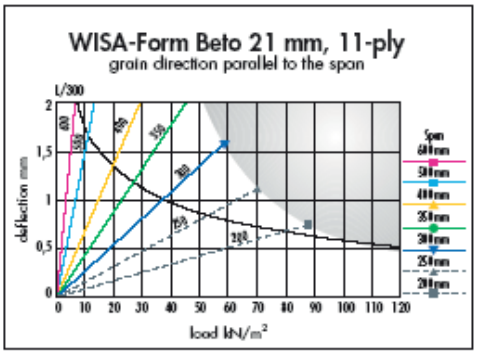
Face grain perpendicular to the span

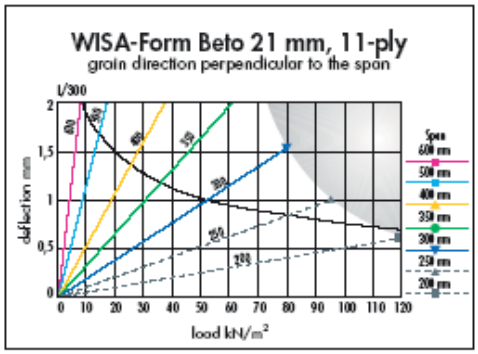
grain direction of surface veneers





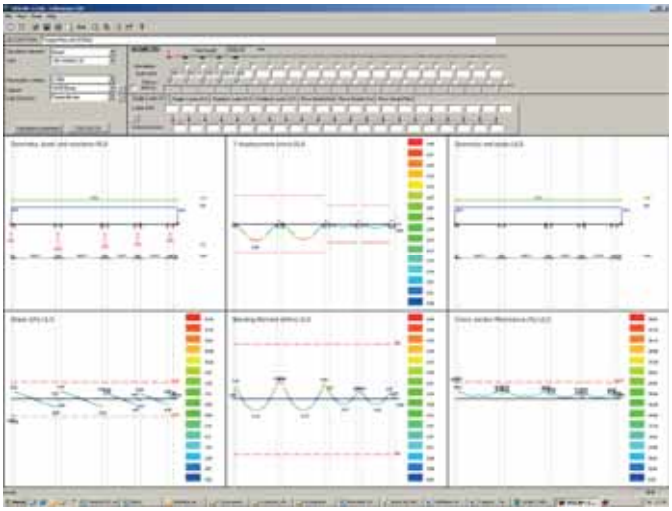






Moisture content 27 %, short time loading
Partial safety factor for the material is 1.3. Partial safety factor for the loads is 1.2.
Deflection limit L/300 of the span
Support width is not taken into account in calculations

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



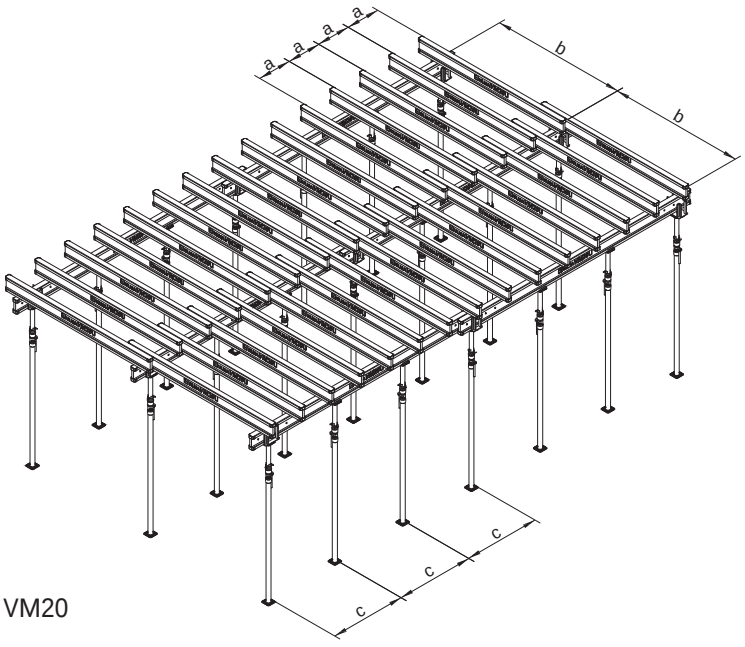
ULMA's Boards and beams calculation software

5.6. ENKOFLEX

The most flexible slab formwork with VM20 timber beams.

