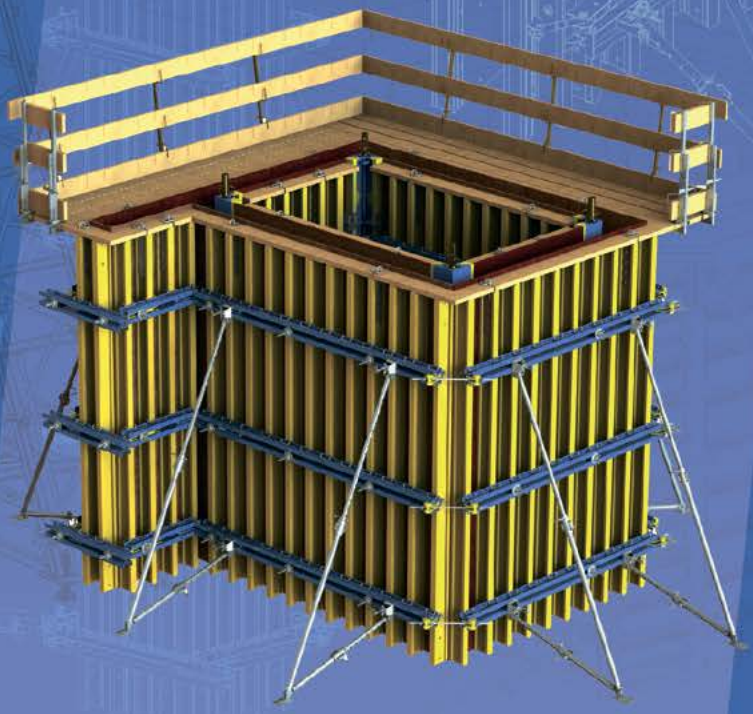
VERTEX 60

Large-area formwork



VARIANT

USER MANUAL

ISO 9001
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Certification
N° 00000

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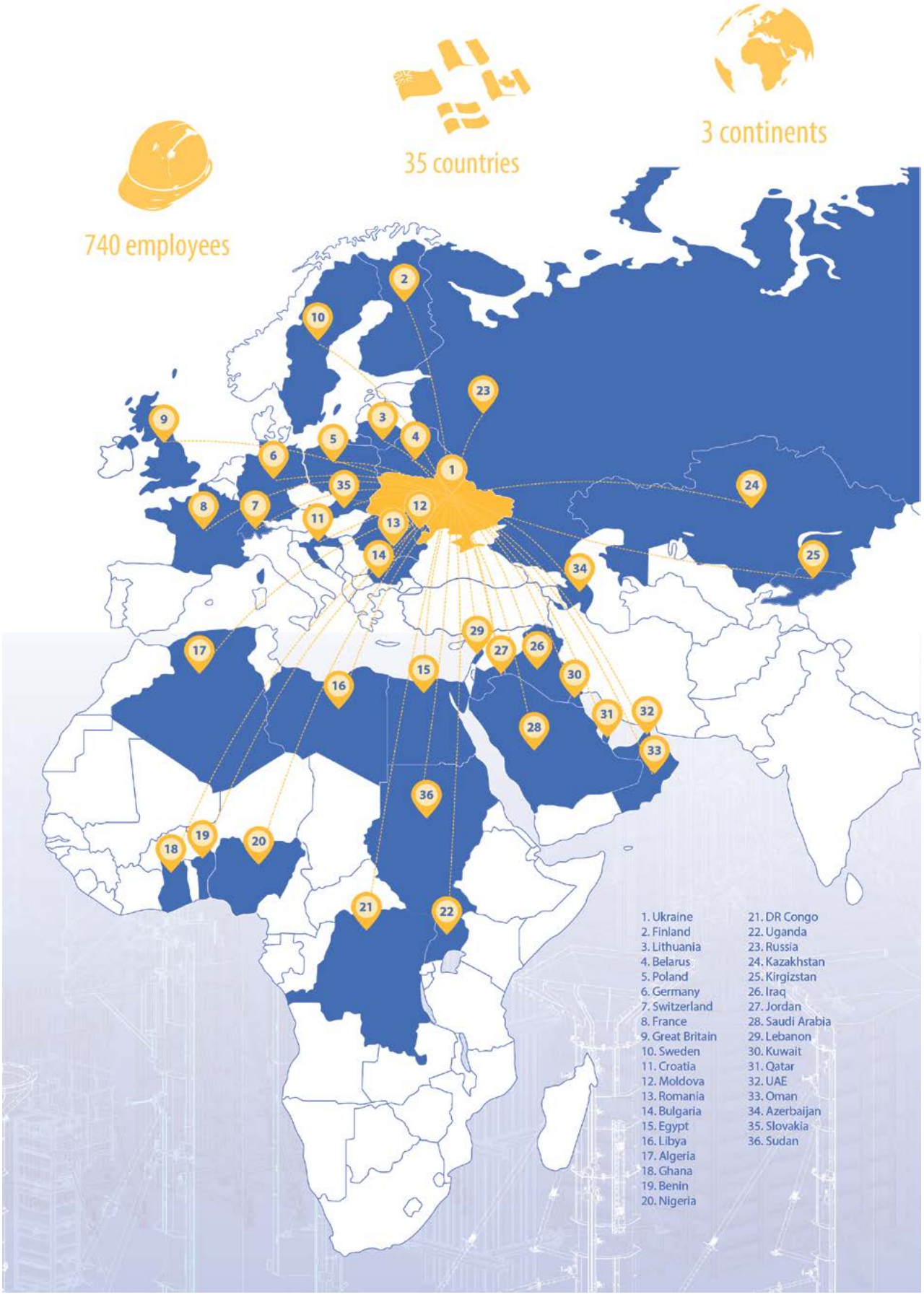

740 employees
35 countries
3 continents
1. Ukraine
2. Finland
3. Lithuania
4. Belarus
5. Poland
6. Germany
7. Switzerland
8. France
9. Great Britain
10. Sweden
11. Croatia
12. Moldova
13. Romania
14. Bulgaria
15. Egypt
16. Libya
17. Algeria
18. Ghana
19. Benin
20. Nigeria
21. DR Congo
22. Uganda
23. Russia
24. Kazakhstan
25. Kirgizstan
26. Iraq
27. Jordan
28. Saudi Arabia
29. Lebanon
30. Kuwait
31. Qatar
32. UAE
33. Oman
34. Azerbaijan
35. Slovakia
36. Sudan

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, con-nector 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

Easily adaptable system, which solves all requirements for architectural concrete design. Vertex 60 means applications in different type of projects and construction sites. Starting from simple straight walls, complicated column cross-section through residential and high-rise construction up to bridges construction. Also it can be used as formwork shutters for single sided or climbing systems. The standard components of the system such as steel walings, H20 beams and flange clamps can be assembled in formwork and customized for a particular project.

Adaptable load-bearing capacity:

• Due to its adaptability Vertex 60 can be assembled and customized to withstand almost any pressure of fresh concrete (recommended range is form 30 up to 70 kN/m^2)
• The most cost-efficient in terms of formwork price and pace of forming is 40 kN/m^2 of permitted pressure of fresh concrete.

Cost-effective

• Large-areas of concrete surface can be easily cast.
• High number of use cycles means lower follow-up expenses.
• Reduction of expenses by means of system adaptability.
• High quality of concrete surface minimizes finishing work.
• Project-specific adaptation possible, as it can be faced with any type of form-ply.

Safe use

• Accessories such as — bracing platforms, lifting brackets, bracing struts etc. make for save and easier handling of the system.

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.
• Load-bearing capacity of the system can be adjusted by means of H20 girders and steel walings.
• Any requirements for architectural concrete design can be met, due to the system adaptability.

Safe use

• Accessories such as — lifting hooks, wall brackets, supporting struts etc. make for save and easier handling of the system.

Areas of use of the Vertex 60 system:

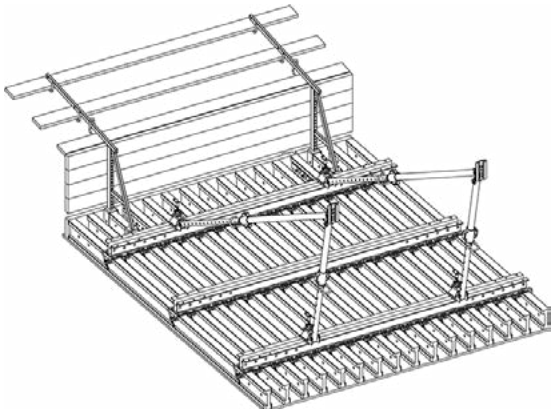
• Large area wall formwork;
• Column formwork;
• For single sided system;
• Bridges construction;
• For climbing system.

INSTRUCTIONS FOR ASSEMBLY AND USE

The sequence shown here is based on a straight wall. However, you should always start forming from the corner outwards.

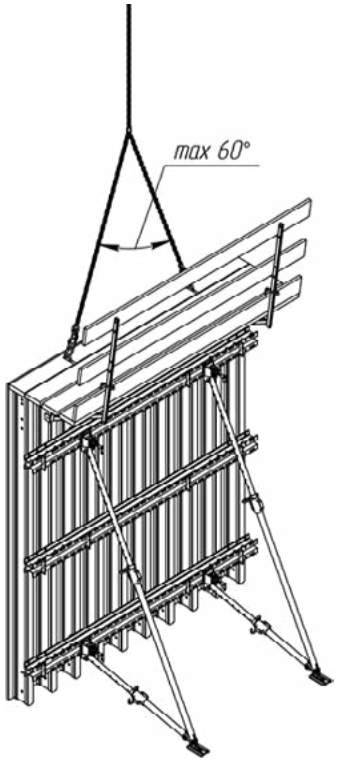
Preparations

- The elements are pre-assembled face-down on an assembly bench. For detailed instructions on assembling the elements, see «Panel assembling».
- Mount the wall bracket H20. Join timber planks to make working platform.
- Attach the support braces.



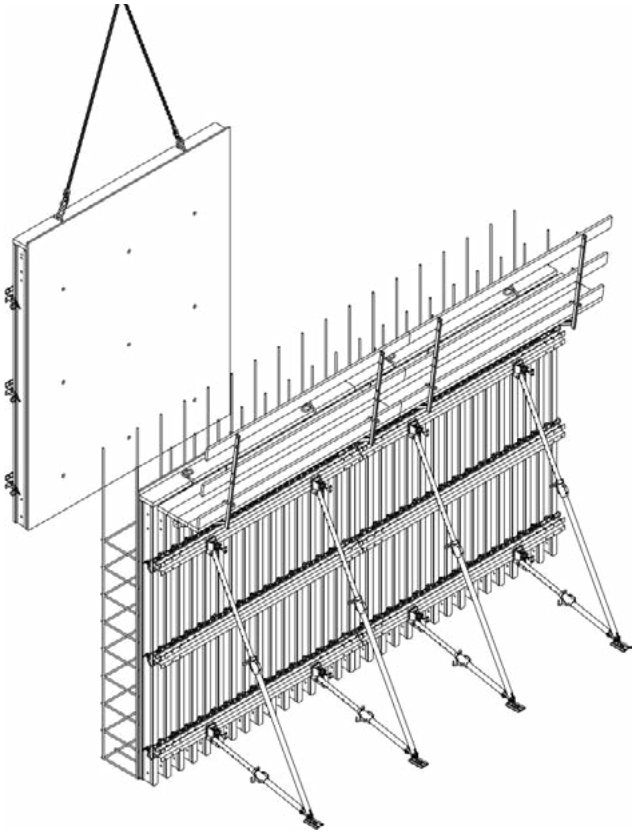
Erecting the formwork

- Attach the crane suspension tackle to the lifting brackets (1300 kg permitted vertical force per bracket),
- Pick up the element by crane.
- Spray the plywood with oil.
- Shift the element to its new location.
- Fix the support braces firmly to the ground.
- The element is now stable and can be plumbed and aligned exactly, with no need of the crane.
- Detach the element from the crane.
- Continue lining up elements in this way, and link them together.



