Slab formwork
VARIFLEX

VARIANT

USER MANUAL

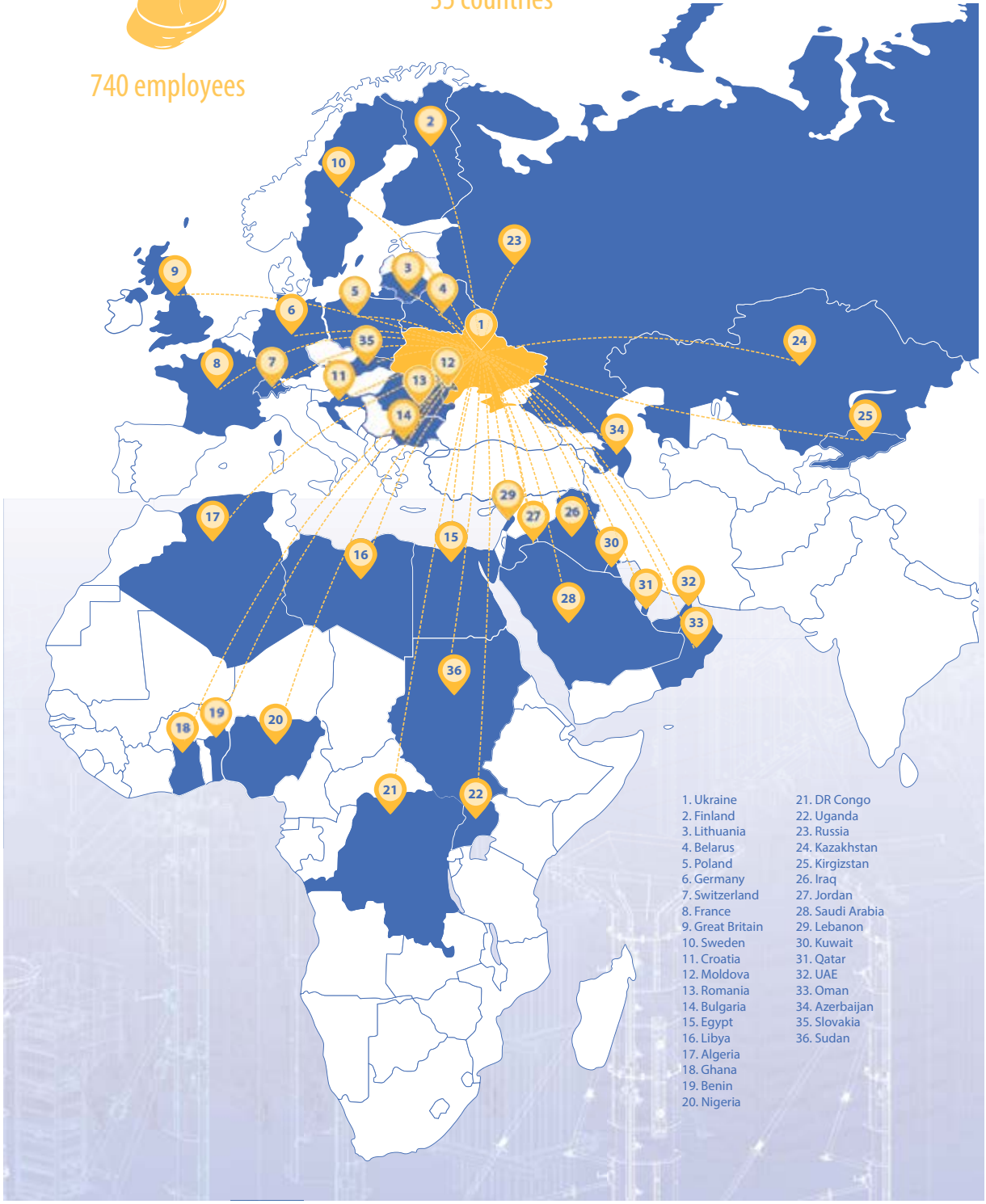
www.variant-factory.eu

ISO 9001
BUREAU VERITAS
Certification
Nº 00000

740 employees

35 countries

3 continents



Contents

GENERAL INSTRUCTIONS

This user manual (method statement) is aimed at everyone who will be working with the «VARIANT» product or system it describes. It contains information on how to set up this system, and proper use it.

All persons working with the product described herein must be familiar with the contents of this manual and with all the safety instructions it contains.

The customer is to ensure that the information materials provided by «VARIANT»are available to all users, and that they have been made aware of them and have easy access to them at the usage location.

Persons who are incapable of reading and understanding this booklet, or who can do so only with difficulty, must be instructed and trained by the customer.

Always observe all construction safety regulations and other safety rules applying to the application and using of our products in the country and/or region in which you are operating.

In the relevant technical documentation and formwork usage plans, «VARIANT» shows the workplace safety precautions that are necessary in order to use the «VARIANT» products safely in the usage situations shown. In all cases, users are obliged to ensure compliance with national laws, Standards and rules throughout the entire project and to take appropriate additional or alternative workplace safety precautions where necessary.

The customer is responsible for drawing up, documenting, implementing and continually updating a hazard assessment on every construction site. This document serves as the basis for the site-specific hazard assessment, and for the instructions given to users on how to prepare and use the system. It does not substitute for these, however.

This manual can also be used as a generic method statement or incorporated with a site-specific method statement.

The equipment/system must be inspected by the customer before use, to ensure that it is in suitable condition. Steps must be taken to rule out the use of any components that are damaged, deformed, or weakened due to wear, corrosion or rot.

The customer must ensure that this product is erected and dismantled, reset and generally used for its intended purpose under the direction and supervision of suitably skilled persons with the authority to issue instructions. These persons' mental and physical capacity must not in any way be impaired by alcohol, medicines or drugs.

The equipment/system must be assembled and erected in accordance with the applicable laws, Standards and rules by suitably skilled personnel of the customer's, having regard to any and all required safety inspections.

Many of the illustrations in this user manual show the situation during formwork assembly and are therefore not always complete from the safety point of view.

Combining our formwork systems with those of other manufacturers could be, but needs to be checked by customer compatibility «VARIANT» product/system with other independently under its responsibility.

It is not permitted to modify«VARIANT» products because of a safety risk.

Only original «VARIANT» components may be used as spare parts. Repairs may only be carried out by the manufacturer or authorized facilities.

We reserve the right to make alterations in the interests of technical progress.

WARNING NOTES

«VARIANT» products and systems must be set up in such a way that all loads acting upon them are safely transferred.

Do not exceed the permitted fresh-concrete pressures. Excessively high pouring rates lead to formwork overload, cause greater deflection and risk causing breakage.

The stability of all components and units must be ensured during all phases of the construction work.

All connections must be checked regularly to ensure that they still fit properly and are functioning correctly. It is very important to check all screw-type connections and wedge-clamped joins whenever the construction operations require (particularly after exceptional events such as storms), and to tighten them if necessary.

Remove any loose parts or fix them in place so that they cannot be dislodged or fall free.

It is strictly forbidden to weld «VARIANT» products – in particular anchoring/tying components, suspension components, connector components and castings etc. – or otherwise subject them to heating. Welding causes serious change in the microstructure of the materials from which these components are made. This leads to a dramatic drop in the failure load, representing a very great risk to safety. The only articles which are allowed to be welded are those for which the «VARIANT» literature expressly points out that welding is permitted.

If a person or object falls against, or into, the side-guard component and/or any of its accessories, the component affected may only continue in use after it has been inspected and passed by an expert.

Provide safe workplaces for those using the formwork (e.g. for when it is being erected/dismantled, modified or repositioned etc.). It must be possible to get to and from these workplaces via safe access routes.

Fire-sources are not permitted anywhere near the formwork. Heating appliances are only allowed if properly and expertly used, and set up a safe distance away from the formwork.

The work must take account of the weather conditions (e.g. risk of slippage). In extreme weather, steps must be taken in good time to safeguard the equipment, and the immediate vicinity of the equipment, and to protect employees.

Do not strike the formwork until the concrete has reached sufficient strength and the person in charge has given the order for the formwork to be struck.

When striking the formwork, never use the crane to break concrete cohesion. Use suitable tools such as timber wedges, special pry-bars or system features such as «VARIANT» stripping corners.

When striking the formwork, do not endanger the stability of any part of the structure, or of any scaffolding, platforms or formwork that is still in place.

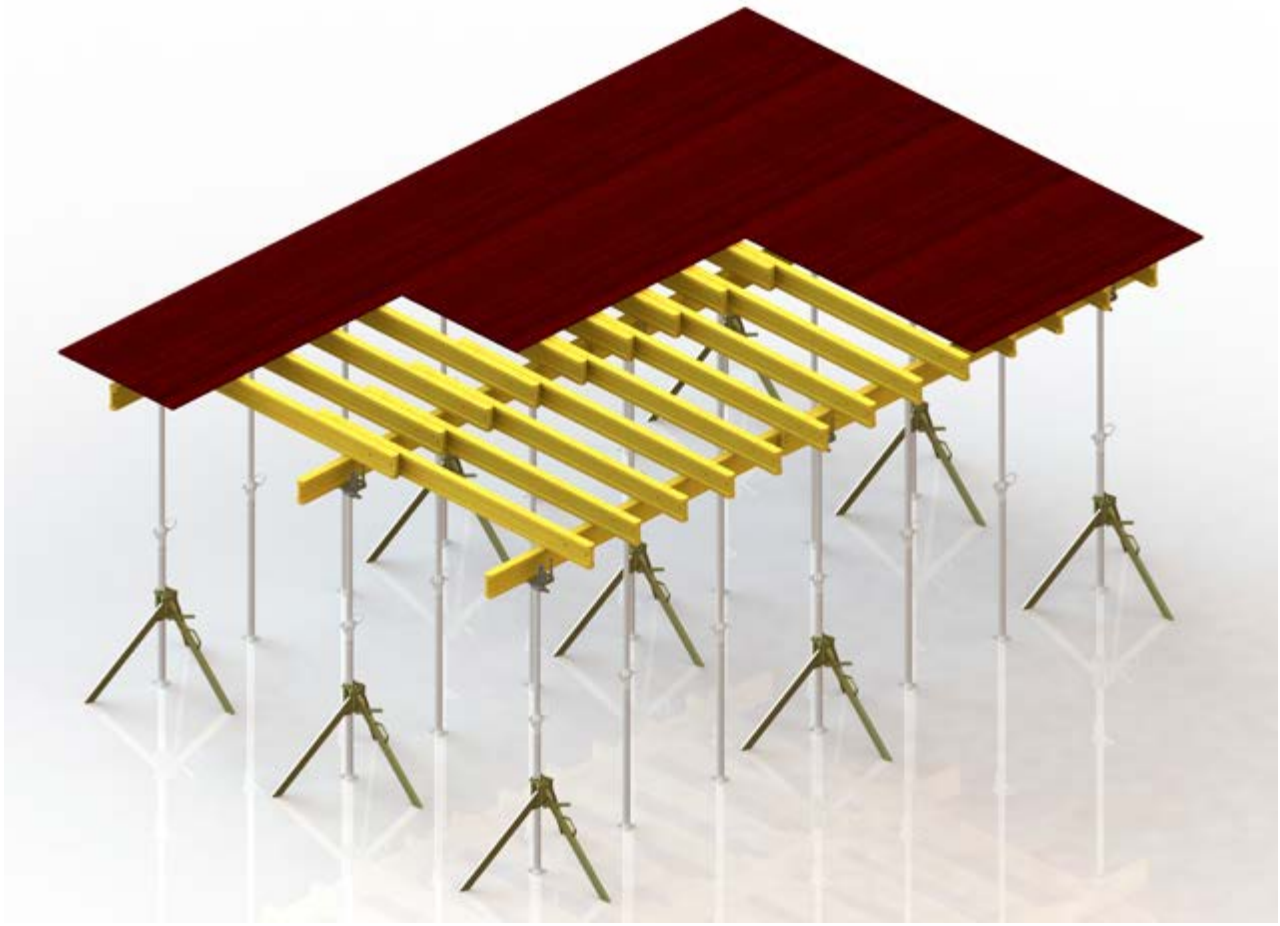
Observe all regulations applying to the handling of formwork and scaffolding.

SYSTEM OVERVIEW

Variflex by Variant is a conventional prop formwork system for flat slabs forming and shoring. Having only 5 main components, the system is fast and easily assembled, consequently operational time and labor costs are optimized. VARIFLEX adapts to any slab applications due to beams overlap and the fact that the props can be placed anywhere along the main beam. Simply by changing 3 variables (distance between main rows, distance between props in the main row and distance between secondary beams), the system can be applied to any load.

Load-bearing capacity :

• Due to its load-bearing flexibility, VARIFLEX can be adapted to withstand loads of fresh concrete of different kinds of slab thicknesses. Optimal and cost-effective use within the range of slab thicknesses up to 500 mm.
• Maximum formwork height—6.0 m



Cost-effective:

• Fewer parts speed up assembly;
• Assembly, stripping and disassembly by hand;
• High number of use cycles means lower follow-up expenses;
• Reduction of expenses by means of system adaptability;
• Galvanized or powder coated elements, for long service life.

System adaptability:

• Easily adapts to different and varying layouts, especially in case of irregular geometrics, specific load cases, different slab thicknesses.

Easy handling and planning:

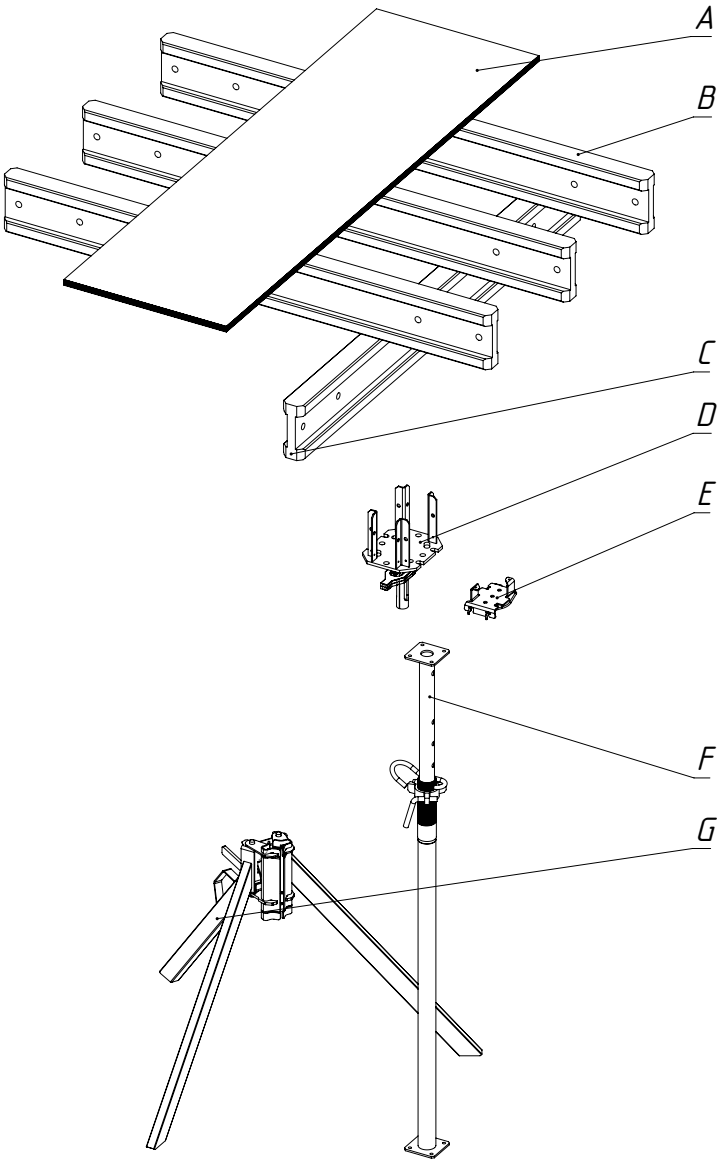
• All the connectors and accessories are easily fixed into the slots and quickly tighten, consequently forming time is efficient and maximized;
• Any requirements for architectural concrete flat slab design can be met.