Espesor losa / Slab thickness (m)	Carga (kN/m2) según EN12812 / Load (kN/m2) according to EN12812	Distancia entre vigas de Primera tramada (m) / Distance between main beams (m)				Distancia entre puntales (m) / Distance between props (m) Carga del puntal (kN) / Prop load (kN)										
		Distancia entre vigas de Segunda tramada (m) / Distance between secondary beams (m)				Distancia entre vigas primera tramada (m) / Distance between main beams (m)										
		0,357	0,416	0,500	0,625	0,50	0,75	1,00	1,25	1,5	1,75	2,00	2,25	2,50	2,75	3,00
0,10	4,30	4,99	4,73	4,31	3,86	4,662	3,807	3,297	2,949	2,692	2,424	2,118	1,882	1,691	1,538	1,407
						10,69	***13,60***	***15,92***	***17,91***	***19,69***	***20,74***	***20,73***	***20,74***	***20,73***	***20,73***	***20,71***
0,12	4,80	4,73	4,48	4,08	3,65	4,413	3,603	3,120	2,791	2,542	2,172	1,897	1,686	1,515	1,377	1,261
						11,30	***14,37***	***16,82***	***18,92***	***20,76***	***20,74***	***20,73***	***20,74***	***20,73***	***20,73***	***20,71***
0,14	5,30	4,51	4,26	3,89	3,47	4,199	3,429	2,969	2,656	2,302	1,967	1,718	1,527	1,372	1,247	1,142
						11,87	***15,10***	***17,67***	***19,88***	***20,76***	***20,74***	***20,73***	***20,74***	***20,73***	***20,73***	***20,71***
0,16	5,80	4,33	4,07	3,71	3,32	4,014	3,278	2,838	2,537	2,104	1,797	1,570	1,396	1,254	1,140	1,043
						12,42	***15,80***	***18,49***	***20,79***	***20,76***	***20,74***	***20,73***	***20,74***	***20,73***	***20,73***	***20,71***
0,18	6,30	4,17	3,91	3,56	3,19	3,852	3,145	2,723	2,336	1,937	1,655	1,445	1,285	1,154	1,049	0,960
						12,95	***16,46***	***19,27***	***20,79***	***20,76***	***20,74***	***20,73***	***20,74***	***20,73***	***20,73***	***20,71***
0,20	6,80	4,04	3,76	3,43	3,07	3,707	3,027	2,621	2,164	1,794	1,533	1,339	1,190	1,070	0,972	0,890
						13,45	***17,10***	***20,02***	***20,79***	***20,76***	***20,74***	***20,73***	***20,74***	***20,73***	***20,73***	***20,71***
0,22	7,30	3,92	3,63	3,31	2,96	3,578	2,921	2,530	2,016	1,671	1,428	1,247	1,109	0,996	0,906	0,829
						13,93	***17,72***	***20,74***	***20,79***	***20,76***	***20,74***	***20,73***	***20,74***	***20,73***	***20,73***	***20,71***
0,24	7,80	3,79	3,51	3,20	2,86	3,461	2,826	2,378	1,887	1,564	1,336	1,167	1,038	0,932	0,848	0,776
						14,40	***18,32***	***20,83***	***20,79***	***20,76***	***20,74***	***20,73***	***20,74***	***20,73***	***20,73***	***20,71***
0,26	8,30	3,67	3,40	3,10	2,78	3,356	2,740	2,235	1,773	1,470	1,256	1,097	0,975	0,876	0,797	0,729
						14,86	***18,90***	***20,83***	***20,79***	***20,76***	***20,74***	***20,73***	***20,74***	***20,73***	***20,73***	***20,71***
0,28	8,80	3,57	3,31	3,02	2,70	3,259	2,661	2,108	1,672	1,387	1,185	1,035	0,920	0,826	0,751	0,688
						15,30	***19,46***	***20,83***	***20,79***	***20,76***	***20,74***	***20,73***	***20,74***	***20,73***	***20,73***	***20,71***
0,30	9,30	3,47	3,22	2,93	2,62	3,170	2,588	1,995	1,582	1,312	1,121	0,979	0,870	0,782	0,711	0,651
						15,73	***20,00***	***20,83***	***20,79***	***20,76***	***20,74***	***20,73***	***20,74***	***20,73***	***20,73***	***20,71***
0,35	10,68	3,24	3,00	2,74	2,45	2,959	2,365	1,738	1,379	1,143	0,976	0,853	0,758	0,681	0,619	0,567
						16,85	***20,98***	***20,83***	***20,79***	***20,76***	***20,74***	***20,73***	***20,74***	***20,73***	***20,73***	***20,71***
0,40	12,05	3,05	2,82	2,58	2,30	2,785	2,095	1,539	1,221	1,013	0,865	0,756	0,672	0,604	0,549	0,502
						17,90	***20,98***	***20,83***	***20,79***	***20,76***	***20,74***	***20,73***	***20,74***	***20,73***	***20,73***	***20,71***
0,45	13,43	2,89	2,68	2,44	2,18	2,638	1,880	1,382	1,096	0,909	0,776	0,678	0,603	0,542	0,492	0,451
						18,90	***20,98***	***20,83***	***20,79***	***20,76***	***20,74***	***20,73***	***20,74***	***20,73***	***20,73***	***20,71***
0,50	14,80	2,75	2,55	2,32	2,08	2,513	1,706	1,253	0,994	0,824	0,704	0,615	0,547	0,491	0,447	0,409
						19,84	***20,98***	***20,83***	***20,79***	***20,76***	***20,74***	***20,73***	***20,74***	***20,73***	***20,73***	***20,71***