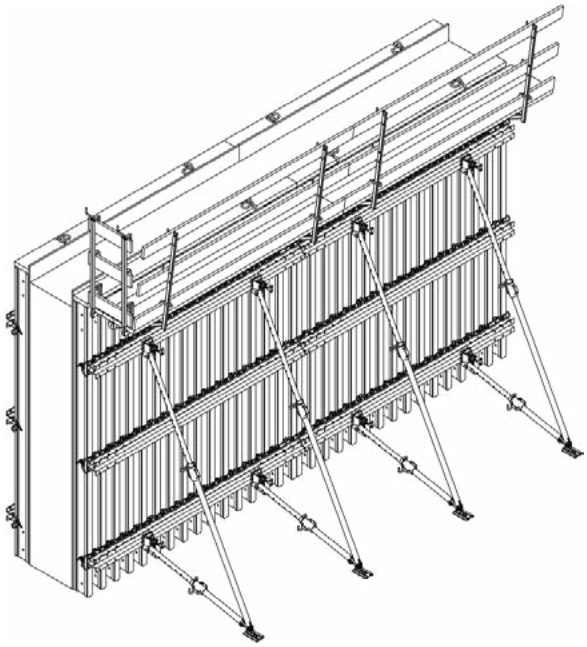
Once the reinforcement has been placed, the opposite formwork can be closed.

- Pick up the element by crane.
- Spray the plywood with oil.
- Lift the opposite formwork by crane to its next location.
- Working from the ground, insert the bottom rows of tie-rods. If there are no supporting struts on the opposite formwork, do not disconnect the element from the crane until a large enough number of tie-rods have been installed to keep it safely in upright position .
- Detach the element from the crane.
- Insert the remaining tie-rods. These tie-rod locations can be reached from the platforms or mobile scaffolding.
- Continue lining up elements in this way, and link them together.



Pouring

- Do not exceed the maximum permissible rate of placing. Max. pressure of the fresh concrete depends on structural design of elements.
- Pour the concrete.
- Make only moderate use of vibrators, carefully coordinating the times and locations of vibrator use.
- To increase long-life of elements, immediately after pouring, clean the rear face of the formwork with water.

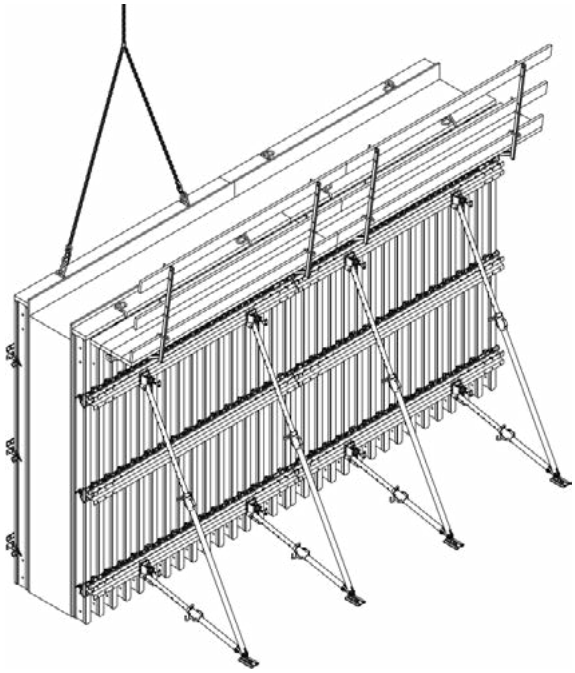


Striking

- Observe the stipulated striking times.
- Remove any loose items from the formwork and platforms, or secure them firmly.

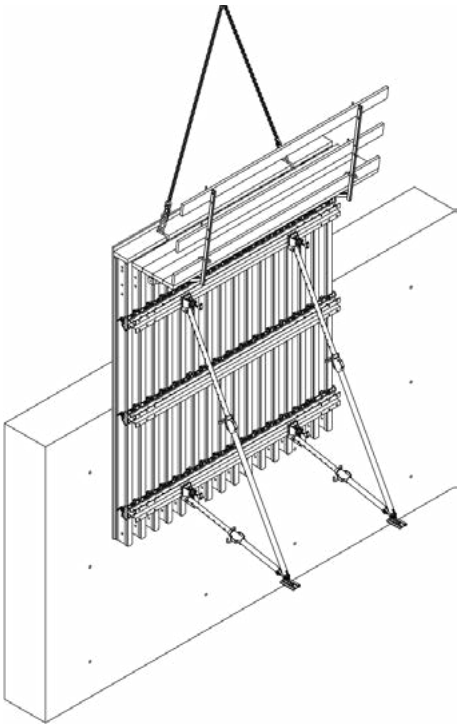
Begin striking of the formwork on the opposite formwork.

- Undo the connectors to the adjacent elements.
- Take out the tie-rods from the top rows of ties. These tie-rods locations can be reached from the platforms or mobile scaffolding. There must be necessary number of tie-rods left in place as they are needed to keep the element safely in the upright.
- Attach the element (incl. platforms) to the crane.
- Working from the ground, take out the bottom rows of tie-rods.



When stripping the formwork, never use the crane to break concrete cohesion. Use suitable tools such as timber wedges or a pinch bar.

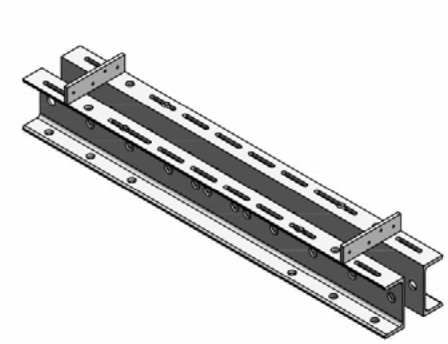
- Lift the element away and to its next location, or place it face-down for intermediate storage.
- Clean off the plywood face from concrete.
- Where the element has support braces attached to it, first attach this element to the crane, and only then detach the floor anchorages of the support braces.



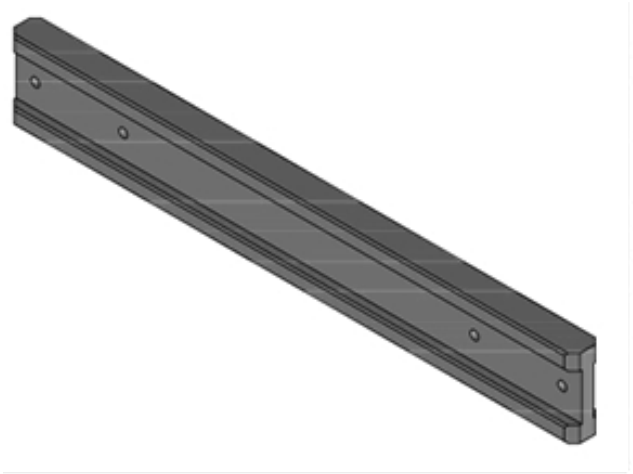
SYSTEM IN DETAIL

The large-area formwork Vertex 60 is a system which can be easily adjusted to a specific application, consisting of only three main elements Vertex 60 is an easy-to-use system.

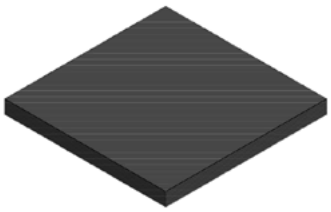
- Steel walings



- H20 beams



- Plywood



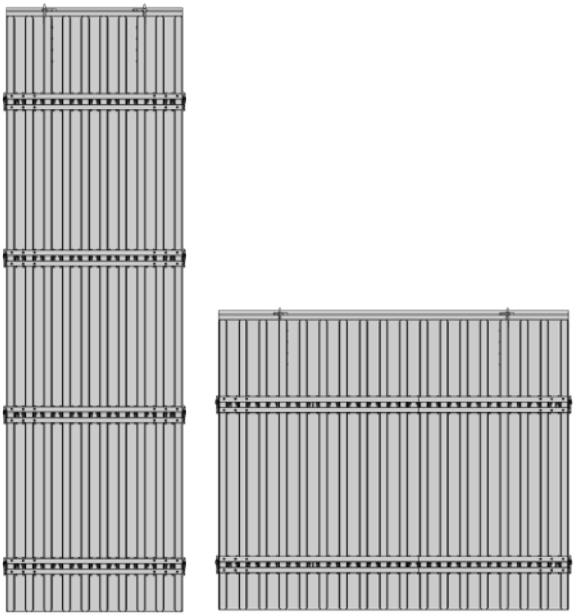
These main elements as well as connecting and supporting elements make practically and economically useful formwork system.

Great flexibility

• In terms of shape and size - optimised for each structure
• In terms of concrete pressures: depending on the pressure, the H20 beams and the steel walings will be spaced closer together or further apart
• In terms of surface finish: The right formwork sheet is available for any assignment

Sizes

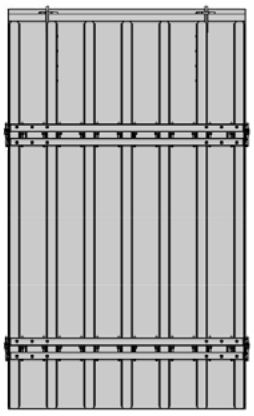
The size of a panel which is going to be assembled depends on:
• Length of steel walings used-determines possible width of the Vertex 60 panel.
Variant provides wide range of waling starting from 0.5 m up to 6.0 m in a 250 mm grid.
• Length of H20 beams-determines possible height of the Vertex 60 panel.
Variant provides wide range of H20 beams starting from 1.25 m up to 5.9 m.
Consequently the smallest panel possible is 0.5 m in width and 1.25 m in height, the biggest 6.0 m in width by 6.0 m in height.



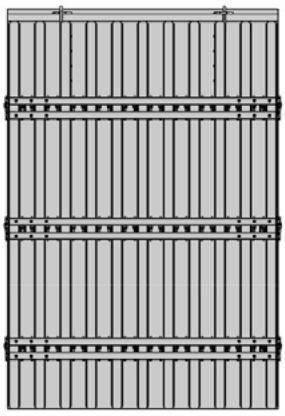
Vertex 60 elements can be assembled **in heights of up to 6.0 m.**
Vertex 60 elements can be assembled **in width of up to 6.0 m.**

Load-bearing adaptability

Depending on the concrete pressure required, the Variant H20 beams and the walings are spaced closer together or further apart. This ensures optimum formwork design and great economy of materials. For more information on structural design of Vertex 60 elements.

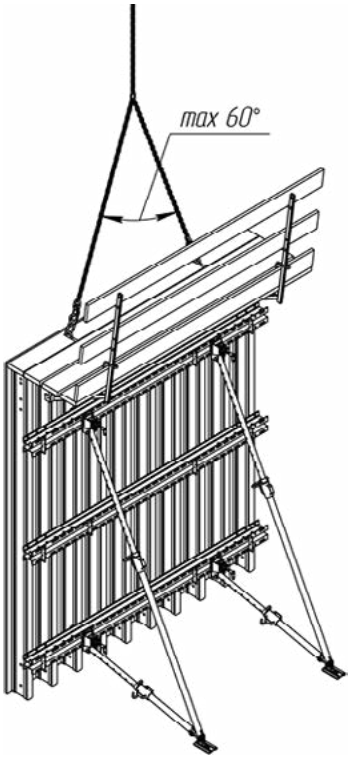


e.g. concrete pressure **30 kN/m2**



e.g. concrete pressure **70 kN/m2**

SHIFTING BY CRANE



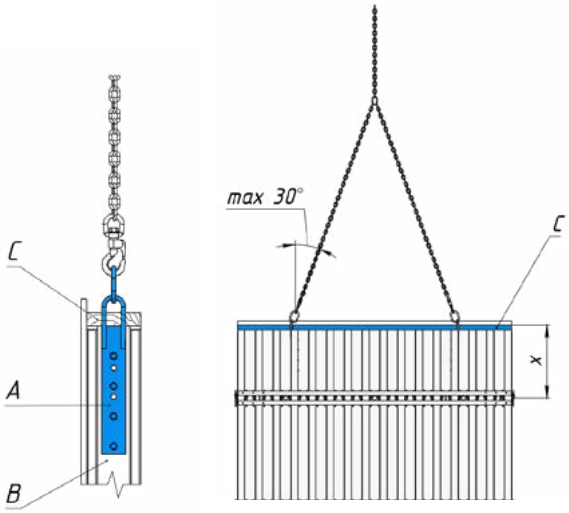
With lifting hooks and wooden pressure bracing

The crane slings for lifting of the formwork elements are fastened to the lifting hooks, which are bolted onto the webs of the H20 beams.
When necessary, the lifting brackets can also be connected to the holes in the steel walings (e.g. when elements are being used with vertical walings).