Safe use:

• Accessories such as — handrail makes for save and easier handling of the system;
• Safe working already during assembly.

SYSTEM IN DETAIL

The Variflex is a system with small number of components – simple for understanding and easy to use.



A - Facing
Any kind of facing can be used from conventional plywood and plastic panels to permanent formwork panels with preffered thickness 21 mm and 18mm

B - Secondary wooden beam
C - Primary wooden beam
standart lengths and section gives simple way to install

D - Lowering head (Crown head)
Used in conjunction with supporting props as a main support of primary beams. Lowering head has integrated quick-lowering function for fast stripping.

E - Support head
Is used for connecting intermediate props to the primary beams.

F - Supporting prop
Wide range of Variant supporting props can be used with the system. The choice is to be made depending on loads, formwork height and working conditions.

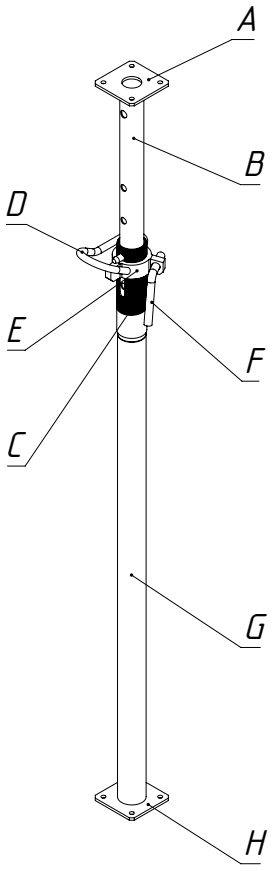
G - Removable folding tripod
Is used for aligning and holding props upright during formwork assembly and stripping.

MAIN SYSTEM COMPONENTS

PROPS

Variflex props are extendable supporting props made of steel and designed for use as vertical supports for temporary structures.

Heavy duty prop RBGU; Medium duty prop RBGN

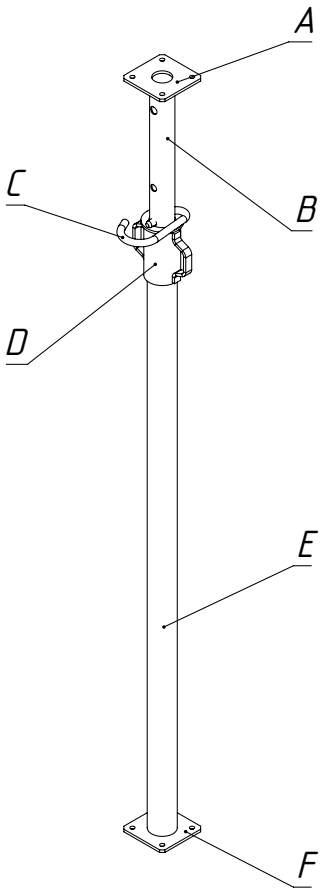


(A) Head plate
(B) Slider tube
(C) Open thread
(D) Peg
(E) Adjusting nut
(F) Toggle lever
(G) Fixed tube
(H) Base plate

The main features:

• high load-bearing capacity (See the section entitled "Permitted prop loads");
• pegging holes with step 80 mm, for easier height adjustment;
• quick connection: head adapters of various types can be secured against pull with the Spring locked connecting pin 16 mm;
• drop-out latch: for safety reasons, props have latches to prevent the inner tube sliding out of the fixed tube;
• galvanized or powder coated, for long service life;
• self-cleaning galvanized (even for powder coated props) open thread.

Medium duty prop RBG; Light duty prop RBGE; Extra light duty prop RBR



(A) Head plate
(B) Slider tube
(C) Peg
(D) Closed thread with Adjusting nut
(E) Fixed tube
(F) Base plate

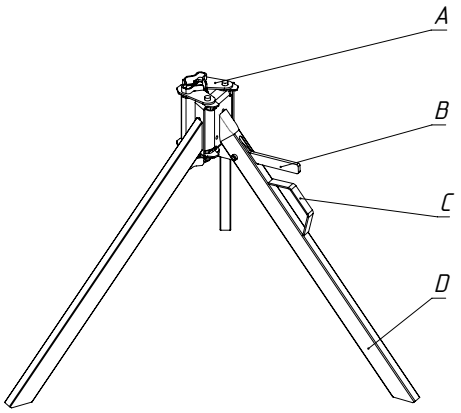
The main features:

• economically profitable load-bearing capacity (See the section entitled “Permitted prop loads”);
• pegging holes with step 80 mm, for easier height adjustment;
• quick connection: head adapters of various types can be secured against pull with the Spring locked connecting pin 16 mm;
• drop-out latch: for safety reasons, props have latches to prevent the inner tube sliding out of the fixed tube;
• galvanized or powder coated, for long service life;
• Closed thread with Adjusting nut.

TRIPODS

Removable folding tripods are used for aligning and holding props upright during formwork assembly and stripping.

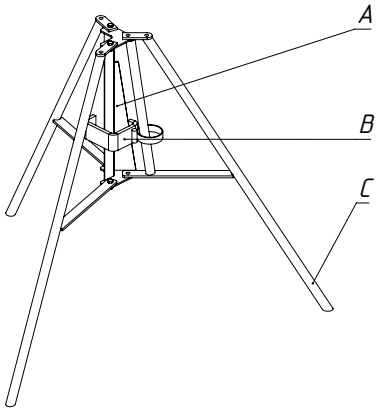
Tripod W



(A) Clamping mechanism
(B) Lever
(C) Handle
(D) Folding leg

The main features:
• using with Heavy duty prop RBGU (can be used with another Variflex props types also);
• folding legs for easier adjustment on project places and cost-effective transportation;
• integrated handle;
• galvanized or powder coated, for long service life.

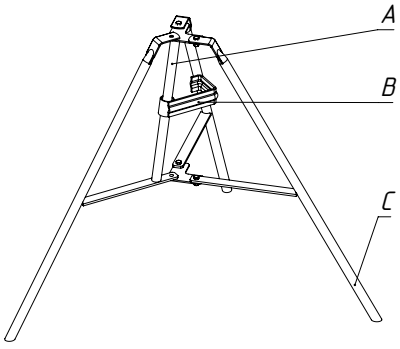
Tripod L



(A) Guide plate
(B) Clamp
(C) Folding leg

The main features:
• using with Medium duty prop RBGN & RBG;
• folding legs for easier adjustment on project places and cost-effective transportation;
• galvanized or powder coated, for long service life.

Tripod L light



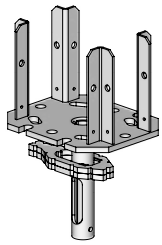
(A) Guide plate
(B) Clamp
(C) Folding leg

The main features:
• using with Light & Extra light duty prop RBGE & RBR;
• folding legs for easier adjustment on project places and cost-effective transportation;
• galvanized or powder coated, for long service life.

HEADS

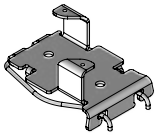
Wide range of heads are used to hold primary H20 beams along lengths and overlap

Lowering head



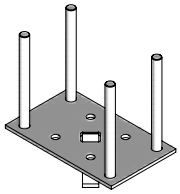
The main features:
- using with Heavy duty prop RBGU (can be used with another Vari-flex props types also);
- integrated quick-lowering function when stripping;
- galvanized, for long service life.

Support head



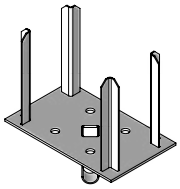
The main features:
- fixing intermediate props to the primary beam;
- integrated fastening to the prop;
- galvanized, for long service life.

Crown head



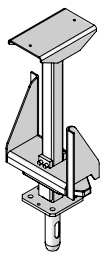
The main features:
- using with Medium duty prop RBGN & RBG;
- four-way head to hold single H20 beam or H20 beams overlap;
- galvanized or powder coated, for long service life.

Crown head light



The main features:
- using with Light & Extra light duty prop RBGE & RBR;
- four-way head to hold single H20 beam or H20 beams overlap;
- galvanized or powder coated, for long service life.

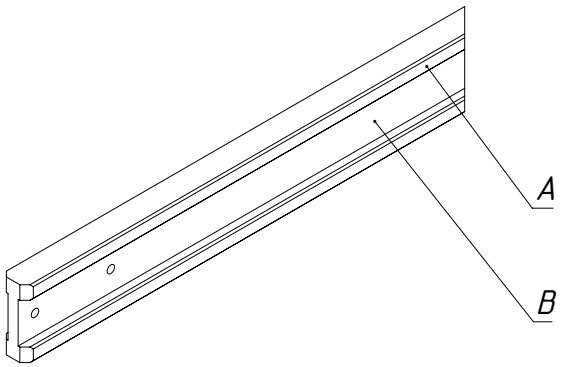
Lowering head ES (early stripping)



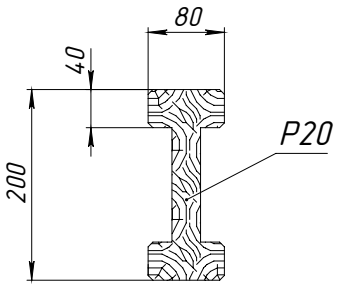
The main features:
- integrated shoring system for early stripping out the slab formwork;
- using with Heavy duty prop RBGU;
- integrated quick-lowering function when stripping;
- galvanized for long service life.

H20 BEAMS

Formwork beams proven in practice for efficient slab construction



(A) H20 beam flange 40x80 mm
(B) H20 beam web 31 mm (27 mm) thick



The main features:

- high load-bearing capacity (permitted bending moment 5.0 kNm; shear force 11 kN);
- wide range of standard lengths;
- dimensional & form stability;
- each beam end with 2 holes drilled;
- no significant reduction in load bearing surface at the end.

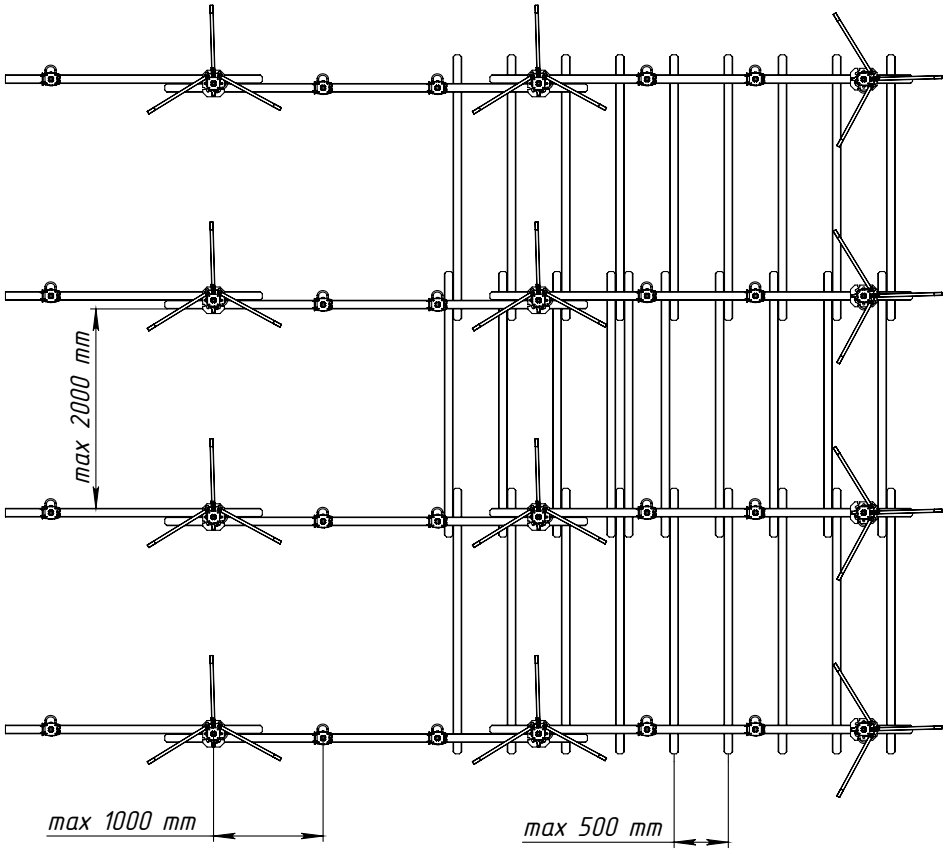
SYSTEM LOGIC

For all floor-slabs up to 30 cm thick

The straightforward logic underlying the Variflex system means that there is no need for planning and operations scheduling work. The quantities are simply computed using:

next formwork elements:
- Props with load-bearing capacity 20 kN;
- H20 beams 3.90 m long as a primary; 2.65 m long as a secondary;
- few accessories such as Tripods; Heads etc.

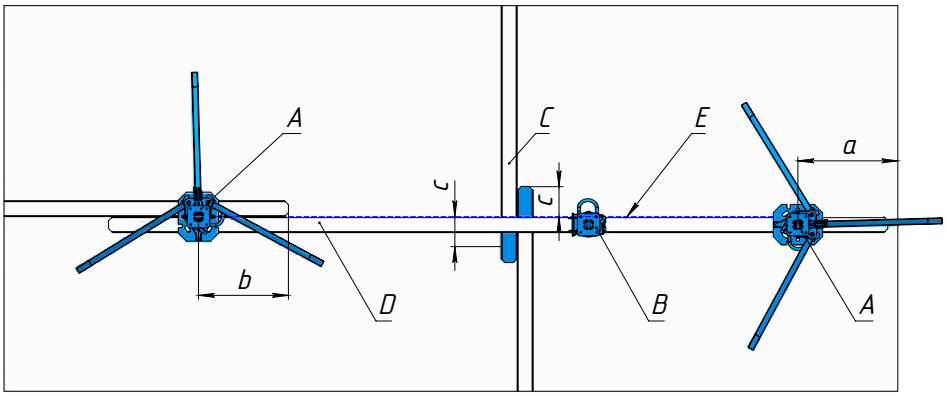
next simple rules:
- max. distance between primary lines is 2.00 m;
- max. distance between props in primary lines is 1.00 m;
- max. distance between secondary beams is 0.50 m for finnish birch plywood 21 mm; 0.45 m for finnish birch plywood 18 mm.