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.

a: distance between secondary beams
b: distance between main beams
c: distance between props

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

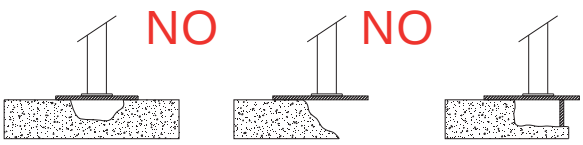
- Comply with the maximum pressures according to the instructions of the respective formwork system.
- Continuously check the state of the formwork during concrete casting. Stop further casting in case of any incident.
- Place the concrete in uniform layers of 30 to 45 cm.
- For vertical concrete placement, 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.

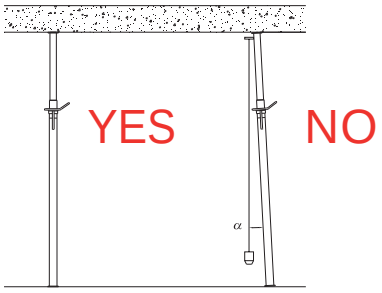
6.1.2.6. Concrete curing and formwork stripping

- 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.

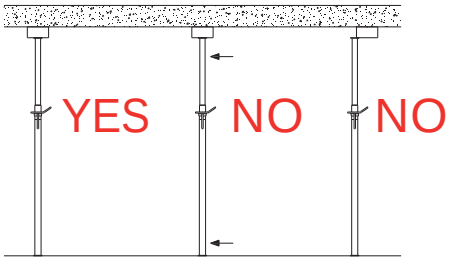
6.2. RECOMMENDATIONS



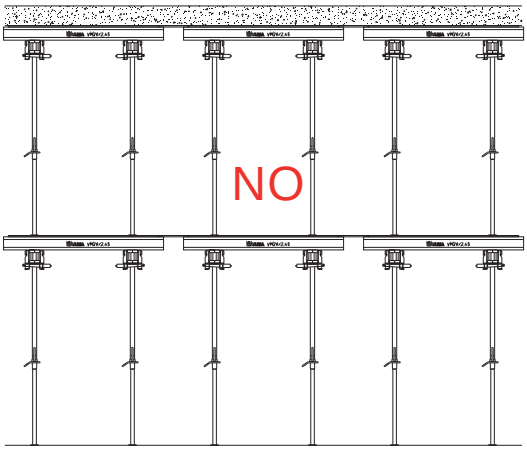
The prop's support should be horizontal, flat and with a stable support.