It is strictly prohibited to lift the formwork without pressure bracing.

Spread-angle of slinging chains: max. 60°.

Shore the formwork in a windproof manner when erecting it and when it is temporarily placed in the upright position.

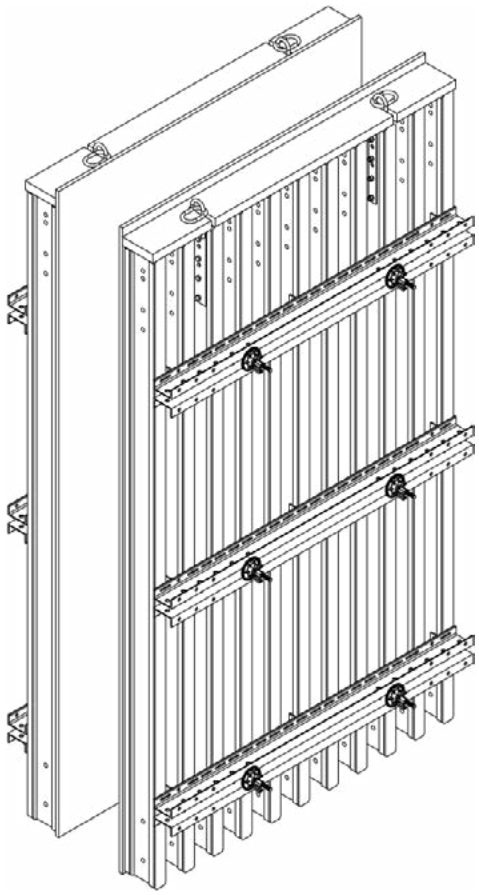


(A) Lifting-bracket
(B) H20 beam
(C) Pressure bracing (plank 5x20 cm)

Permitted vertical force

- 1300 kg / lifting hooks where the space x between the walings is less than 0.75 m
- 1000 kg / lifting hooks where the space x between the walings (x) is 0.75 - 1.00 m

TIE-ROD SYSTEM

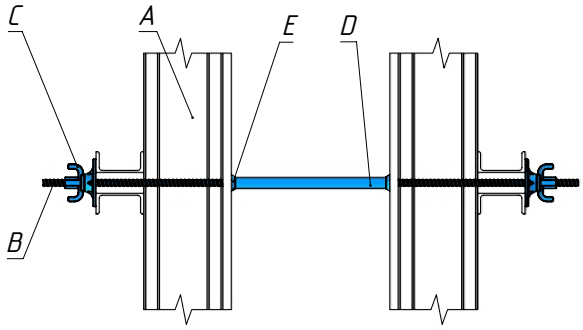


Only use approved tie-rods
Never weld or heat tie-rods up

For correct positioning of the form-ties, see paragraph "STRUCTURAL DESIGN" and/or the relevant project plan.

Tie-rod system 15.0 mm

Permitted capacity with safety factor of 1.6: 120 kN
Permitted capacity to DIN 18216: 90 kN

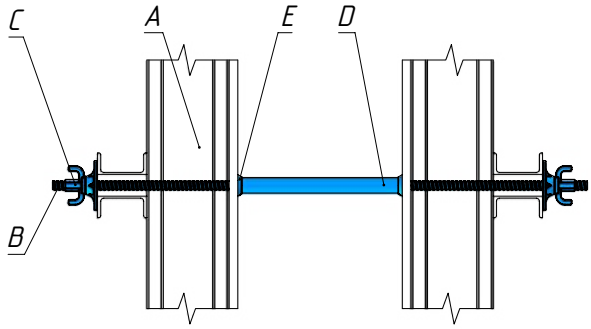


(A) Large-area panel Vertex 60
(B) Tie-rod 15.0
(C) Superplate 15.0
(D) Plastic tube 22 mm
(E) Plastic cone 22 mm

The Plastic tubes 22 mm left behind in the concrete are sealed off with Plugs 22 mm

Tie-rod system 20.0 mm

Permitted capacity with safety factor of 1.6: 220 kN
Permitted capacity to DIN 18216: 150 kN

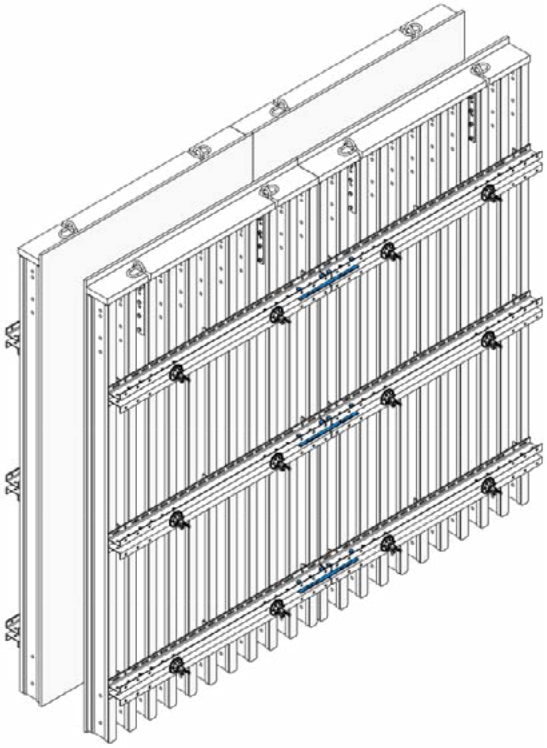


(A) Large-area panel Vertex 60
(B) Tie-rod 20.0
(C) Superplate 20.0
(D) Plastic tube 26 mm
(E) Plastic cone 26 mm

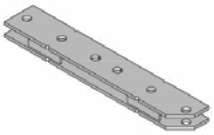
The Plastic tubes 26 mm left behind in the concrete are sealed off with Plugs 26 mm.

INTER-ELEMENT CONNECTIONS

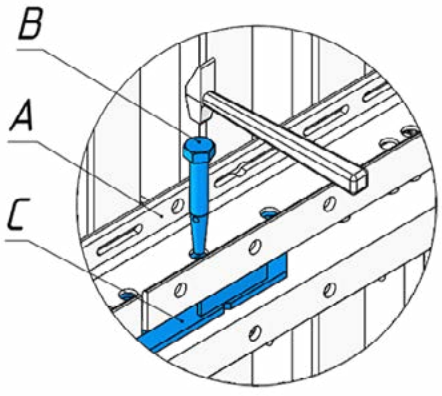
Using Connection plate



Vertex 60 elements are linked and aligned horizontally using Connection plate and Connection pins.



- fast, tension-proof joints between Vertex 60 elements
- insensitive to soiling
- the only tool required is a hammer,

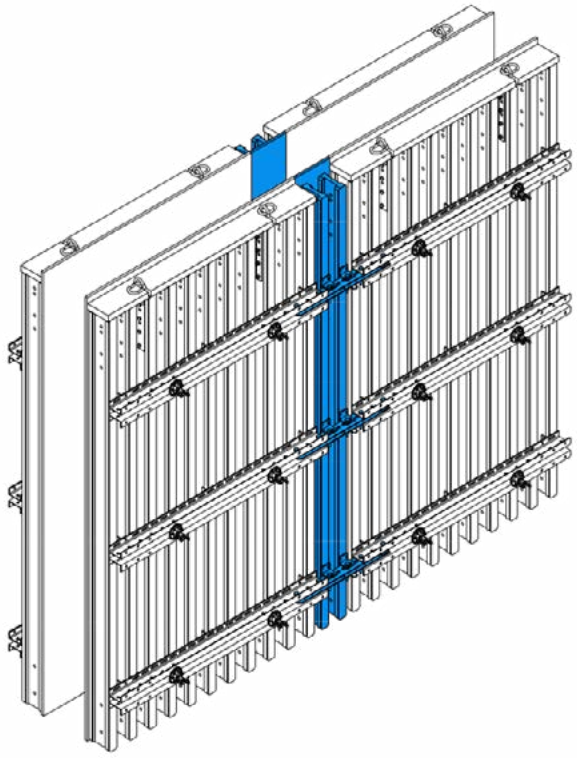


(A) Waling 10 or 12
(B) Connection pin
(C) Connection plate

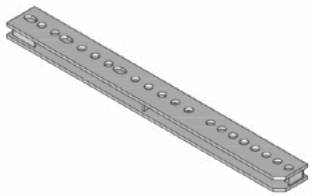
When the Connection pin is used in a horizontal position, secure it with a Spring cotter.

LENGTH ADJUSTMENT

Using Adjustable connection plate



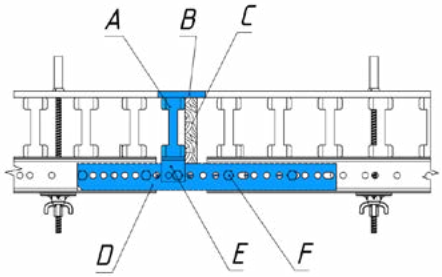
Adjustable connection plates are used for obtaining tension-proof and slippage-free links between the Vertex 60 elements.



- fast, tension-proof joints between Vertex 60 elements
- adjustment up to 50 cm closure between Vertex 60 elements
- insensitive to soiling
- the only tool required is a hammer

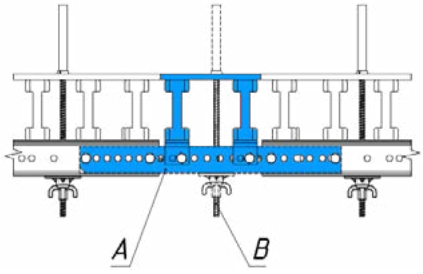
When connecting short elements to the closure zone, watch out for possible collisions between the Adjustable connection plate and the Connection plate.

Adjustment for closures of up to 23 cm



(A) H20 beam
(B) Adjusting sheet of plywood
(C) Nailed-on timber to add support to plywood
(D) Adjustable connection plate
(E) Beam clamp Vertex 60
(F) Connection pin

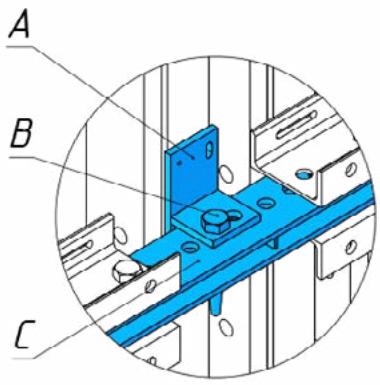
Adjustment for closures from 23 cm up to 50 cm



(A) Adjustable connection plate
(B) Where statically necessary - place a tie-rod through the closure.

Beam clamp Vertex 60

For fastening the H20 beams to the Adjustable connection plate the beam clamp is held in place by a Connection pin.