The primary beams should be oriented at right angles to the direction of an uneven length/width of room (5 m, 7 m, 9 m, etc.). This makes more efficient use of the potential of the system.

When pouring thinner slabs, the distance between formwork elements can be increased after previous statical calculation.

Permitted beam cantilever / overlap



(A) Supporting prop with Lowering (Crown) head
(B) Supporting prop with Support head
(C) Secondary H20 beam
(D) Primary H20 beam
(E) Primary beam axis

a = max. 50 cm or half the prop spacing
b = min. 30 cm primary beam overlap
c = min. 15 cm secondary beam cantilever

OPTIMIZATION OF H20 BEAM AND PROP SPACINGS

The quantities of Variflex system components can be calculated exactly, with reference to the thickness of slab.
The H20 beam and prop spacing are optimized depending on the layout, and in accordance with the slab load.

Spacing of props & primary H20 beams

Slab thickness cm	Total load kN/m²	Permitted spacing of props, m for the selected primary-beam spacing, m				
		1.50	1.75	2.00	2.25	2.50
16	5.9	2.12	1.92	1.68	1.49	1.34
18	6.4	2.03	1.76	1.54	1.37	1.23
20	6.9	1.90	1.63	1.43	1.27	1.14
22	7.4	1.77	1.52	1.33	1.18	1.06
24	7.9	1.66	1.42	1.24	1.11	1.00
26	8.4	1.56	1.34	1.17	1.04	0.93
28	8.9	1.47	1.26	1.10	0.98	0.88
30	9.4	1.38	1.18	1.04	0.92	0.83
35	10.9	1.19	1.02	0.89	0.79	0.71
40	12.4	1.04	0.89	0.78	0.70	0.63
45	13.9	0.93	0.80	0.70	0.62	0.56
50	15.4	0.84	0.72	0.63	0.56	-

The table assume:
- Props with load-bearing capacity 20 kN;
- Weight of the fresh concrete 25 kN/m³;
- Live load of 20% of the dead load of the fresh concrete, but not less than 1.5 kN/m²;
- Mid-span deflection has been limited to l/500.

Spacing of secondary H20 beams

Slab thickness cm	Max. spacing of secondary beams, m	
	Finnish birch plywood	
	21 mm	18 mm
up to 20	0.63	0.57
up to 25	0.57	0.50
up to 30	0.53	0.46
up to 35	0.51	0.44
up to 40	0.48	0.42
up to 45	0.47	0.41
up to 50	0.45	0.39

Spacing of secondary H20 beams can be various; depends on plywood parameters.

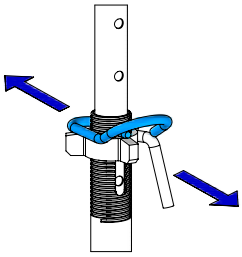
INSTRUCTIONS FOR ASSEMBLY AND USE

Instructions of 'Reshoring props, concrete technology and stripping out' have to be followed

For increased stability, in large rooms, the full erection sequence of primary beams; secondary beams; formwork sheets should be carried out progressively for successive sub-areas of the room. When doing this, provide suitable bracing to walls or columns.

If there is any risk of the formwork being blown over, all free-standing, non-enclosed areas of slab formwork must be secured during work-breaks and when work finishes for the day.

INSTALLATION OF THE FORMWORK

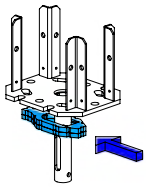


Putting up floor props

Measure up the positions of the props using system logic for all floor-slabs up to 30 cm thick or using optimization of H20 beam and prop spacings

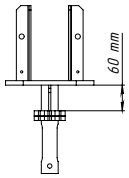
Roughly adjust the height of the floor props, using the peg clamp.

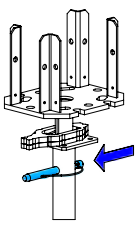
Place lowering head pin in working position for fast stripping.



Insert a lowering head (crown head) into the floor prop.

If the props are transported with the heads still attached, you must secure these with a Spring locked connection pin 16mm to prevent them dropping out.
This is particularly important when they are transported in the horizontal or stripping out in some cases.



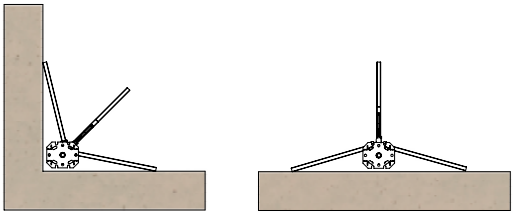


Put up each tripod.

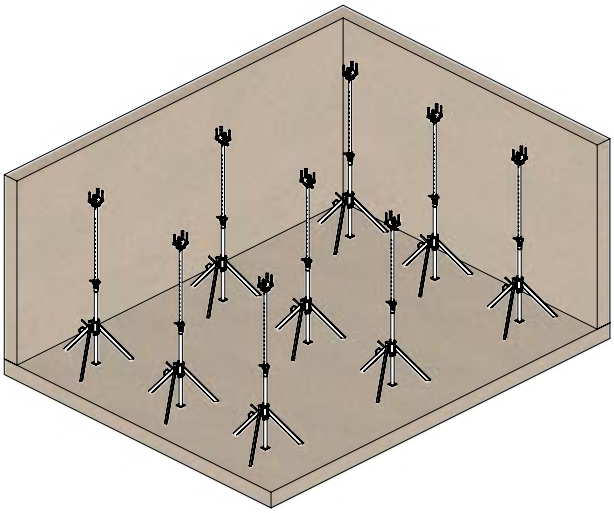
Put the floor prop into the tripod and fix it in place with the clamping lever.

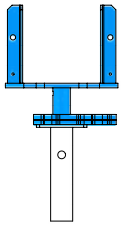
Before stepping onto the formwork , check again to make sure that the props have been correctly fixed in the tripods.

Setting up tripods in corners or up against walls



If it is not possible to completely unfold the legs of the tripod – e.g. at the edges of a structure or at floor breakthroughs etc. – we recommend fastening this tripod to an adjacent floor prop instead, where there is room for the legs to be completely unfolded.

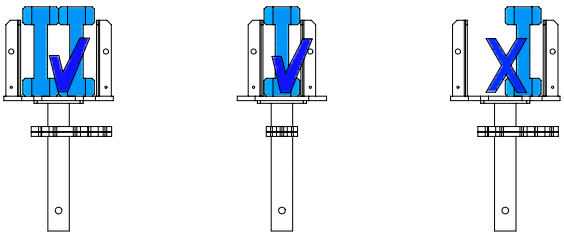




The lowering heads that will be under the primary beams next to the walls must be turned inwards so that they can be knocked undone when the time comes to take down the formwork.

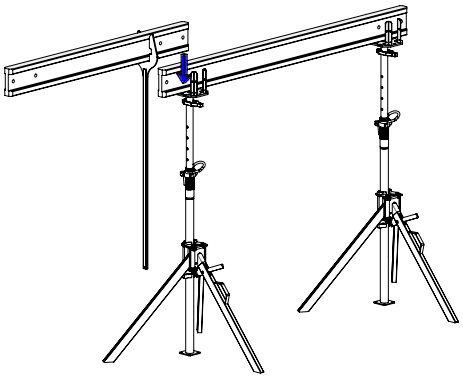
Inserting the primary beams

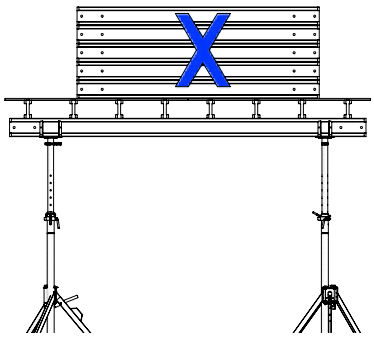
The lowering heads can support both single beams (on edge-of-room props) and double beams (at overlaps).



Loads that are applied non-centrally can cause overloading of the system.
Ensure that all loads are applied centrally.

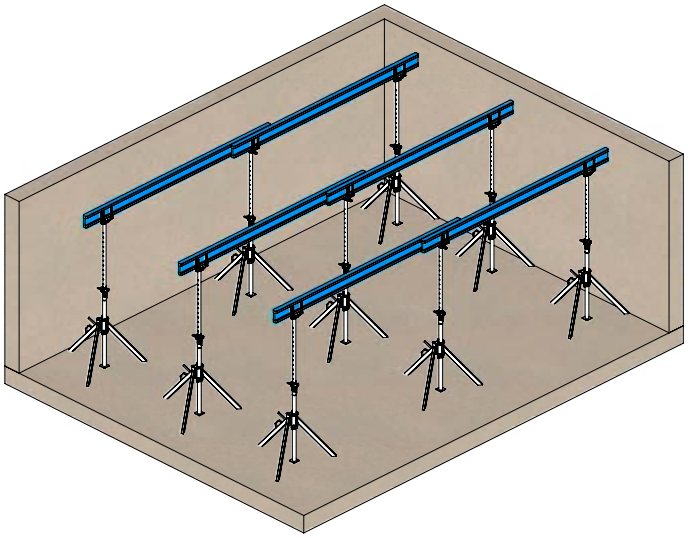
Using beam-forks, place the primary beams into the lowering heads.





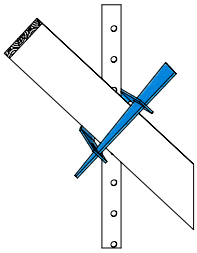
It is not permitted to set down any loads on the floor-slab formwork (e.g. beams, formwork sheets, reinforcement steel) until the intermediate props have been set up.

Adjust the primary beams to the correct floor-slab height.



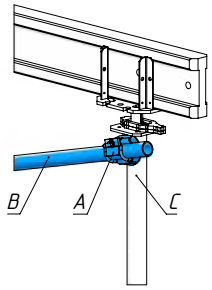
Bracing

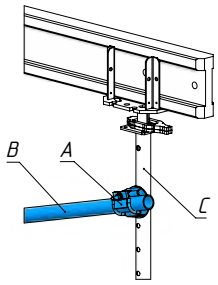
Bracing clamp with planks



Planks can be attached to the floor props as diagonal braces, using the Bracing clamp.
(This is only to help stand the props upright and is not suitable for re-straining horizontal loads).

Screw-on couplers 48 mm 100 with framed tubes



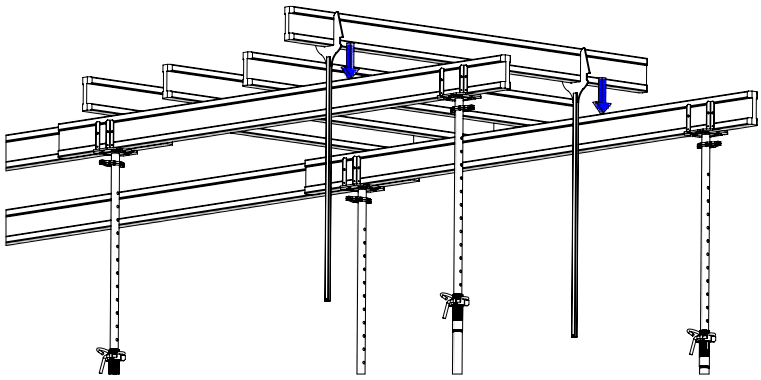


Before fitting the bracing, make sure that the holes in the floor prop or lowering head are correctly aligned.

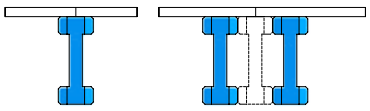
(A) Screw-on couplers 48 mm 100
(B) Framed tube 48mm
(C) Prop

Placing the secondary beams on the primary beams

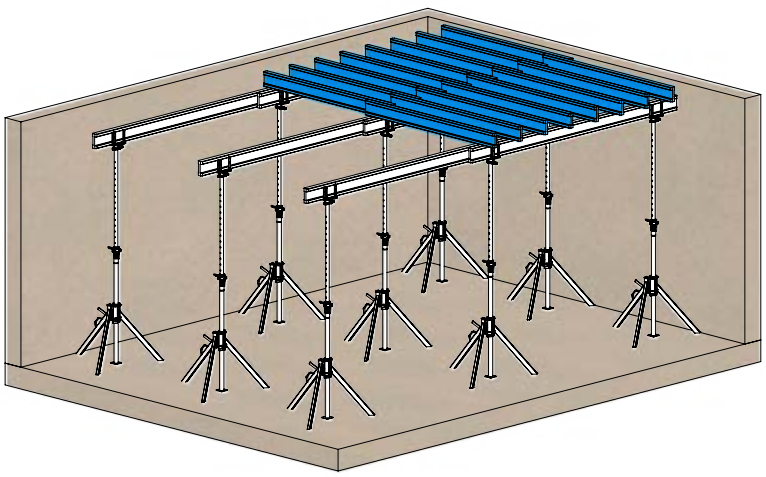
Use the beam forks to place the secondary beams on the primary beams, with an overlap.

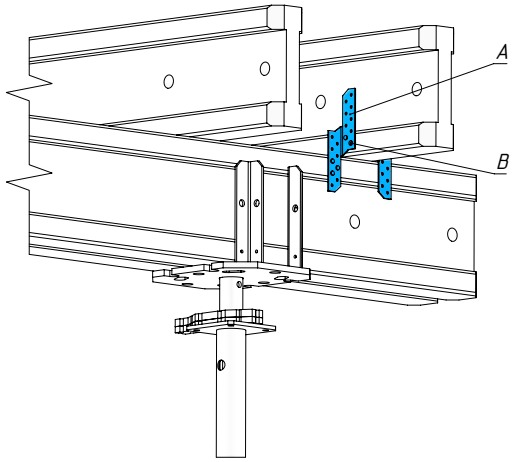


Measure up the positions of the secondary beams.



Be sure to place a beam (or double beam) wherever there is to be a joint be tween the panels.

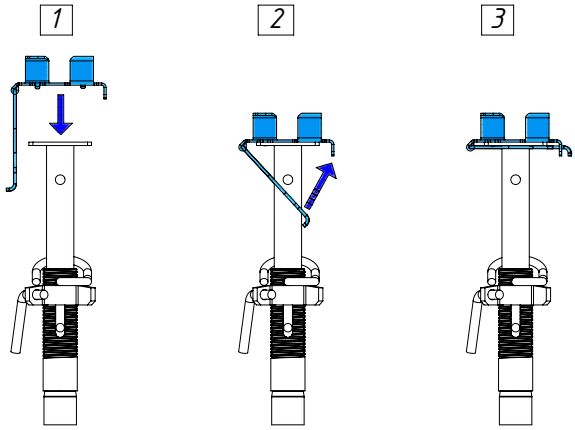




To prevent the secondary beam stipping on their sides while the panels are being laid on them, rafter plates can be used.