The prop must be plumbed.

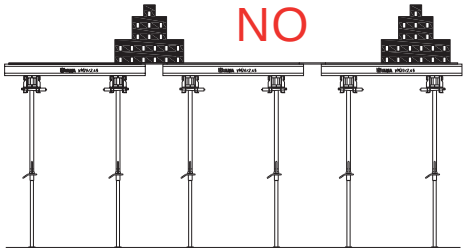


The application of the load on the prop must be vertical and centred. No horizontal loads will be applied to the prop.

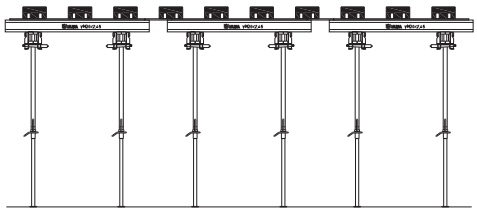


The props must be used between support and load. Do not use overlay because they can cause crashes and loss of effective load.

NO

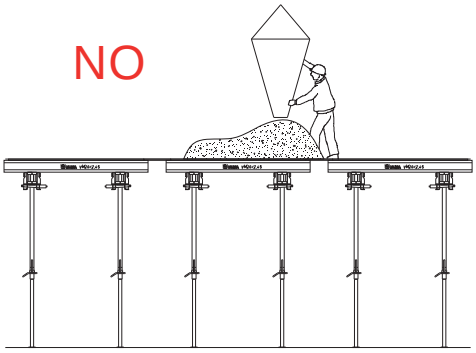


YES



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

NO



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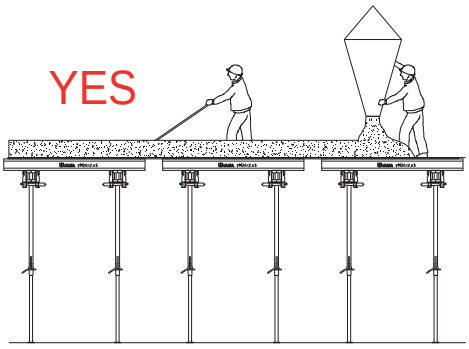


Perform the concrete pouring in layers of uniform thickness and vibrating continuously, preventing accumulations.

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 Construction

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 Construction.

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 8 m in open wind areas, or 12 m 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.
- The Lifting Hook VR can only be used to lift ULMA VR Tables. In no case can it be used for other applications or with other formwork systems.
- The Lifting Hook VR must not suffer strong knocks and excessive crushing during its handling, storage, travelling and, mainly, when shifting the tables.

6.4.2.5. LIFTING HOOK RKS

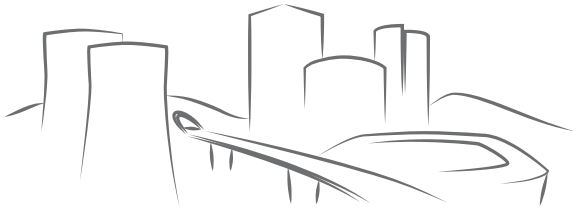
- Check visually the estate of the Lifting Hook RKS before any use, discarding it if any problem.
- The crane Sling used by the contractor should be designed for maximum admissible load of the Hooks.
- The Lifting Hook RKS must not suffer strong knocks and excessive crushing during its handling, storage, and travelling.

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

Equipment with CE marking marketed by ULMA Construction 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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