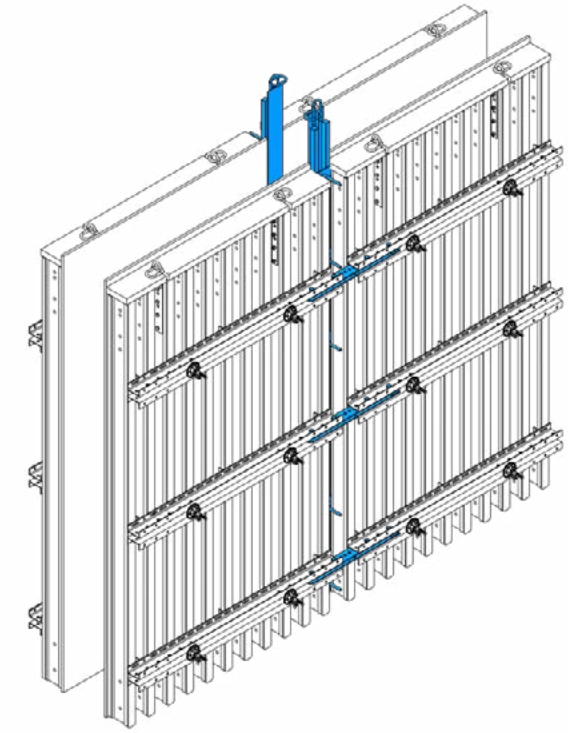


(A) Beam clamp Vertex 60
(B) Connection pin
(C) Adjustable connection plate

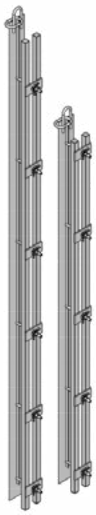
Beam clamp Vertex 60 is to be fixed to the H20 beam via nails in situ.

LENGTH ADJUSTMENT

Using Stripping plate



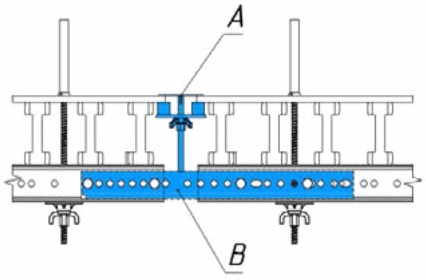
Stripping plate are used for obtaining infill space between the Vertex 60 elements and following easier formwork stripping



Available in heights of 3.0 and 4.0 m, the Stripping plates can be placed on top of one another where needed.

To make the formwork easier to strip: approx. 2 hours after pouring, loosen the Joint plate and pull it out a short way by crane.

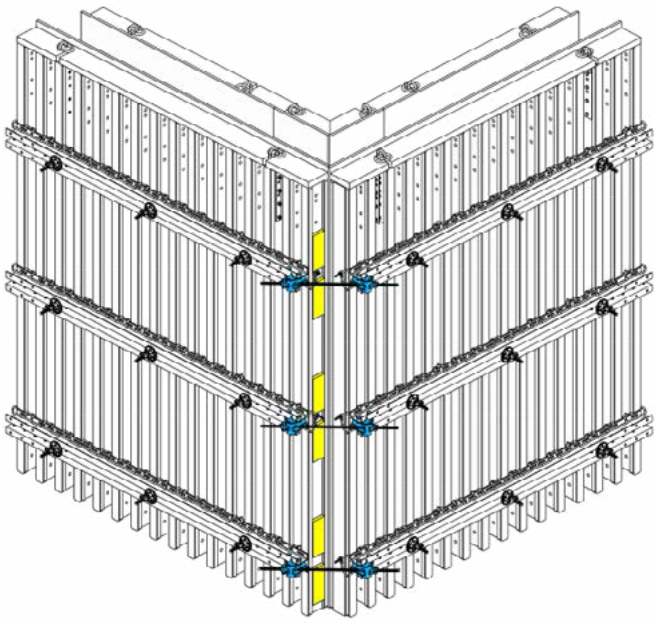
Adjustment for closures from 3 cm up to 11cm



(A) Joint plate Vertex 60
(B) Adjustable connection plate

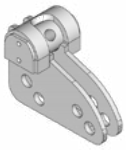
90° CORNER SOLUTIONS

Outside corners

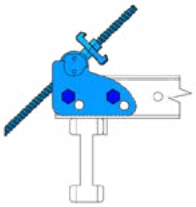
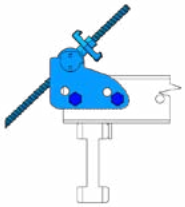


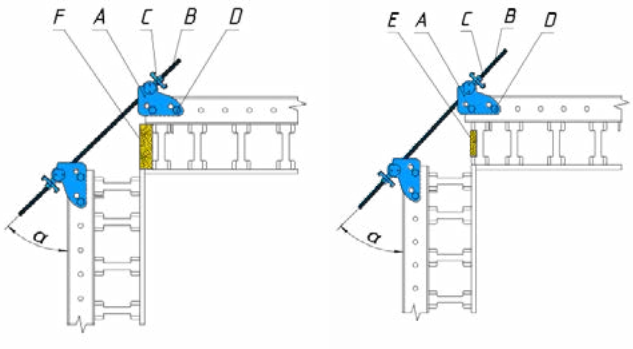
Vertex 60 elements are clamped together with the Corner tie bracket via tie-rods 15.0.

• fast, tension-proof joints between Vertex 60 elements



• the only tool required is a hammer
• can be used with waling 10 as well as for waling 12

Bolting holes for Waling 10	Bolting holes for Waling 12
	

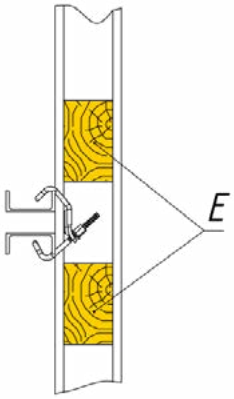


(A) Universal angle tie bracket
(B) Tie-rod 15.0
(C) Wing nut 15.0
(D) Connection pin
(E) Timber flange reinforcement
(F) Timber plank

Make sure that the Universal angle tie bracket is bolted into the right holes for the Waling 10 or 12, depending on which type of waling is being used.

Universal angle tie brackets can be used for solution acute and obtuse-angled corners.

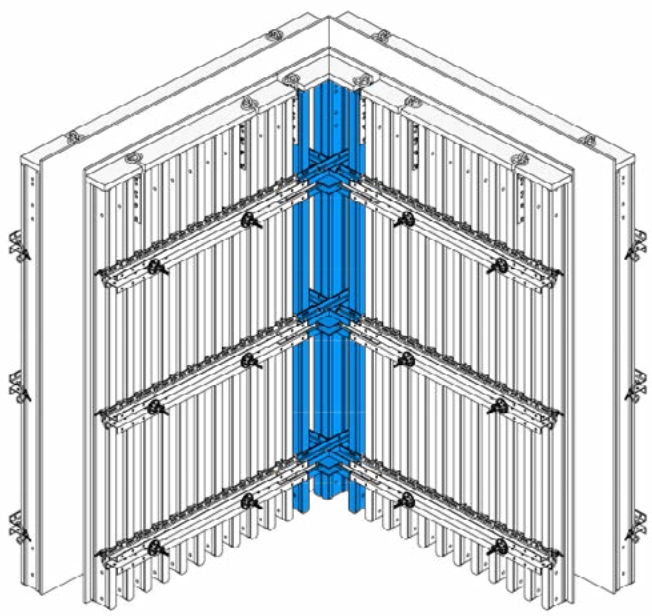
Wooden flange reinforcement prevents the flange of the beam from breaking when exposed to high oblique pull from the tie-rod.



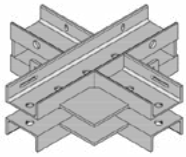
(E) Wooden flange reinforcement

Fit 2 wooden flange reinforcements (pieces of timber) between the flanges of the outside beam, so that plywood of the second corner element is supported.

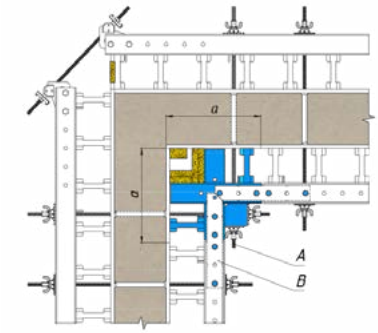
Inside corners
with Corner waling



With the Corner waling, it is possible to make a right angled inside-corner. The H20 beams give the Vertex 60 element the necessary rigidity, and also ensure dimensional accuracy.



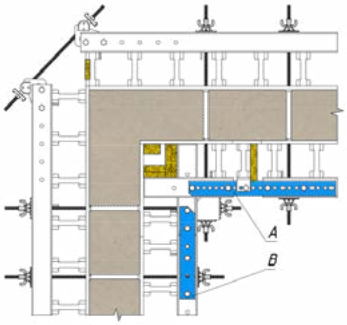
The adjacent Vertex 60 elements are fastened with the normal connecting components.



(A) Tie-rod 15.0 (if necessary, based on static calculation)
(B) Connection plate

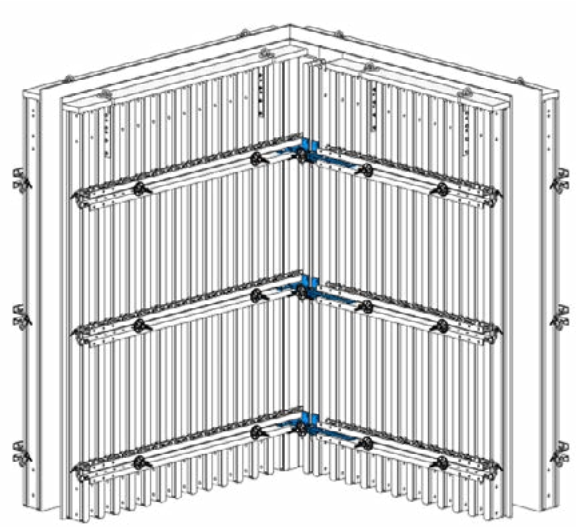
a = 549 mm for plywood 21 mm
a = 546 mm for plywood 18 mm

In case, when length adjustment is needed, Adjustable connection plate is to be used instead Connection plate.

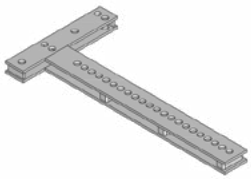


(A) Adjustable connection plate
(B) Connection plate

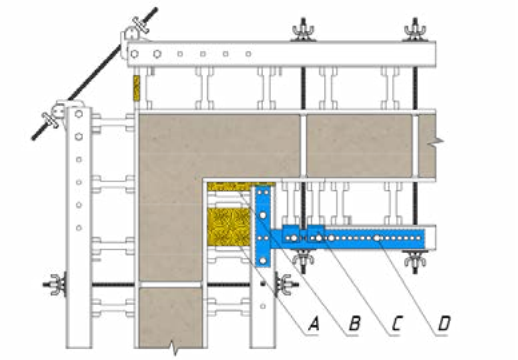
with Internal angle plate



An economical way of making inside corners with a closure function. (For closures of up to 34 cm in 1 cm increments)



By nailing a plywood to the end face of standard elements, these are turned into corner elements. The concrete pressure on the end face is transferred on a edge beam of formwork panel by means of wooden reinforcement.