(A) Rafter plate
(B) Nail

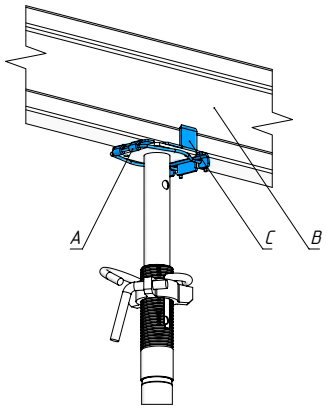
Putting up intermediate props



Put up the intermediate props so that they force-fit.
It is not allowed to make some props higher than others.

Place the support head on the inside tube of the floor prop and secure it with the integral spring-steel stirrup.

Measure up the positions of the floor props.



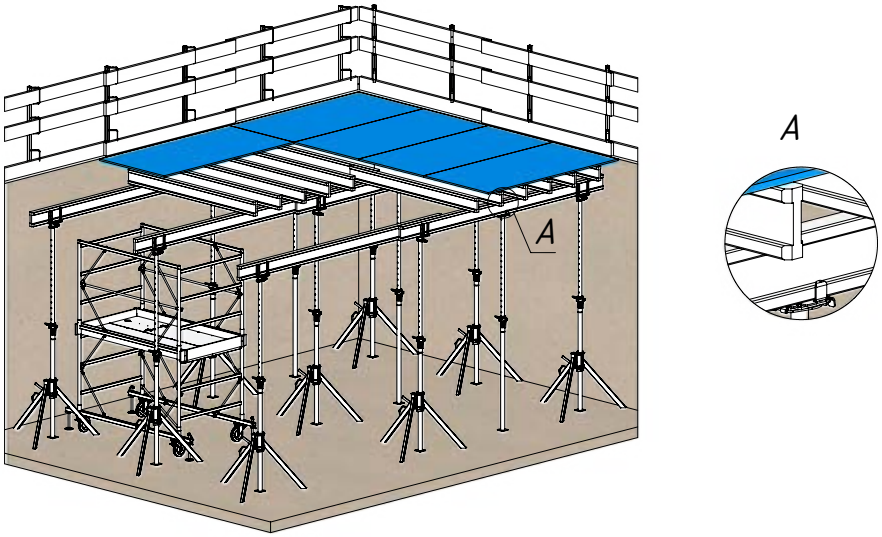
(A) Support head
(B) H20 beam
(C) Bore in the support head (for fixing with chipboard screw 4x35)

Laying the panels onto the beams

Working from below

To lay panels on the secondary beams from below, always work from a standard mobile scaffold towers or a platform ladder.

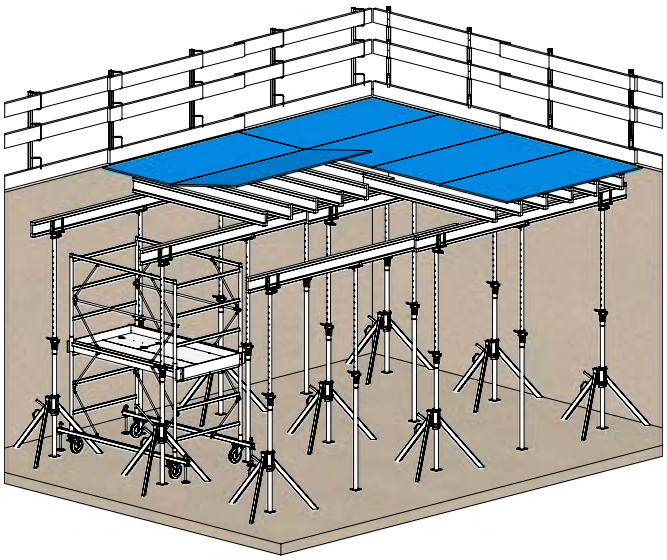
Lay the panels at right angles to the secondary beams.



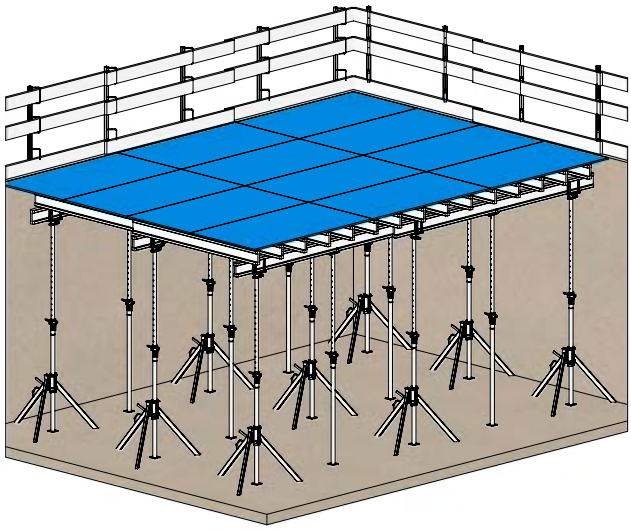
Working from above

Local regulations, or the result of a hazard assessment carried out by the erector, may make it necessary to use personal fall arrest systems (PFAS) when setting-up the panel from above.

Lay the panels at right angles to the secondary beams.



Spray the panels with release agent.



Where necessary (e.g. edge zones), secure the panels with nails.
Recommended nail lengths for the plywood thickness 18-21 mm - approx. 50 mm

POURING

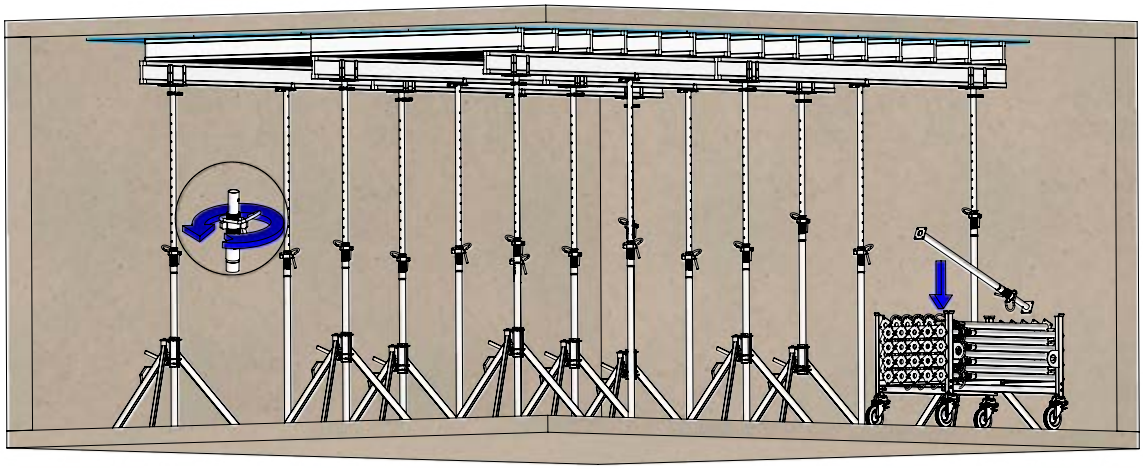
To protect the surface of the plywood, we recommend using a vibrator with a protective rubber cap.

STRIPPING OUT

Observe all stipulated stripping times.

Removing the intermediate props

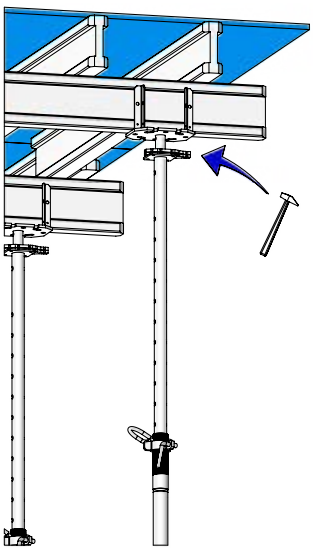
Remove the intermediate props and put them in the stacking pallet.

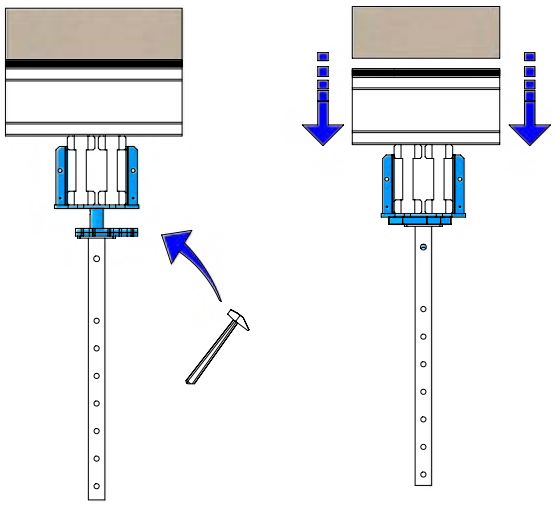


After the intermediate props have been removed, there usually remain only props spaced 2.0 m apart in the direction of the secondary beams and 3.0 m apart in the direction of the primary beams. This leaves enough space to maneuver wheel-around scaffolds and stacking pallets without difficulty.

Lowering the floor-slab formwork

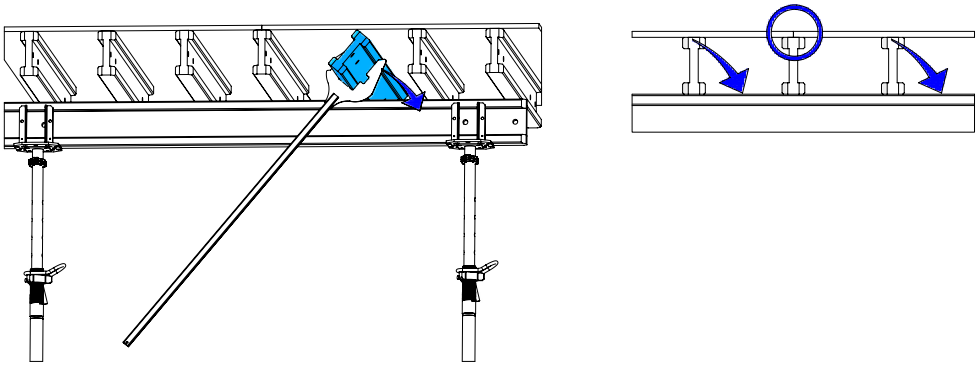
Lower the floor-slab formwork by striking the wedge on the lowering head with a hammer.



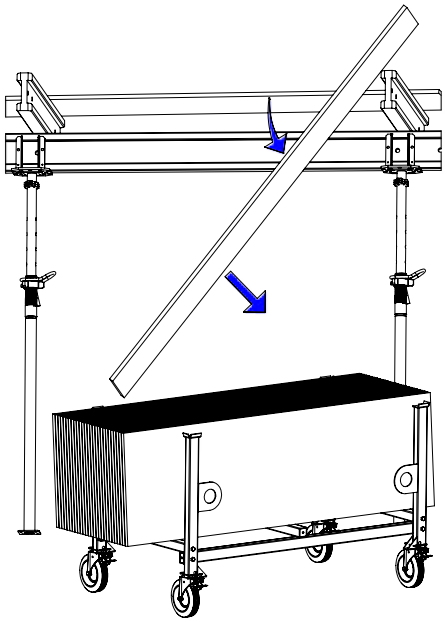


Removing secondary beams and plywood

Turn the secondary beams over onto their sides, pull them out and put them in the stacking pallet. Leave the H20 beams under the panel-joints in place.



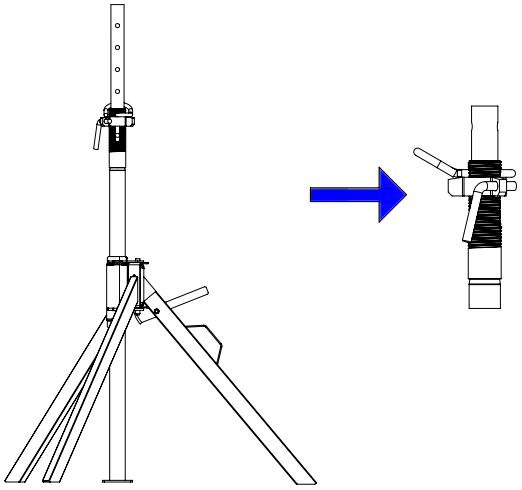
Take out the panels and put them in the stacking pallet.



Remove the remaining secondary beams and the primary beams, and put them in the stacking pallet.

Removing the floor props

Hold the inner tube with one hand. Open the fastening clamp to unfix the inner tube. Guide this by hand while lowering it into the outer tube.



Put the tripods and props in the stacking pallet.

When lifting the equipment to the next stage, it is better to transport the floor props and the lowering heads separately for making compact equipment's volume in the stacking pallet.

RESHORING

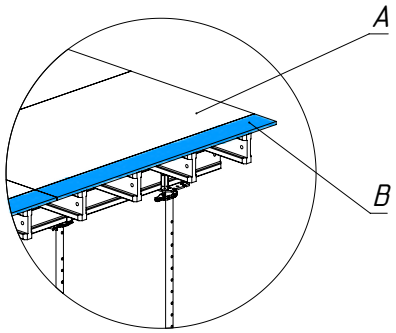
Before pouring the next floor-slab (i.e. above the one that has just been stripped), put up reshoring props.

For further information (number of props etc.), see "Reshoring props, concrete technology and striking".

ADAPTABILITY

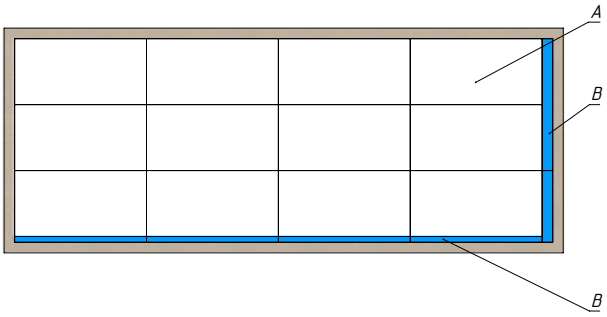
Closures and adjustments

Infill zones are solved within the system - with no special accessories needed. The necessary adaptation is made by overlapping the Wooden beams and inserting strips of facing.