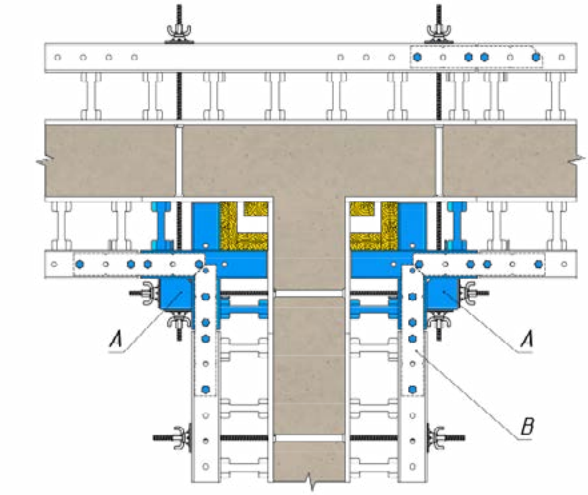


(A) Wooden angle reinforcement (optional)
(B) Wooden flange reinforcement
(C) Beam clamp 10 or 12
(D) Internal angle plate

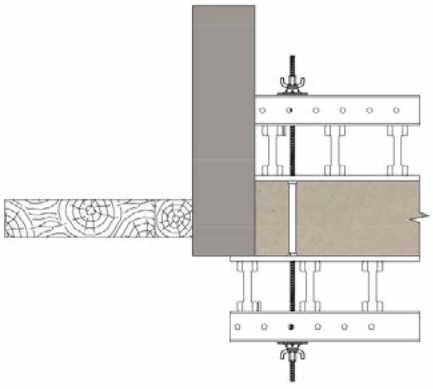
T-junction
with Corner waling

The Corner waling allows the form-ties to cross over in the corner zone. This avoids an excessively wide spacing between tie-rods on opposite panels of Vertex 60 system.

Connecting to existing wall



(A) Corner waling
(B) Connection plate



(A) In-situ support

Static calculation is to be done to determine whether shoring/tension anchoring is required to restrain the formwork (horizontal forces on short walls/large wall thicknesses).

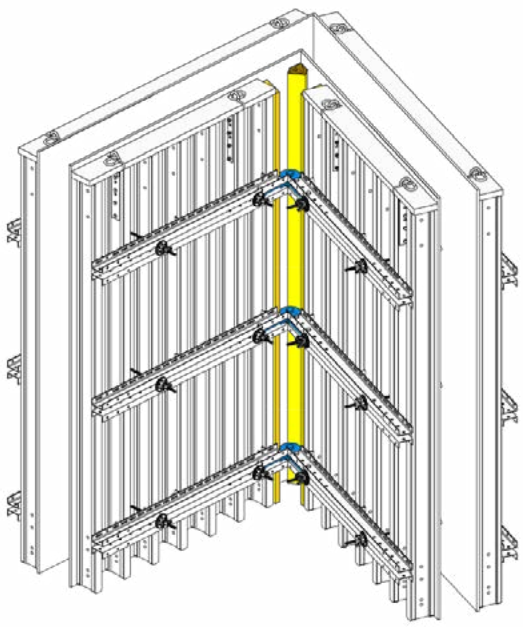
ACUTE & OBTUSE-ANGLED CORNERS

Outside corners

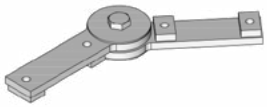
In a similar way to the right-angled corners. Corner tie brackets are also used to make acute or obtuse outside corners.

Inside corners

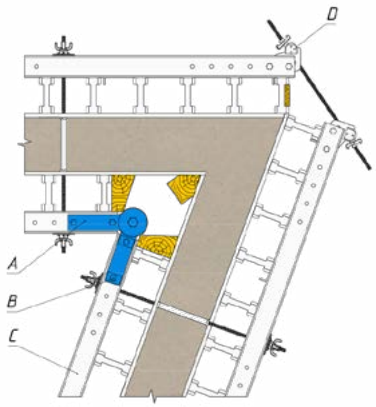
with Corner hingeplate



An economical way of making inside corners with a closure function. (For closures of up to 34 cm in 1 cm increments)

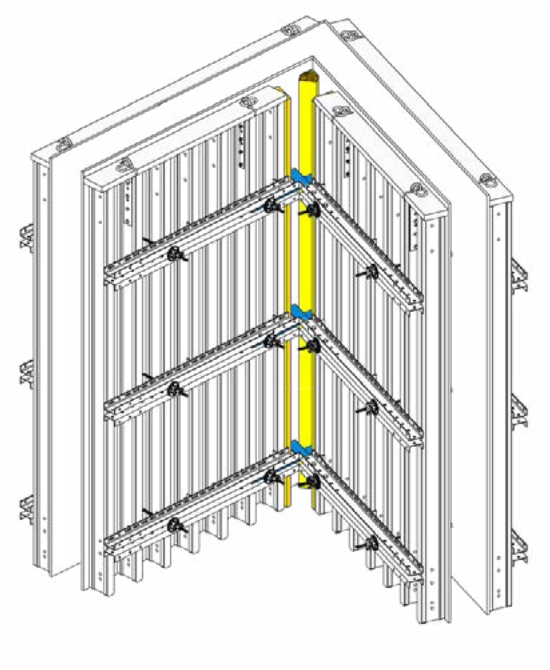


- Can be used on walings of 0.75 m and longer
- Makes it possible to set two steel walings at any angle (in a range between 61° and 299°)
- Multiple use

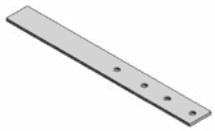


(A) Corner hinge plate
(B) Connection pin
(C) Waling 10 or 12
(D) Universal angle tie bracket

with Half splice plate

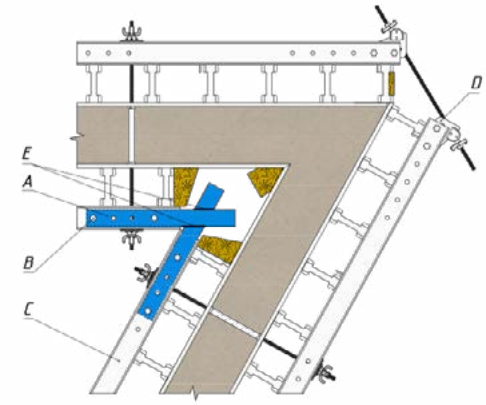


Half splice plates are used for making low-cost corner plates, required directly on the site.



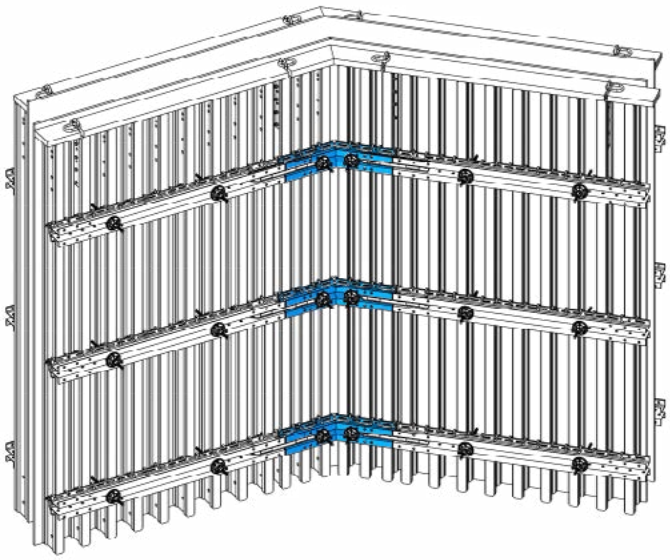
To make a corner plate, two Half splice plates are needed. After the formwork has been plumbed at the prescribed angle, these two plates must be welded firmly together.

The user is responsible for the integrity of the welded joints.



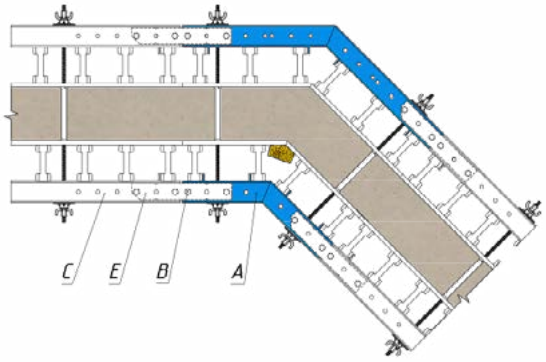
(A) Half splice plate
(B) Connection pin
(C) Waling 10 or 12
(D) Universal angle tie bracket
(E) Weld-seam

with Angular waling

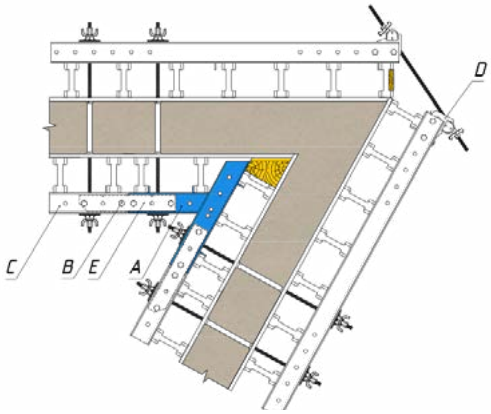


The Angular waling is a welded steel waling used for making strong corner elements. The legs are rigidly fixed at any desired angle other than 90°.

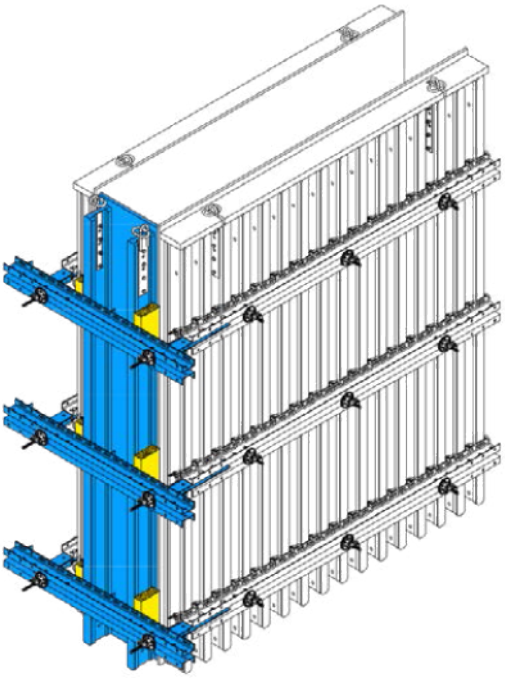
This special waling is custom-made on a project-specific basis.



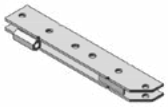
(A) Angular waling 10 or 12
(B) Connection pin
(C) Waling 10 or 12
(D) Universal angle tie bracket
(E) Connecting plate



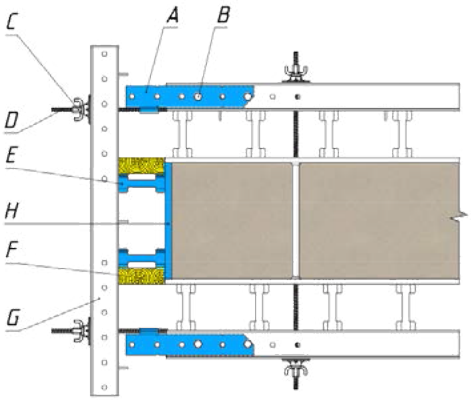
STOP-END FORMWORK



There are two ways of making stop-end formwork:
• using Anchoring plate;
• using wooden planks for thin wall with thickness up to 20 cm.
The Anchoring plate ensures that the loads are safely transferred into the waling system of the Vertex 60 elements.



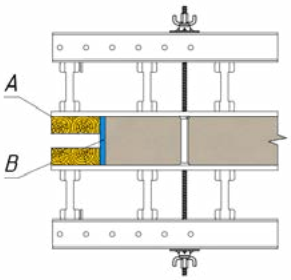
The tie-rods are screwed into the Anchoring plate, and the correct spacing of the stop-end element is adjusted using the Superplate 15.0.



(A) Anchoring plate
(B) Connection pin
(C) Superplate 15.0
(D) Tie-rod 15.0
(E) H20 beam
(F) Nailed-on plank
(G) Waling 10 or 12
(H) Plywood

The Anchoring plate can also be used as a normal Connection plate.

Example of stop-end formwork with wooden planks for thin walls in situ with thickness up to 20 cm.

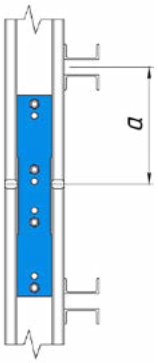


(A) Timber plank
(B) Plywood

VERTICAL STACKING OF ELEMENTS

The vertical-stacking methods shown here are only suitable for:
• lifting the formwork;
• setting down the formwork;
• crane-handling the formwork.

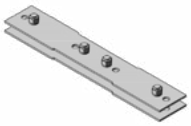
The vertical stacking joint must not be exposed to loads from concrete pressure or concrete weight.
This means:
• that the cantilever arms at the beam-joints must be as short and symmetrical as possible;
• or that users must take all measures required in accordance with static calculation (e.g. extra waling level).



a ... min 40 cm

with Stacking plate

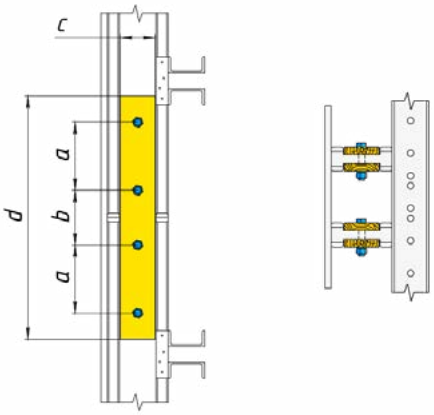
The Stacking plate serves as a bolt-on longitudinal connector for H20 beams, and is used for vertical stacking of Vertex 60 formwork elements. The plate is bolted onto the beams through the pre-drilled holes at either end of the beam.



Stacking plate must be fastened to every H20 beam.
In addition, it is absolutely essential to place extra walings across the horizontal joins, in order to achieve sufficient stability.

with wooden -planks

An in-situ solution that often works well in practice. The existing holes at the end of the beam can be used for making the bolted connections.

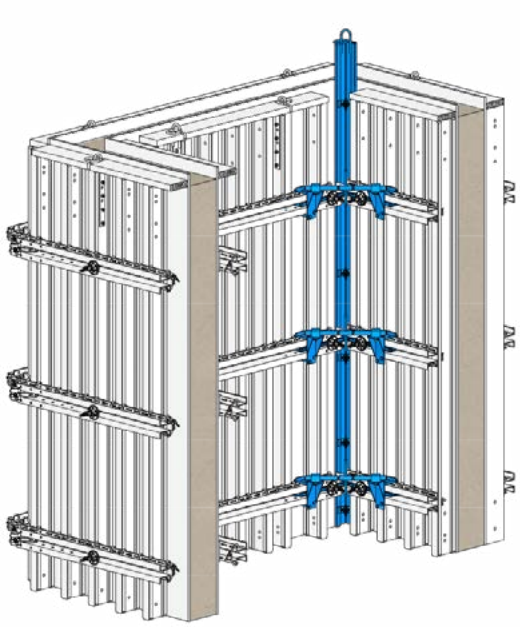


Items needed for each beam join:
• Timber plank 115x25, length min 800 mm - 2 pcs.
• Hexagonal bolt M20x110 - 4 pcs.
• Hexagon nut M20 - 4 pcs.
• Washer 22 - 4 pcs.

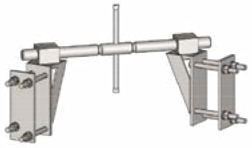
a ... 22.4 cm
b ... 18.0 cm
c ... 11.5 cm
d ... min. 80.0 cm

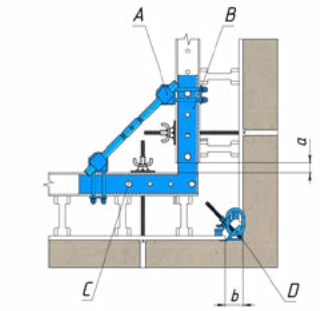
SHAFT FORMWORK

with Corner spindle, Shaft corner plate and Inside corner plate



For inside formwork in narrow cross-sections (e.g. lift shafts, staircases etc.), from these items the right angle between formwork elements can be made to enable rapid striking of the formwork and lifting of the complete shaft formwork, in one piece.

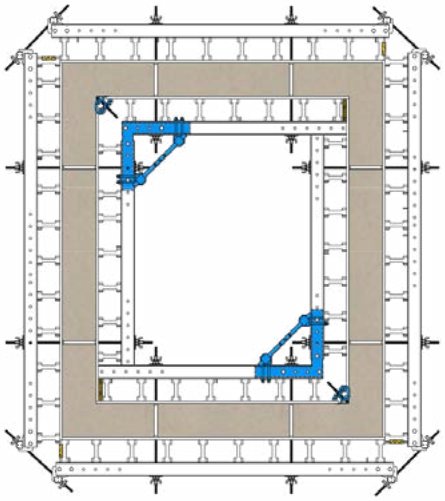




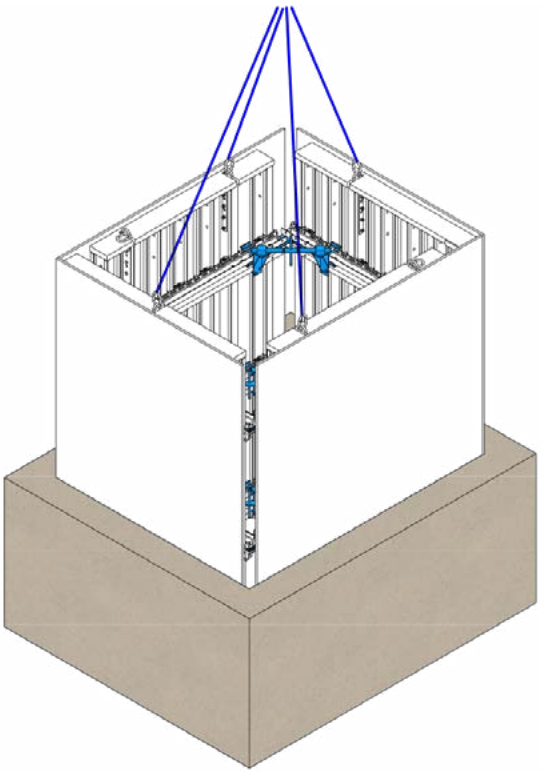
a = 60 mm
b = 100 mm

(A) Corner spindle
(B) Shaft corner plate
(C) Connection pin
(D) Inside corner plate

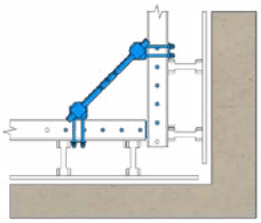
Sample of the shaft formwork



Striking the shaft formwork



- Loosen the tie-rods on one half of the formwork.
- Remove the tie-rods from the other half of the formwork.
- Remove all 4 connecting pins from the Shaft corner plate.
- Loosen the Corner spindles and Inside corner plates.
- Pull out the Inside corner plates by crane.
- Use the Corner spindles to pull the Inside formwork approx. 2 - 3 cm together.
- Remove the remaining tie-rods.
- Use the Corner spindles to pull the Inside formwork approx. 2 - 3 cm further together.
- Lift and reposition the entire inside formwork.



To make the formwork easier to strip: approx. 2 hours after pouring, loosen the Inside corner plate and pull it out a short way by crane.

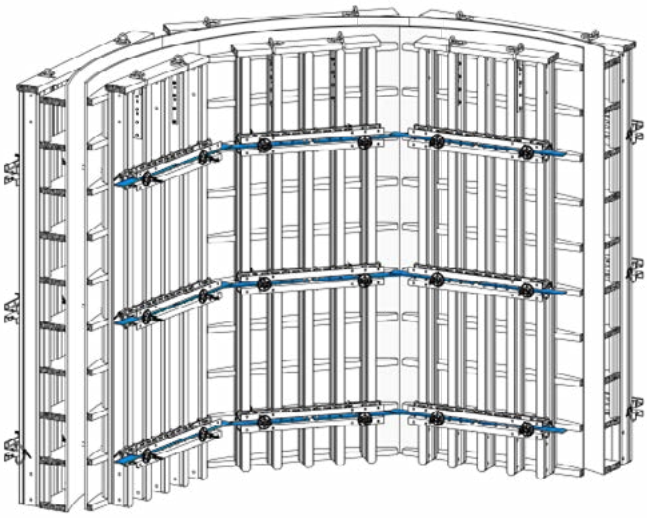
Shaft platform

With its telescopic shaft beams, this platform can accommodate any dimension of structure. The inside formwork can be installed on the platform and repositioned together with the platform.

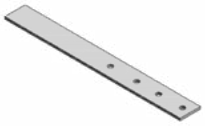
Resetting by crane

Use suitably long crane slings in order to avoid oblique pull (depending on the size of the shaft).

CIRCULAR FORMWORK

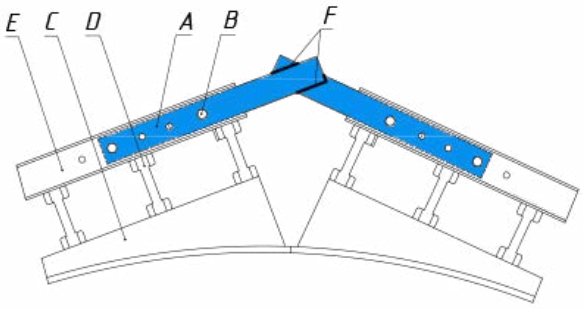


Curved structures can be formed with Half splice plates.



Profiled wooden templates are placed between the H20 beams and the plywood to provide the desired shape.

Smallest possible radii depend on plywood parameters. In some cases, small radius can be achieved by cutting into the formwork sheets or by using strips of formwork sheeting.

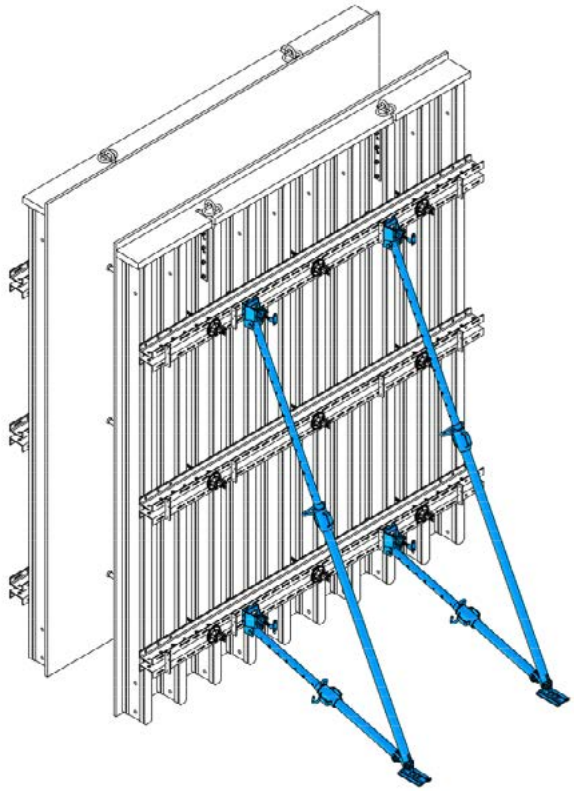


(A) Half splice plate
(B) Connection pin
(C) Profiled wooden template
(D) H20 beam
(E) Waling 10 or 12
(F) Welded seam*

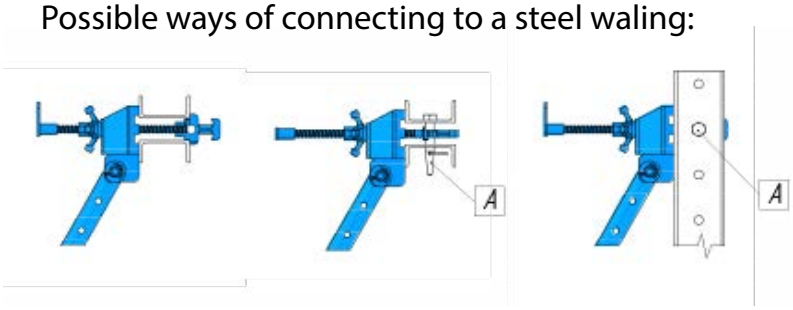
* - after plumbing and aligning of the formwork

PLUMBING ACCESSORIES

Supporting struts, secure the elements against wind loads, and make it easier to plumb and align the formwork.