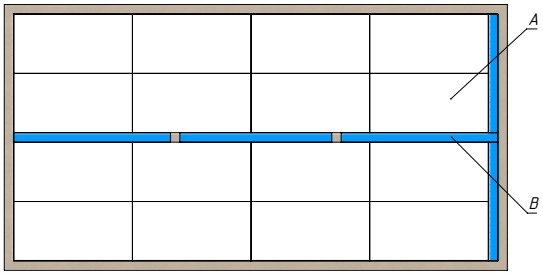


(A) Plywood sheet
(B) Plywood strip

Adaptation along edges

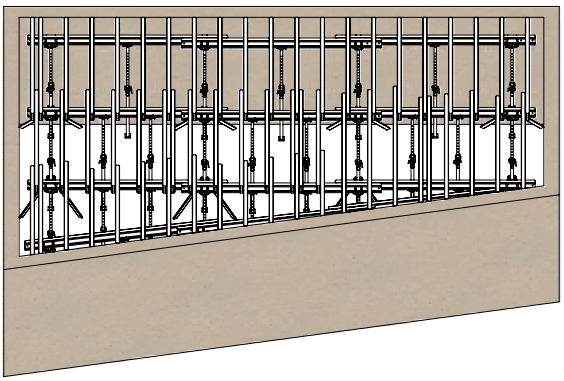


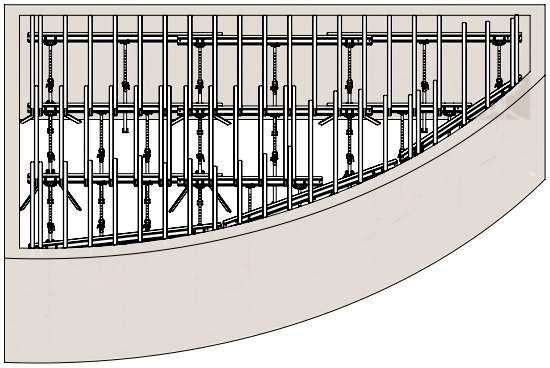
Adaptation around columns



Grid and flexibility - in one system

Variflex adapts to difficult layouts.



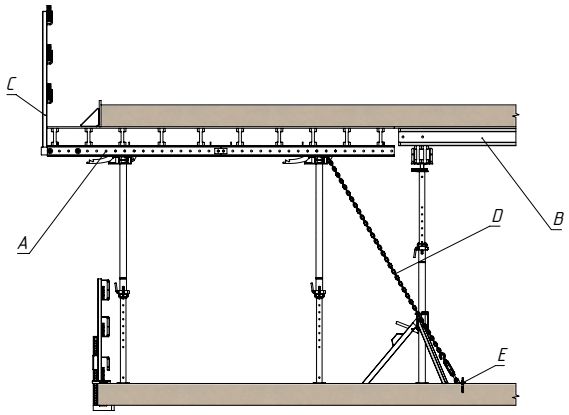


SLAB FORMWORK AROUND EDGES

It is advantageous to combine Variflex formwork with Varitable / Varitable plus system, particularly in edge-zones.
This is an easy, safe way of forming drop beams and slab stop ends with pre-mounted side railings.

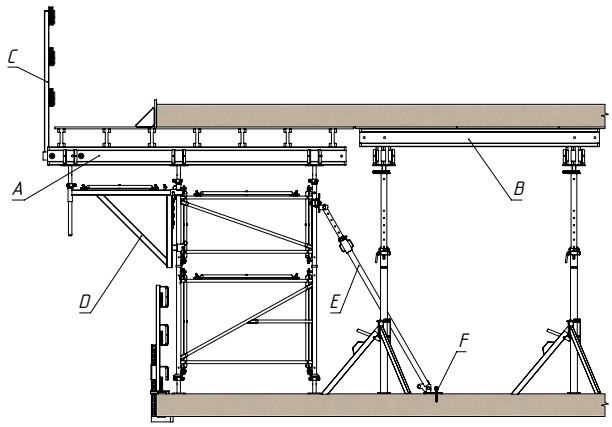
With flat slab

Using formwork table Varitable plus



(A) Varitable plus system
(B) Variflex system
(C) Handrail post
(D) Lashing strap
(E) Anchorage

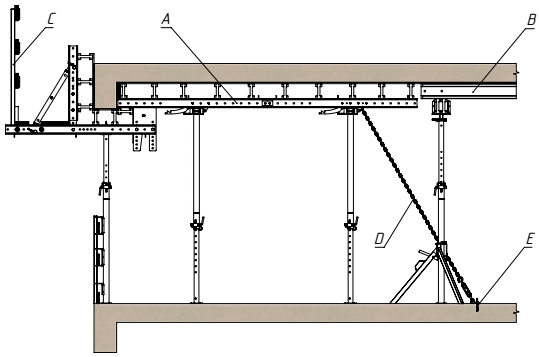
Using scaffolding tower TopTower 40



(A) TopTower 40 system
(B) Variflex system
(C) Handrail post
(D)Tower bracket TT40
(E) Tower strut 340
(F) Anchorage

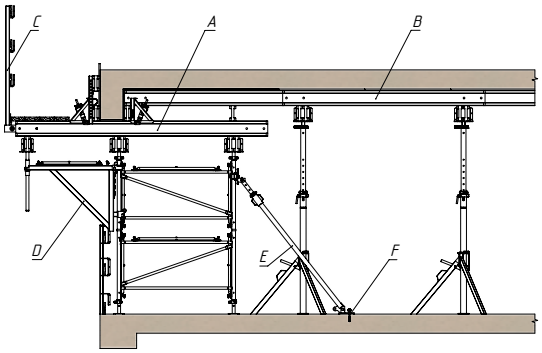
With edge drop beam

Using formwork table Varitable plus



(A) Varitable plus system
(B) Variflex system
(C) Handrail post
(D)Lashing strap
(E) Anchorage

Using scaffolding tower TopTower 40



(A) TopTower 40 system
(B) Variflex system
(C) Handrail post
(D)Tower bracket TT40
(E) Tower strut 340
(F) Anchorage

Where Wooden beams cantilever out a long way, secure them against accidental lift-out.

Variflex on edges

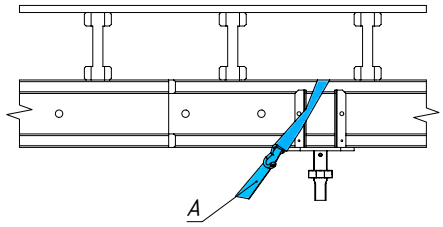
If no separate edge tables are available, the following points must be remembered when using Variflex:

- In order to be able to transfer the horizontal forces, the superstructure components must be firmly attached to one another;
- The tie-back can be fastened to either the secondary or primary beam.

TIE-BACK SOLUTIONS

For transferring low horizontal loads (stabilisation, windproofing etc.)

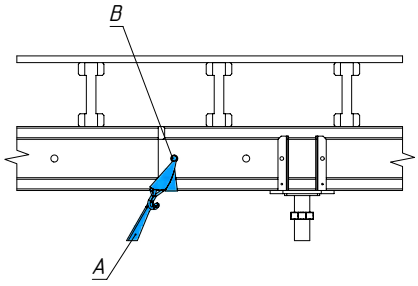
Around H20 beam and Lowering head



max. tie-back load: 5 kN

(A) Lashing strap

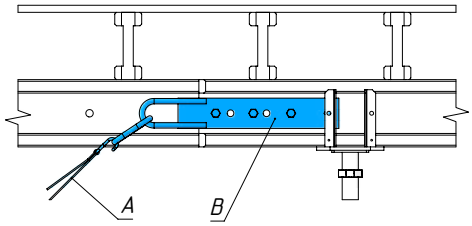
Through H20 beam-hole



max. tie-back load: 5 kN

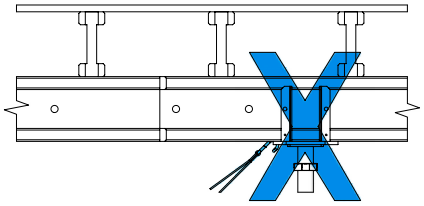
(A) Lashing strap
(B) Tie-rod or reinforcement rod Ø20 mm

Lifting hook Vertex



max. tie-back load: 5 kN

(A) Lashing strap
(B) Lifting hook Vertex, (pre-mounted to beam)

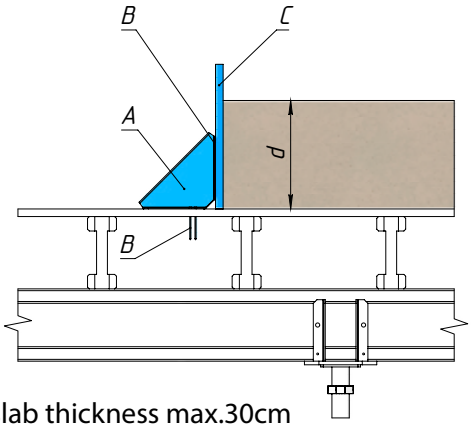


Never attach the tie-back directly to a head unit or floor prop

SLAB STOP-ENDS

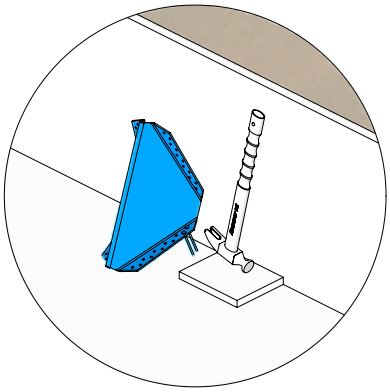
End-shutter support for slab

Fastened with nails



d = slab thickness max.30cm

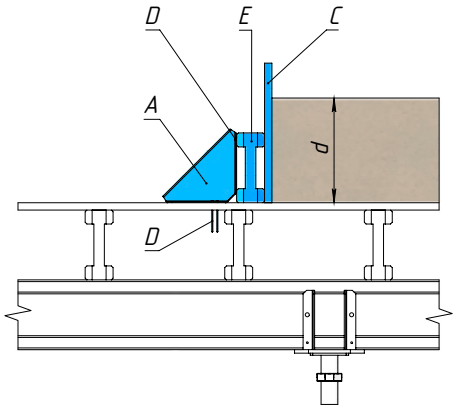
(A) End-shutter support for slab
(B) Nail 3.1x80
(C) Plywood



When stripping out:

- Take out the nails on the stop-end side;
- Put the claw of a hammer under the corner (put a piece of wood under it to protect the plywood;
- Lever up the End-shutter support.

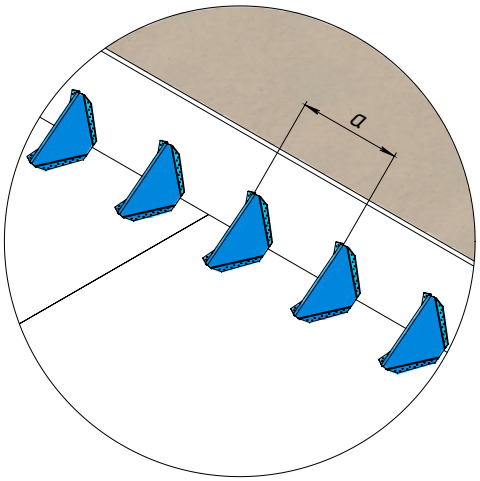
Fastened with Spax screws



d = slab thickness max. 30 cm

(A) End-shutter support for slab
(C) Plywood
(D) Spax screws 4x40 (fully threaded)
(E) H20 wooden beam

Permitted spacing between End-shutter supports



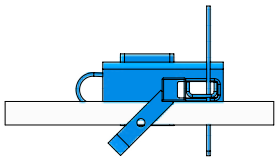
Fastened with	Max. influence width 'a', cm		
	for slab thickness		
	20 cm	25 cm	30 cm
Nails 3.1x80 – 4 pcs	90	50	30
Spax screws (fully threaded) 4x40 – 4 pcs	220	190	160

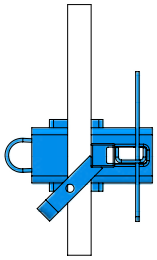
SAFETY WITH GUIDE RAIL CLAMP

The Guide rail clamp makes it possible to erect fall-arrest barriers. As well as to concrete floor-slabs, the Guide rail clamp can also be clamped onto platforms, floor-slab formwork and wall formwork.

The main features:

• The Guide rail clamp is used for erecting safety railings at fall-hazard locations;





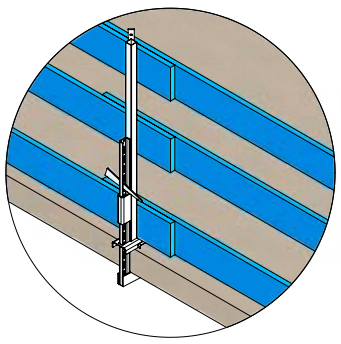
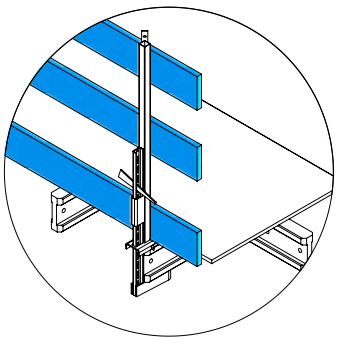
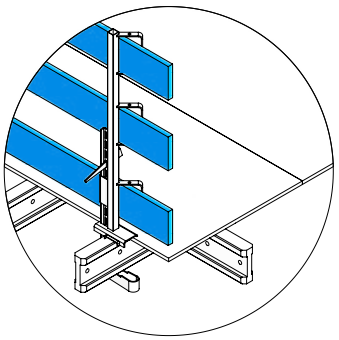
• It is designed so that it can be fastened onto various different components, making it suitable for use on: platforms; wall formwork; concrete floor-slabs; floor-slab formwork etc.;
• Guide rail clamp plate angled at 45°, to allow guardrail boards to be inserted in either direction (i.e. at 90° to one another);
• Holes drilled in the handrail-post plates for mounting screw-on couplers so that guard-rails can be erected using scaffolding tubes.

The clamping range is from 20 mm to 435mm.

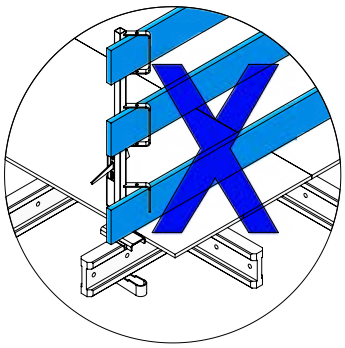
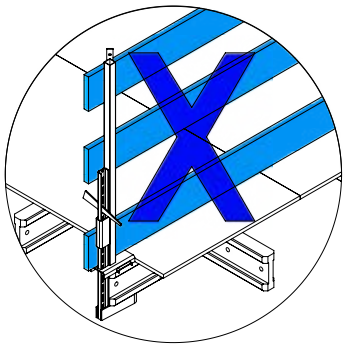
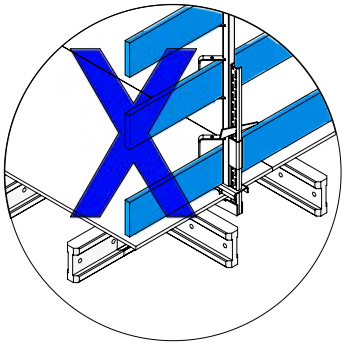
Assembly instructions

• To adjust the Guide rail clamp, remove the wedge from the wedge slot.
• Stand the Guide rail clamp in the chosen position and wedge it in place firmly.
• Insert guard-rail boards and secure them with nails.