Possible ways of connecting to a steel waling:



(A) Connecting pin + Spring cotter

The formwork elements must be held stable in every phase of the construction work.

Adjustable plumbing struts is allowed to connect to a steel waling with Connection pin with Spring cotter only.
Every gang-form must be supported by at least 2 panel struts.

Permitted spacing [m] of the plumbing accessories:

Formwork height [m]	Supporting strut		Adjustable plumbing strut
	340	540	
3.00	3,00		
4.00	2,00		
5.00		2,50	
6.00	2,00	2,00	
7.00	3,00		3,00
8.00	1,50		3,00

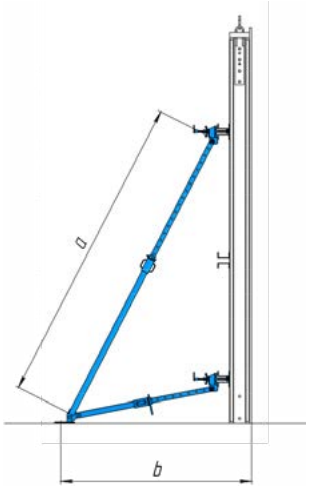
Values apply up to a structure height of 20 m.
The permitted prop load must be determined separately for:
- structure heights over 20 m;
- formwork higher than 8.00 m;
- other influence widths.

SUPPORTING STRUTS

- Can be telescoped in 8 cm increments;
- Fine adjustment by screw-thread;
- All parts are captively integrated - including the telescopic tube.

Supporting strut 340

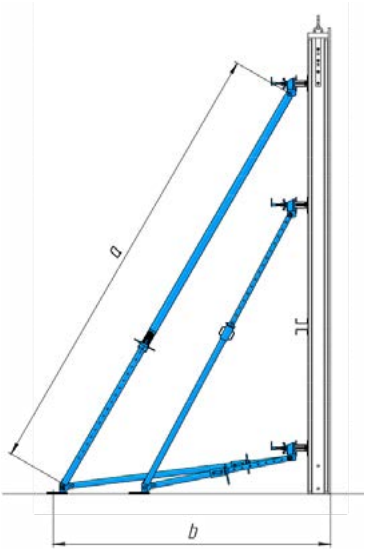
Retractable brace length, m	Allowable load	
	Pressure, kN	Stretching, kN
2,00	22,0	15,0
2,20	21,0	
2,40	17,5	
2,60	14,5	
2,80	12,5	
3,00	11,0	
3,20	9,5	
3,40	8,0	



a ... 193.0 - 340.9 cm
b ... 128.3 - 181.6 cm

Supporting strut 540

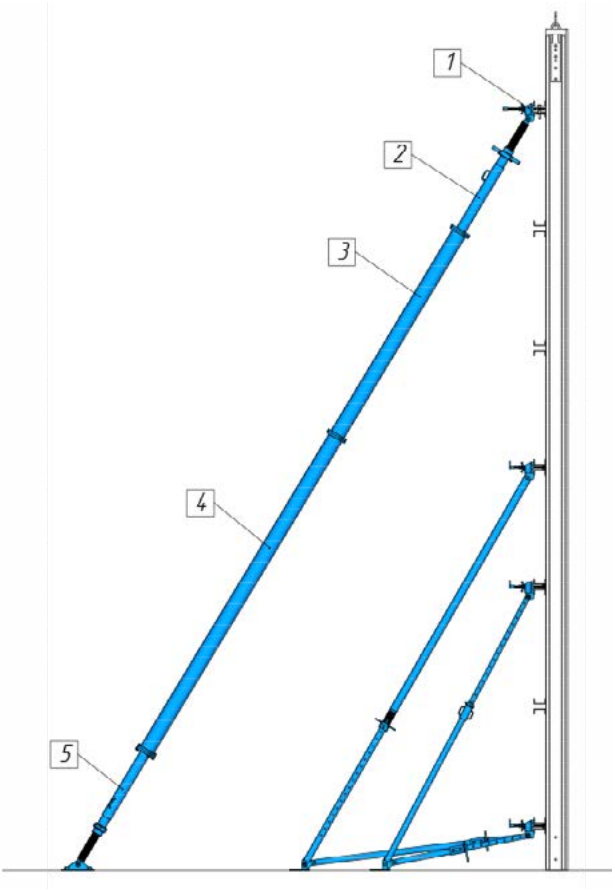
Retractable brace length, m	Allowable load	
	Pressure, kN	Stretching, kN
3,20	30,0	30,0
3,40	29,0	
3,60	27,0	
3,80	25,0	
4,00	21,5	
4,20	19,0	
4,40	16,5	
4,60	15,0	
4,80	13,5	
5,00	12,0	
5,20	11,0	
5,40	9,0	
5,50	7,0	



a ... 309.0 - 550.0 cm
b ... 224.2 - 281.6 cm

Adjustable plumbing strut

Consist of:
1 - Spindle head;
2 - Spindle element without end-hinge;
3 - Extension strut 2,40 m;
4 - Extension strut 3,70 m;
5 - Spindle element with end-hinge.



Length L, m	Allowable axis load on pressure, kN		
	min. L	half L	max. L
6,0-7,4	40,0	40,0	27,8
7,1-8,5	40,0	38,2	24,3
8,4-9,8	40,0	35,6	21,7
9,7-11,1	40,0	31,7	19,0
10,8-12,2	40,0	27,8	16,1
12,1-13,5	34,2	24,1	13,4
13,4-14,8	27,1	21,5	12,2
14,5-15,9	20,8	17,5	9,5
	Allowable axis load on tention – 40 kN		

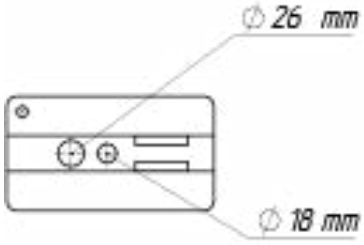
Intermediate parts	
short 2,40	long 3,70
-	1
2	-
1	1
-	2
2	1
1	2
-	3
2	2

The spindle head must be secured to the waling with a connecting pin and spring cotter. The length of the adjustable plumbing strut should be the same as the height of the formwork to be supported.

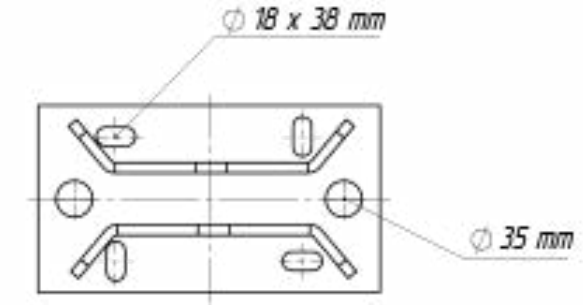
Footplate and anchorage

- Drilled holes in the footplates.

Supporting struts 340; 540



Adjustable plumbing strut
Fix with two anchor bolt.

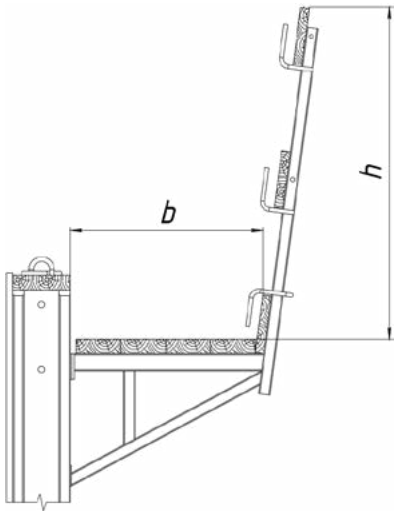


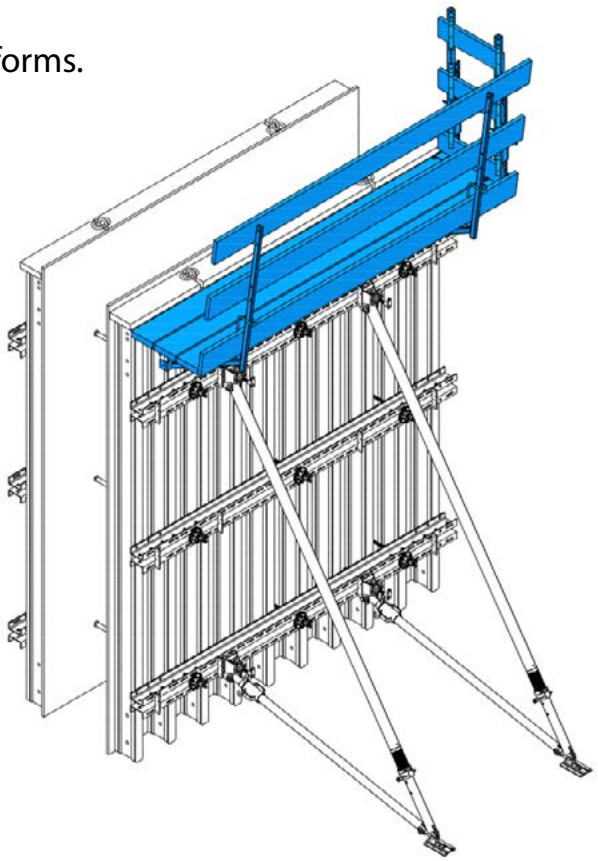
- Anchor the plumbing accessories in such a way as to resist tensile and compressive forces.
- Required load-bearing capacity of anchor bolt is min. 13.5 kN.
- Required concrete strength is 25 N/mm^2 (concrete C20/25).
- The anchoring bolt can be re-used few times over.

POURING PLATFORMS

Wall bracket H20

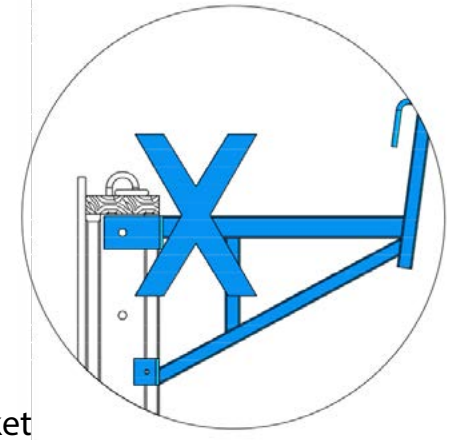
is lightweight bracket for making working platforms.





b ... 62 cm
h ... 115 cm
Permitted live load: 1.5 kN/m²
Max. influence width: 2.00 m
The brackets must be secured against accidental lift-out.

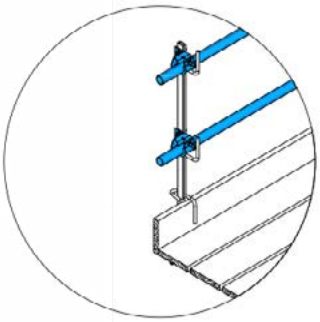
In the case of H20 beams where the first drilled hole is 5 cm from the end of the beam, it is not allowed to fix the bracket in the top hole in the beam!