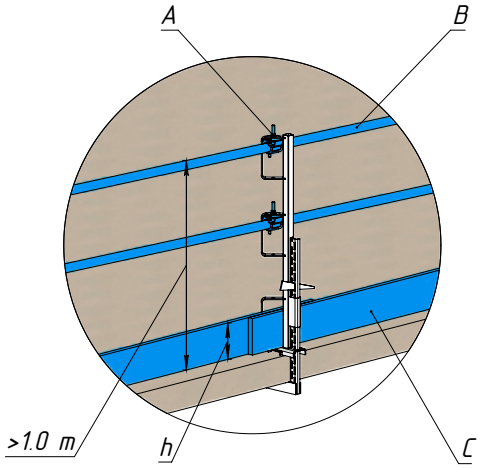
Areas of use

On concrete slabs	On slab formwork	
		

Only attach the Guide rail clamp to formwork beams if these cannot tip over.
Never mount guard-rail boards in the longitudinal direction of the formwork beams.
It is forbidden to fasten the clamp to the formwork sheeting only.

Typical mistakes of use. Never install in such way		
		

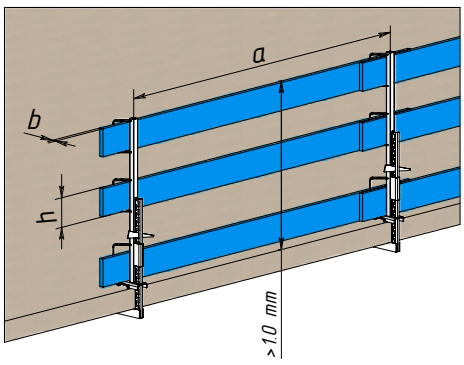
Using scaffolding tubes



(A) Screw-on couplers 48 mm 50
(B) scaffolding tube 48.3 mm
(C) Toeboard

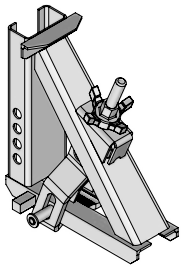
h = min. 200 mm

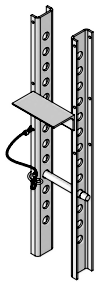
Permitted centre-to-centre distances



Guard-rail boards		max. distance 'a' for heights above ground of	
width (b)	height (h)	up to 40 m (up to 0.84 kPa)	40 to 100 m (up to 1.10 kPa)
30 mm	150 mm	2.00 m	1.60 m
30-50 mm	200 mm	2.50 m	2.00 m
Scaffolding tube 48.3mm		3.00 m	3.00 m

BEAM FORMING SUPPORT



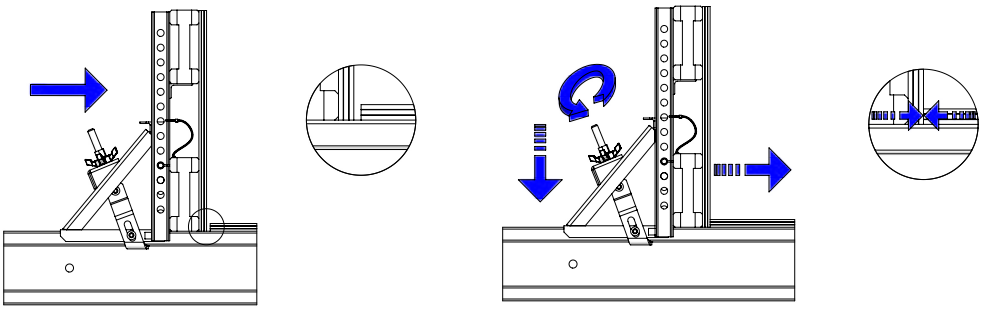


The beam forming support is a part of slab system for forming drop beams and slab stop-ends. In conjunction with the extension for beam forming support, exact height adjustment to within 1 cm is possible.

This does away with time-consuming jobsite squared-timber constructions. The beam forming support automatically clamps the formwork tight, result –cleanconcrete surfaces and grout-tight edges.

Work with the beam forming support

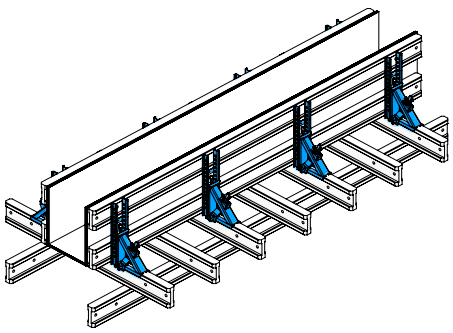
• Place the beam-forming support onto the secondary beam and push it up against the sidewall formwork.
• Clamp the beam forming support firmly into position.



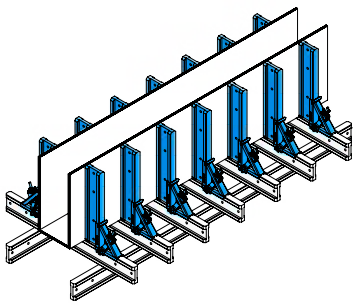
The diagonal bracing of the beam forming support ensures that the joint between the plywod sheets is automatically pressed together tightly when the beam forming support is clamped.

Formwork beams

- Horizontal up to a height of 60 cm

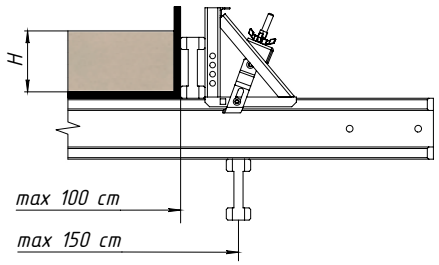


- Vertical up to a height of 90cm



DROP BEAM NOT INTEGRATED INTO THE FLOOR-SLAB. STOP-END FORMWORK

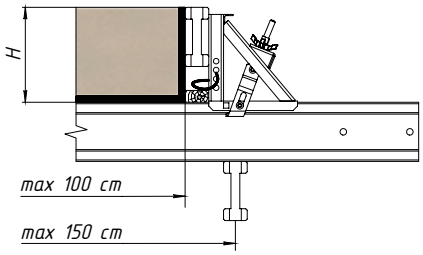
All the data below apply where use plywood 21 mm



Drop beams 10-30 cm height

• Sidewall formwork: wooden beam

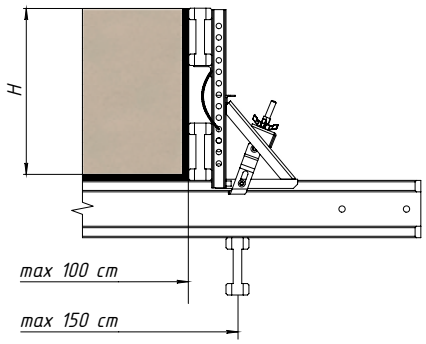
Spacing of secondary beams	Beam forming support
50.0 cm	on every 3rd secondary beam



Drop beams 30-47 cm height

• Sidewall formwork: wooden beam & squared timber 4x8 cm for drop beams 30-34cm height / squared timber 8x8cm for drop beams 34-47 cm height.

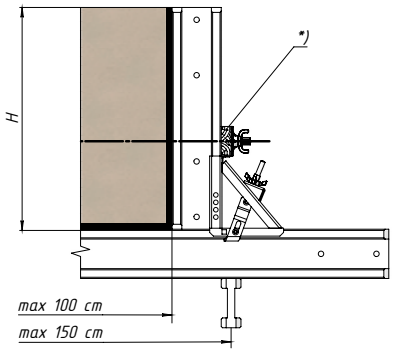
Spacing of secondary beams	Beam forming support
50.0 cm	on every 2nd secondary beam



Drop beams 47-70 cm height

• Sidewall formwork: two wooden beams

Drop beam height H	Spacing of secondary beams	Beam forming support
up to 60 cm	50.0 cm	on every 2nd secondary beam
up to 70 cm	33.3 cm	



Drop beams 70-90 cm height

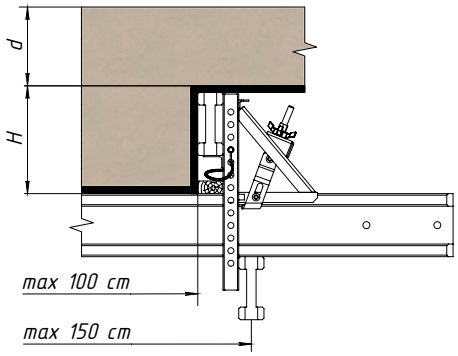
• Sidewall formwork: wooden beam upright

* - where the dimensional requirements are especially stringent, we recommend placing tie-rod through the sidewall formwork as an additional precaution.

Drop beam height H	Spacing of secondary beams	Beam forming support
up to 85 cm	41.7 cm	on every secondary beam
from 85 cm	36.0 cm	

DROP BEAM INTEGRATED INTO THE FLOOR-SLAB SECONDARY BEAMS PARALLEL TO DROP BEAM

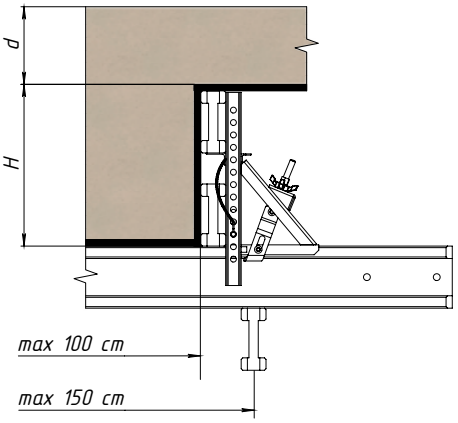
All the data below apply where use plywood 21 mm



Drop beams 30-47 cm height

• Sidewall formwork: wooden beam & squared timber 4x8 cm for drop beams 30-34 cm height/ squared timber 8x8 cm for drop beams 34-47 cm height

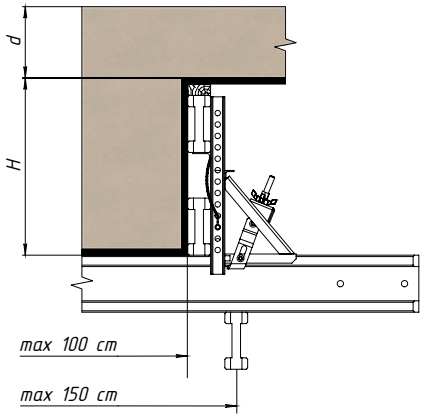
Slabthickness «d»	Spacing of secondary beams	Beam forming support
20 cm	41.7 cm	on every 2nd secondary beam
30 cm	33.3 cm	



Drop beams 47-60 cm height

• Sidewall formwork: two wooden beams

Slabthickness «d»	Spacing of secondary beams	Beam forming support
20 cm	31.2 cm	on every 2nd secondary beam
30 cm	25.0 cm	



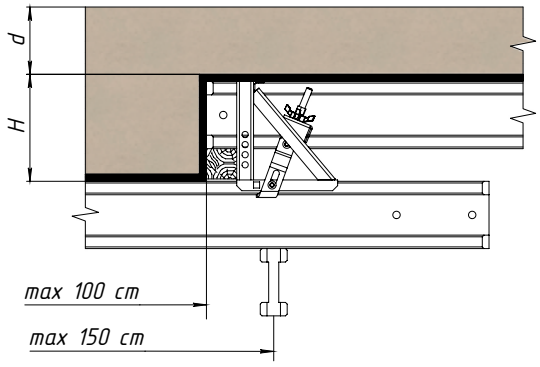
Drop beams 60-70 cm height

• Sidewall formwork: two wooden beams
• Height of squared timber = H-60 cm

Slabthickness «d»	Spacing of secondary beams	Beam forming support
20 cm	40.0 cm	on every secondary beam

DROP BEAM INTEGRATED INTO THE FLOOR-SLAB SECONDARY BEAMS PERPENDICULAR TO DROP BEAM

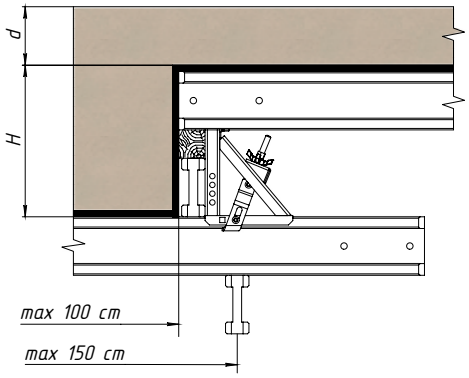
All the data below apply where use plywood 21mm
Slab influence zone on either side of the drop-beam max. 1.0 m



Drop beams 30-40 cm height

- Sidewall formwork: wooden beam
- Height of squared timber = H-20 cm

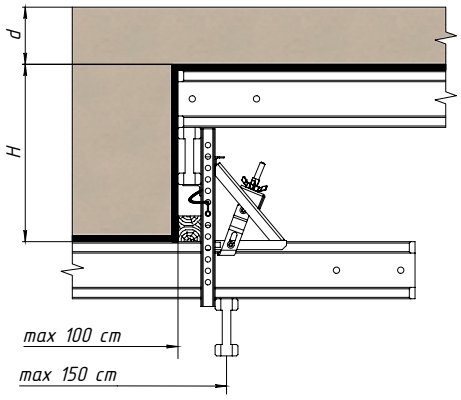
Slabthickness «d»	Spacing of secondary beams	Beam forming support
20 cm	50.0 cm	on every 2nd secondary beam
30 cm	41.7 cm	



Drop beams 40-51 cm height

- Sidewall formwork: wooden beam
- Height of squared timber = H-40 cm

Slabthickness «d»	Spacing of secondary beams	Beam forming support
20 cm	41.7 cm	on every 2nd secondary beam
30 cm	31.2 cm	



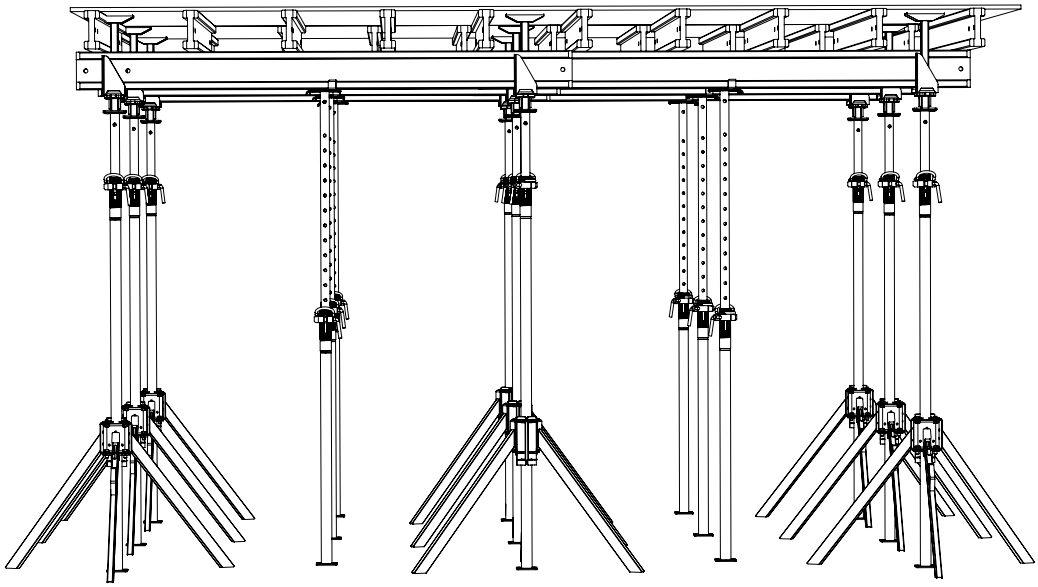
Drop beams 51-70 cm height

- Sidewall formwork: wooden beam & squared timber 5x8 cm for drop beams 51-60 cm height /squared timber 10x8 cm for drop beams 60-70 cm height

Slabthickness «d»	Spacing of secondary beams	Beam forming support
20 cm	40.0 cm	on every secondary beam

VARIFLEX WITH LOWERING HEAD ES

It is the manhandled system with integrated "stripping logic" for early stripping some components



Variflex with lowering head ES makes for a swift, easy workflow:
• pre-defined formwork-stripping operation;
• optimized site logistics - use only one single length of beam 2.65 m;
• reduced commissioning quantities - approx. 75% of the component parts can be struck at an early stage;
• less wear-and-tear on the equipment used;
• combines the advantages of flexibility and a defined increment-grid - easy accommodation to walls and columns;
• for shoring heights of up to 5.50 m;
• any type of form-facing can be used.

For detailed information, see user manual «Variflex with lowering head ES».

RESHORING PROPS, CONCRETE TECHNOLOGY AND STRIPPING OUT

The best time to strip out the formwork

The concrete strength needed before the formwork can be stripped out will depend upon the load factor α. This can be read off from the following table.

Load factor α
This is calculated by: $\alpha = \frac{DL_{\text{concrete}} + LL_{\text{construction state}}}{DL_{\text{concrete}} + DL_{\text{finishing}} + LL_{\text{final state}}}$

Slab thickness, m	Dead load DL_{concrete}, kN/m²	Load factor α $LL_{\text{final state}}$			
		2.00 kN/m²	3.00 kN/m²	4.00 kN/m²	5.00 kN/m²
0.14	3.50	0.67	0.59	0.53	0.48
0.16	4.00	0.69	0.61	0.55	0.50
0.18	4.50	0.71	0.63	0.57	0.52
0.20	5.00	0.72	0.65	0.59	0.54
0.22	5.50	0.74	0.67	0.61	0.56
0.25	6.25	0.76	0.69	0.63	0.58
0.30	7.50	0.78	0.72	0.67	0.62
0.35	8.75	0.80	0.75	0.69	0.65

Valid for a finishing-load $DL_{\text{finishing}} = 2.00 kN/m^2$ and a live load in the early-stripped state of $LL_{\text{construction state}} = 1.50 kN/m^2$
DL_{concrete}: calculated with γ concrete = 25 kN/m³
$DL_{\text{finishing}}$: load for floor finish, etc.

Example:
Slab thickness 0.30 m with a final live load of 5.00 kN/m² results in a load factor α of 0.62.
This means that formwork removal / stress-release can take place once the concrete has reached 62% of its 28-day strength. The load-bearing capacity will then correspond to that of the finished structure.

If the floor props are not stress-relieved, meaning that the slab has not been activated, then the props will remain loaded with the dead weight of the floor-slab.

When the floor above is concreted, this may lead to a doubling of the load that is being applied to the floor props.

The floor props are not designed to cope with such an overload, and the result may be damage to the formwork, the floor props and the structure.

Put up reshoring props after stripping out the formwork

After the formwork has been stripped and the slab has been stress-relieved or dismantled, the slab is able to bear its dead load and live loads resulting from the construction state, but not the concreting loads from subsequent floor-slabs.
The temporary reshoring serves to support the floor-slab and distribute the concreting loads across several floors.

Positioning the reshoring props correctly

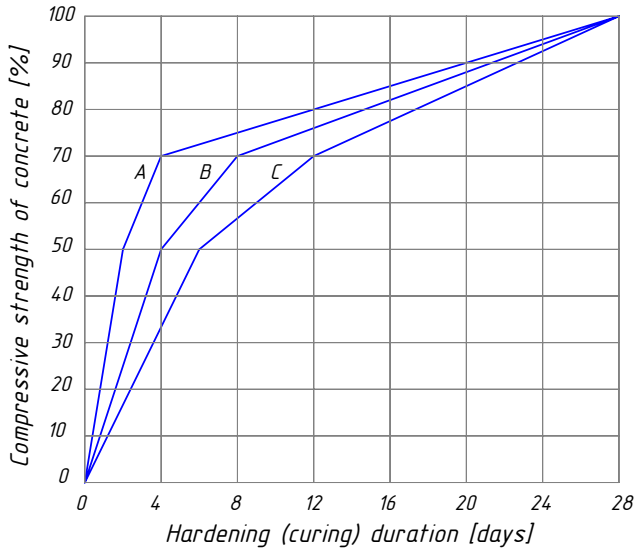
Reshoring props have the job of spreading loads between the new floor-slab and the floor beneath it. This load distribution will depend on the relationship between the rigidities of these two floor-slabs.

As a rule, the question of using reshoring props should be referred to the responsible experts, regardless of the information given above. Observe all local Standards and regulations.

Strength development in the new concrete

Rough reference values can be found in DIN 1045-3:2008, Table 2. The length of time until 50 percent of the final (28-day) strength is reached can be read off from this Table as a function of the temperature and the type of concrete.
The values are only valid if the concrete is given correct, appropriate curing throughout the entire period. For a concrete with medium strength development, the following inferred diagram may thus be used.

Concrete-strength development – medium



(A) υ ≥ 15°
(B) υ ≥ 10°
(C) υ ≥ 5°

Deflection of the new concrete

The modulus of elasticity of the concrete has already reached more than 90 % of the 28-day value after only 3 days, regardless of the formulation of the concrete. The increase in the elastic deformation taking place in the new concrete is thus only negligible.
The creep deformation, which only finally ceases after several years, is several times more than the elastic deformation.
Early stripping – e.g. after 3 days instead of 28 – thus only leads to an increase in the total deformation of less than 5 %.
The part of this deformation accounted for by creep deformation, however, may be anything between 50% and 100% of the standard value, due to such variable influences as the strength of the aggregates, and the atmospheric humidity. This means that the total deflection of the floor-slab is practically independent of the time at which the formwork was stripped out.

Cracks in new concrete

The bonding strength between the reinforcement steel and the concrete develops more rapidly in the new concrete than does its compressive strength. This means that early stripping does not have any negative influence upon the size and distribution of cracks on the tension side of reinforced concrete constructions.
Other cracking phenomena can be countered effectively by appropriate curing methods.

Curing of new concrete

New site-placed concrete is exposed to influences which may cause cracking and slow down its strength development:
• premature drying;
• over-rapid cooling in the first few days;
• excessively low temperatures or frost;
• mechanical damage to the surface of the concrete;
• hydration heat;
• etc.
The simplest precaution is to leave the formwork on the concrete surface for longer. As well as the familiar extra curing measures, this measure should be carried out in any case.

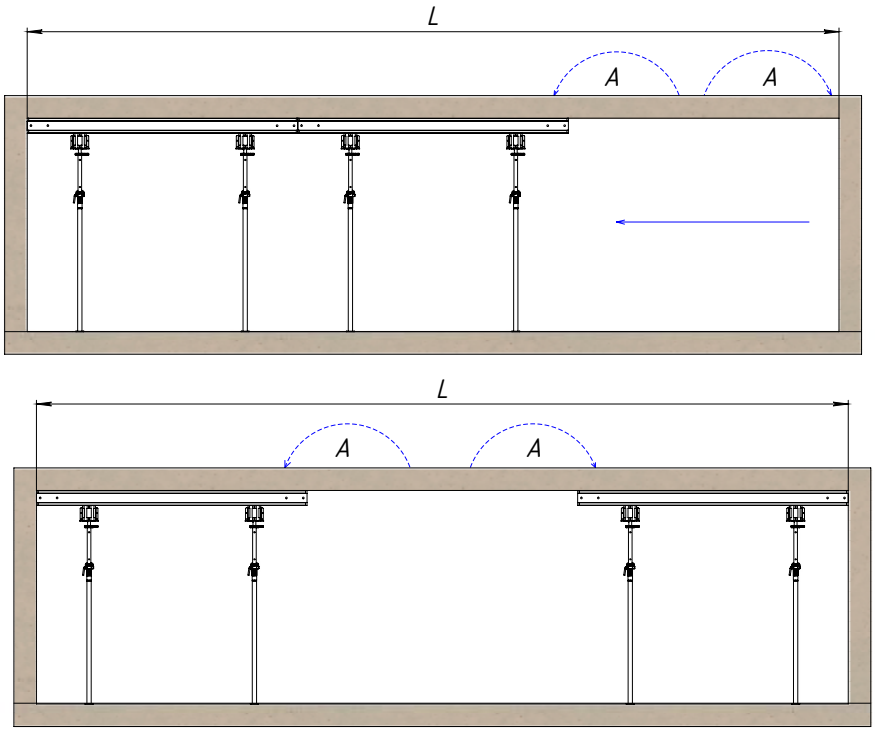
Removing the load from the formwork from wide-spanned floor-slabs with support centers of over 7.5 m

In the case of thin, wide-spanned concrete floor-slabs (e.g. in multistorey car parks), the following points must be remembered:

- When the load is taken off the floor props, the floor props that are still in place are briefly subjected to additional loads. This may lead to overloading, and to the floor props being damaged.

The basic rule is:

- Stress-release should always be carried out working from one side towards the other, or from the middle of the floor slab (mid-span) towards the slab-edges.For wide spans, this procedure must be followed;
- Stress-relieve must never be carried out from both sides towards the midd.



L ... Effective floor-slab spans of 7.50 m and over

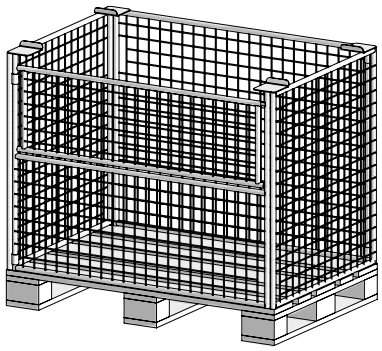
(A) Load redistribution

TRANSPORTING, STACKING AND STORING

Multi-trip packaging such as containers, stacking pallets and skeleton transport boxes keep everything in place on the site, minimize time wasted searching for parts, and streamline the storage and transport of system components, small items and accessories.

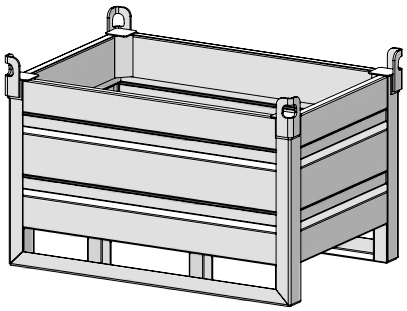
Folding wire mesh container

(based on Euro-pallet 1200 x 800 mm)



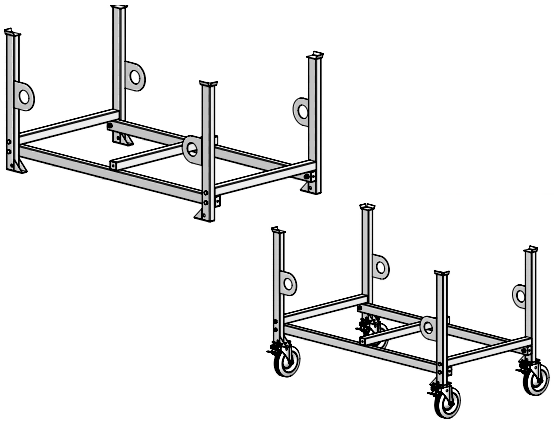
Dimensions 800×1200×h	Weight	Max. load	Wire mesh
800 mm	29.6 kg	250 kg	50x50 mm
1000 mm	35.6 kg		
1200 mm	41.6 kg		

Transportation box



Dimensions 1200x800x800	Weight	Max. load
	120	1000 kg

Stacking pallet



Dimensions	Weight	Max. load
1550x850x750 mm	41.5 kg	900 kg
1700x950x1000 mm	50 kg	

Stacking pallet may be provided on quick-mount wheels with brakes.

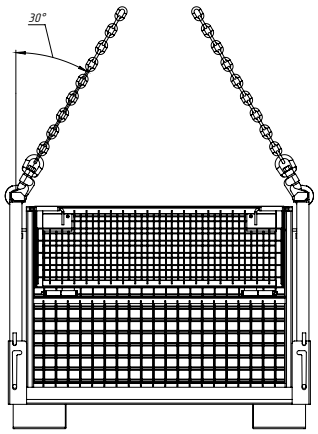
Storage and transport devices for small items
- durable
- stackable

Suitable transport appliances
- crane
- pallet stacking truck
- forklift truck

In warehouses it's possible to put up to 4 containers on top of each other.

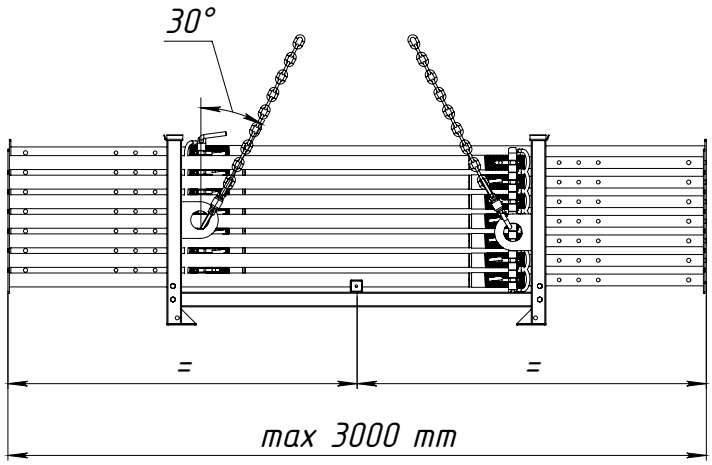
Multi-trip packaging items that each contain very different loads must be stacked with the heaviest ones at the bottom and the lightest ones at the top.

Lifting by crane



- Multi-trip packaging items may only be lifted one at a time.
- Use a suitable lifting chain. Spread-angle max. 30°

Additional for Stacking pallet:
- Load the items centrically
- Fasten the load to the stacking pallet so that it cannot slide or tip out.

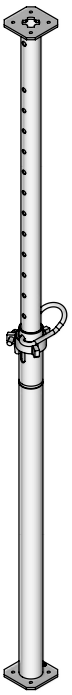


Only lift the boxes when their sidewalls are closed.
Do not exceed the permitted load-bearing capacity.

PERMITTED PROP LOADS

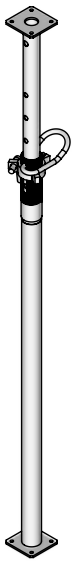
For permissible loads of Supporting props withLowering head ES, see the applicable user information documents.
The Supporting props can be lengthened with the Prop extension 0.50 m (allowed for the reduced load-bearing capacity).

Permitted RBGU prop loads



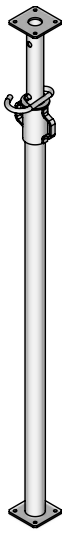
Prop height, m	1.50 m	2.50 m	3.00 m	3.50 m	4.00 m	4.50 m	5.00 m	5.50 m
	Range of moving-out, m							
	0.96-1.50	1.52-2.54	1.97-3.04	2.22-3.54	2.47-4.04	2.72-4.54	2.97-5.04	3.22-5.54
5.5								20kN
5.4								
5.3								
5.2								
5.1								
5.0							20kN	
4.9								
4.8								
4.7								
4.6								
4.5						25kN	25kN	25kN
4.4								
4.3								
4.2								
4.1								
4.0					25kN			
3.9								
3.8								
3.7								
3.6								
3.5				25kN				
3.4								
3.3								
3.2								
3.1								
3.0			25kN					
2.9								
2.8								
2.7								
2.6								
2.5		25kN						
2.4								
2.3								
2.2								
2.1								
2.0								
1.9								
1.8								
1.7								
1.6								
1.5	25kN							
0.9								

Permitted RBGN prop loads



Prop height, m	2.50 m	3.00 m	3.50 m	4.00 m	4.50 m	5.00 m
	Range of moving-out, m					
	1.52-2.54	1.97-3.04	2.22-3.54	2.47-4.04	2.72-4.54	2.97-5.04
5.0						11kN
4.9						11.45kN
4.8						11.94kN
4.7						12.45kN
4.6						13kN
4.5					13.40kN	13.58kN
4.4					14.03kN	14.21kN
4.3					14.69kN	14.87kN
4.2					15.40kN	15.59kN
4.1					16.18kN	16.36kN
4.0				16kN	17.00kN	17.19kN
3.9				16.83kN	17.90kN	18.08kN
3.8				17.73kN	18.86kN	19.04kN
3.7				18.70kN	20kN	20kN
3.6				19.75kN		
3.5			20kN	20kN		
3.4						
3.3						
3.2						
3.1						
3.0		20kN				
2.9						
2.8						
2.7						
2.6						
2.5	20kN					
2.4						
2.3						
2.2						
2.1						
2.0						
1.9						
1.8						
1.7						
1.6						
1.5						

Permitted RBG prop loads



Prop height, m	2.50 m	3.00 m	3.50 m	4.00 m	4.50 m	5.00 m
	Range of moving-out, m					
	1.52-2.54	1.97-3.04	2.22-3.54	2.47-4.04	2.72-4.54	2.97-5.04
5.0						9.58kN
4.9						9.97kN
4.8						10.39kN
4.7						10.84kN
4.6						11.32kN
4.5					11.20kN	11.82kN
4.4					11.50kN	12.37kN
4.3					12.27kN	12.95kN
4.2					12.86kN	13.58kN
4.1					13.49kN	14.25kN
4.0				13.20kN	14.17kN	14.97kN
3.9				13.88kN	14.91kN	15.67kN
3.8				14.63kN	15.70kN	16.59kN
3.7				15.43kN	16.57kN	17.50kN
3.6				16.30kN	17.50kN	18.49kN
3.5			14.50kN	17.25kN	18.52kN	19.56kN
3.4			15.37kN	18.94kN	19.62kN	20kN
3.3			16.31kN	19.40kN	20kN	
3.2			17.35kN	20kN		
3.1			18.48kN			
3.0		20kN	20kN			
2.9						
2.8						
2.7						
2.6						
2.5	20kN					
2.4						
2.3						
2.2						
2.1						
2.0						
1.9						
1.8						
1.7						
1.6						
1.5						

Permitted RBGE prop loads

Prop height, m	2.50 m	3.00 m	3.50 m	4.00 m	4.50 m
	Range of moving-out, m				
	1.52-2.54	1.97-3.04	2.22-3.54	2.47-4.04	2.72-4.54
4.5					9.67kN
4.4					10.11kN
4.3					10.59kN
4.2					11.09kN
4.1					11.64kN
4.0				10.90kN	12.23kN
3.9				11.47kN	12.87kN
3.8				12.08kN	13.56kN
3.7				12.74kN	14.30kN
3.6				13.46kN	14.95kN
3.5			12kN	14.24kN	15kN
3.4			12.72kN	14.87kN	
3.3			13.50kN	15kN	
3.2			14.36kN		
3.1			15kN		
3.0		13kN			
2.9		13.91kN			
2.8		14.75kN			
2.7		15kN			
2.6					
2.5	14kN				
2.4	14.95kN				
2.3	15kN				
2.2					
2.1					
2.0					
1.9					
1.8					
1.7					
1.6					
1.5					

Permitted RBR57 & RBR48 prop loads

Prop height, m	RBR57		RBR48	
	3.00 m	3.50 m	3.00 m	3.50 m
	Range of moving-out, m			
	1.71-3.05	1.96-3.55	1.86-3.06	2.12-3.56
3.5		10kN		8kN
3.4				
3.3				
3.2				
3.1				
3.0	10kN		8kN	
2.9				
2.8				
2.7				
2.6				
2.5				
2.4				
2.3				
2.2				
2.1				
2.0				
1.9				
1.8				
1.7				

FACING

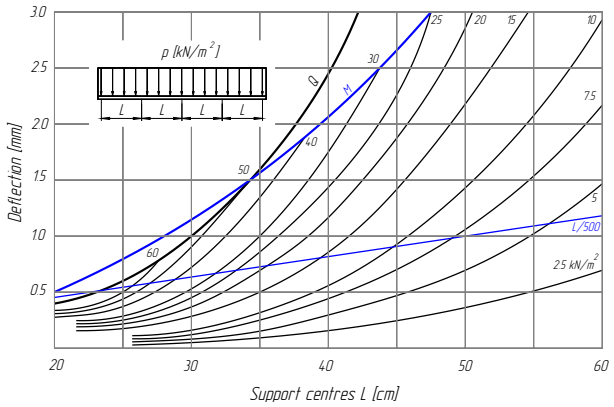
Deflection diagrams

If the moisture content is higher than shown in the diagrams below, the modulus of elasticity diminishes significantly (i.e. deformation increases), and this is accompanied by a reduction in strength. This, in consequence, means a reduction in the ability to bear loads.

Plywood

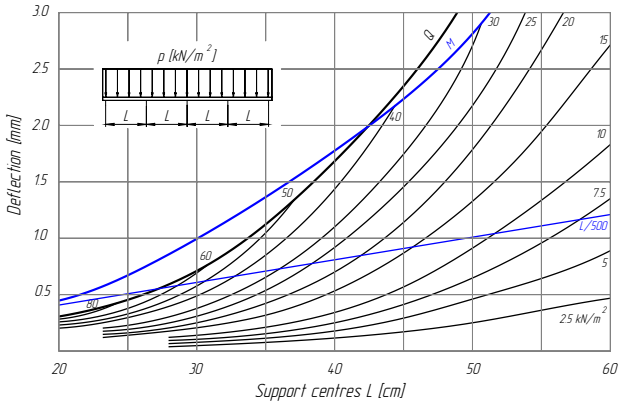
The fibre direction of the face ply relative to the supports is of no significance.

18 mm



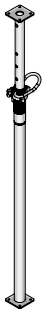
Flexural stiffness EI=3.1 kNm²/m (15% timber moisture content)
M ... permitted bending moment
Q ... permitted shear force

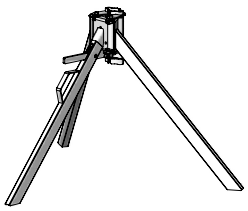
21 mm

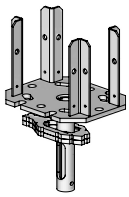
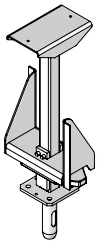


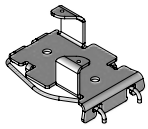
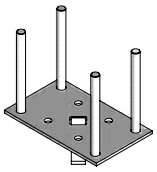
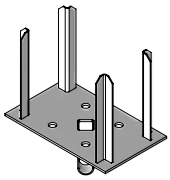
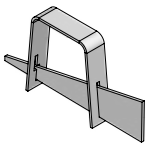
Flexural stiffness EI=4.7 kNm²/m (15% timber moisture content)
M ... permitted bending moment
Q ... permitted shear force

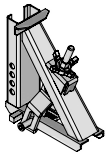
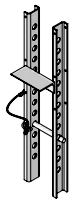
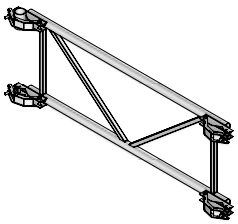
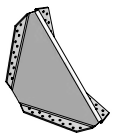
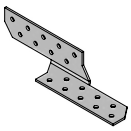
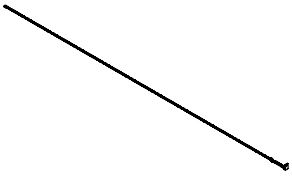
COMPONENT OVERVIEW

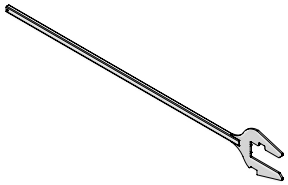
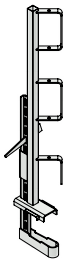
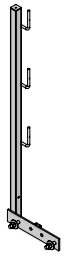
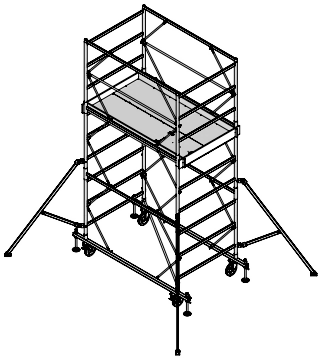
Item		[kg]	Article nº
Heavy duty prop RBGU 	1.50 m 2.50 m 3.00 m 3.50 m 4.00 m 4.50 m 5.00 m 5.50 m	13,45 17,29 20,49 22,66 24,84 27,02 29,20 31,36	51 115 000 51 125 000 51 130 000 51 135 000 51 140 000 51 145 000 51 150 000 51 155 000
Medium duty prop RBGN 	2.50 m 3.00 m 3.50 m 4.00 m 4.50 m 5.00 m	11,15 12,58 14,16 16,02 17,45 18,88	51 225 000 51 230 000 51 235 000 51 240 000 51 245 000 51 250 000
Medium duty prop RBG 	2.50 m 3.00 m 3.50 m 4.00 m 4.50 m 5.00 m	10,87 12,30 13,55 14,94 16,38 17,80	51 425 000 51 430 000 51 435 000 51 440 000 51 445 000 51 450 000

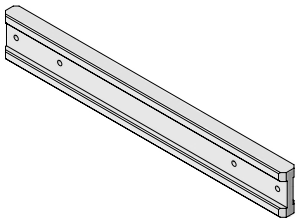
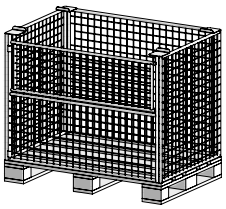
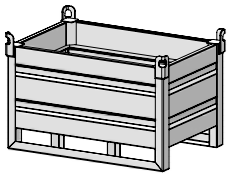
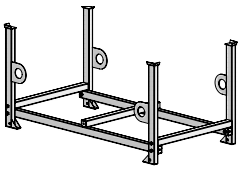
Item		[kg]	Article nº
Light duty prop RBGE	2.50 m	9,67	51 325 000
	3.00 m	10,97	51 330 000
	3.50 m	12,15	51 335 000
	4.00 m	13,45	51 340 000
	4.50 m	14,70	51 345 000
			
Extra light duty prop RBR 57	3.00 m	8,51	51 730 000
	3.50 m	9,56	51 735 000
Extra light duty prop RBR 48	3.00 m	7,44	51 630 000
	3.50 m	8,24	51 635 000
			
Tripod W		15,75	52 100 100
			

Item	[kg]	Article nº
Tripod L 	7,80	52 102 100
Tripod L light 	6,42	52 104 100
Lowering head 	6,33	52 200 100
Lowering head ES  ES - early stripping	10,19	52 202 100

Item	[kg]	Article nº
Support head 	2,87	52 204 100
Crown head 	1,51	52 206 100
Crown head light 	0,78	52 208 100
Spring locked connection pin 16 mm 	0,23	52 310 100
Bracing clamp 	1,45	52 300 100

Item		[kg]	Article nº
Beam forming support 		7,77	52 302 000
Extension for beam forming support 		3,83	52 304 100
Bracing frame 	1,50 m 1,80 m	17,04 18,80	52 314 000 52 316 000
End - shutter support for slab 		1,73	52 312 000
Rafter plate 	right left	0,09 0,09	52 306 100 52 308 100
Wind bracing 	7,00 m	17,47	73 114 100

Item	[kg]	Article nº
Beam fork Variflex 	1,47	52 500 600
Guide rail clamp 	12,40	52 400 100
Handrail post 	12,58	52 402 100
Mobile scaffolding  working height upon request		98 100 000

Item		[kg]	Article nº
H20 Beam 	1,45 m	7,25	91 145 500
	1,80 m	9,00	91 180 500
	1,95 m	9,75	91 195 500
	2,15 m	10,75	91 215 500
	2,45 m	12,25	91 245 500
	2,65 m	13,25	91 265 500
	2,90 m	14,50	91 290 500
	3,30 m	16,50	91 330 500
	3,60 m	18,00	91 360 500
	3,90 m	19,50	91 390 500
	4,50 m	22,50	91 450 500
	4,90 m	24,50	91 490 500
	5,90 m	29,50	91 590 500
Folding wire mesh container 	800 mm	29,60	
	1000 mm	35,60	
	1200 mm	41,60	
Transportation box 	1200x800x800 mm	120,00	
Stacking pallet 	1550x850x750 mm	41,50	
	1700x950x1000 mm	50,00	
Stacking pallets wheel 		3,48	

VARIANT

Ukraine, 61070, Kharkiv,
st. Shevchenko, 325

Tel. +38 (057) 756-37-77
E-mail: international@variant-factory.eu

www.variant-factory.eu