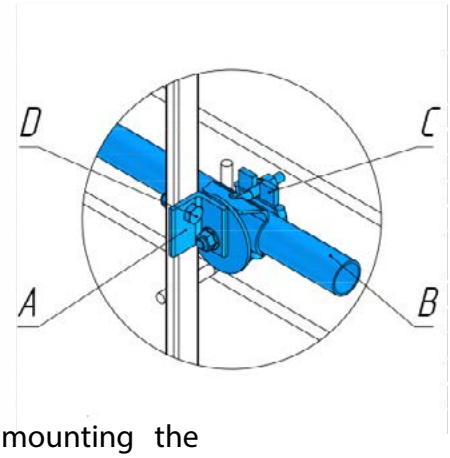


Floor decking

- Deck-boards min. 20x5 cm
- Guard-rail boards min. 20x3 cm
- Deck-boards fix with 3 square bolts M10x120 per bracket

Using scaffolding tubes





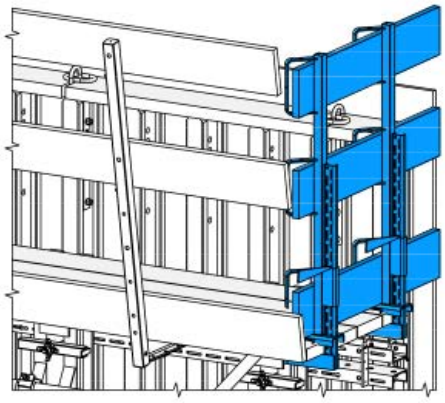
Tools: Fork spanner 22 for mounting the couplers and scaffolding tubes.

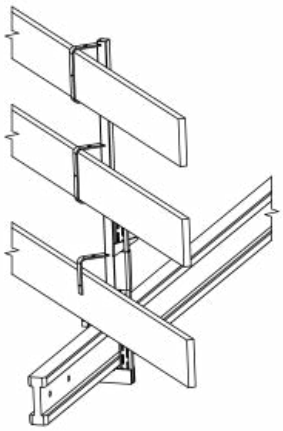
(A) Scaffold tube connector
(B) Scaffolding tube 48.3 mm
(C) Screw-on couplers 48 mm 50
(D) Hexagon screw M14x7 hexagon nut M14 (not included in scope of supply)

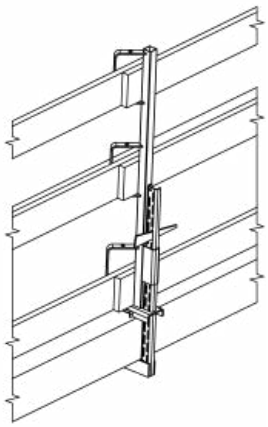
Guide rail clamp

- Attached with integral clamp:
  - on the timber beam;
  - on the floor slab.
- Guard-rail boards or scaffold tubes can be used as the safety barrier.

Suitable for side guards on exposed platform-ends.



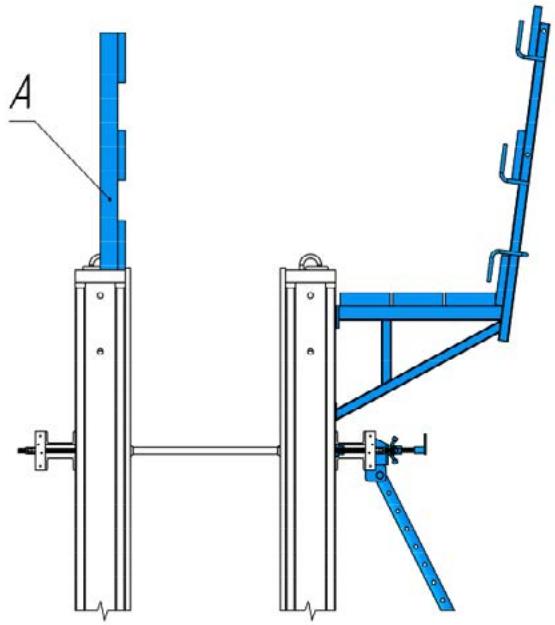




OPPOSITE GUARD-RAIL, INTERMEDIATE PLATFORMS

Opposing guard-rail

If there are work platform mouted on one side of the formwork only, than a fall-protection barrier must be mounted to the opposite formwork.



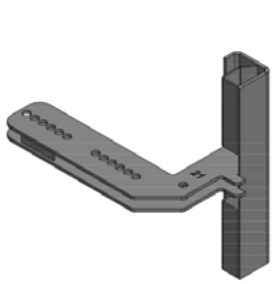
(A) Opposing guard-rail (provided at site)

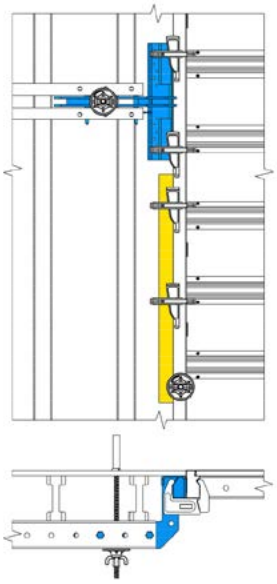
Intermediate platforms with single brackets

Beam wall brackets can be attached anywhere on the Timber beam (if Timber beam has previously drilled hole), quickly and easily. This makes it possible to erect intermediate platforms.

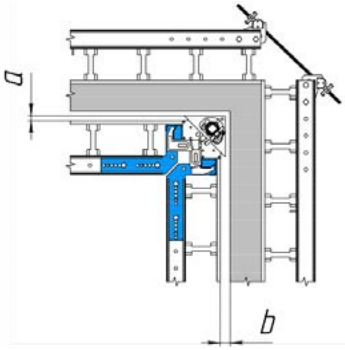
LARGE-AREA FORMWORK WITH FRAMED FORMWORK

- The «Variant» large-area formwork is easily arranged with the panels of the «Variant» framed formwork with use of transition plate.





- Transition plate available for plywood 21 mm and 18 mm.

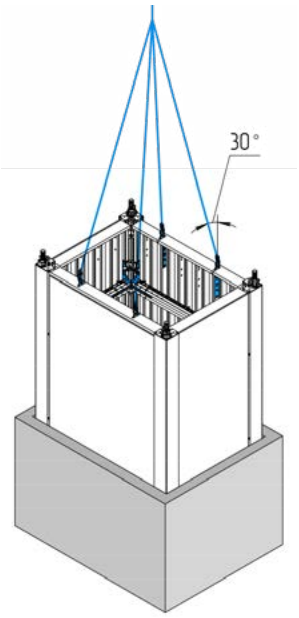


a = 30 mm
b = 60 mm

Framed panels, angles, incl. stripping angles, can be used with large-area formwork via transition plate.

- To make right internal angles and simplify the lift shafts stripping.

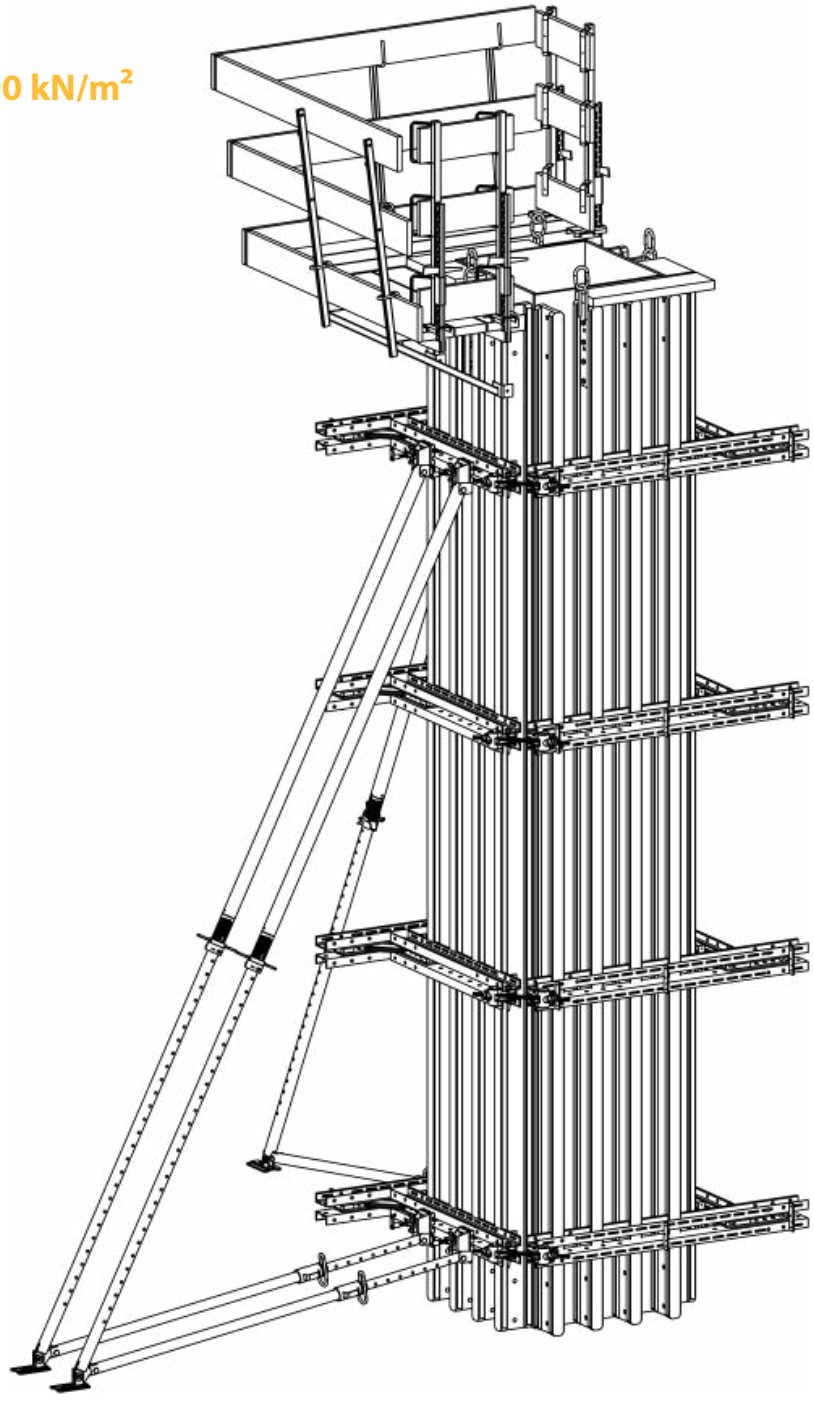
- Framed internal angles can be used for making right internal angles as well.



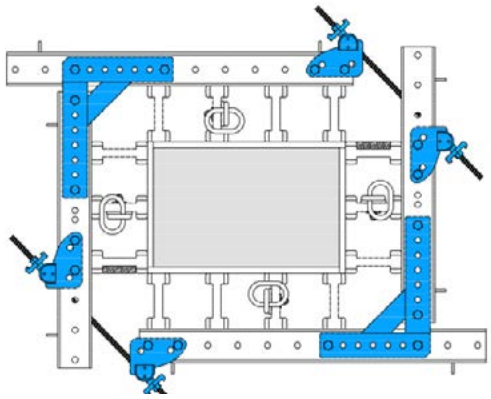
COLUMN FORMWORK

The large-area formwork can also be used for column formwork.
– Cross-sections adjustable up to 120 x 120 cm;
– No tie-rods through the column required;
– Clean, smooth concrete surfaces;
– Easy assembly and handling.

Permitted load pressure - 90 kN/m²

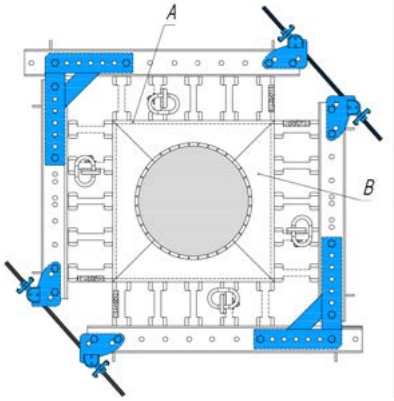


Available for pouring different column shapes, such as:
– Rectangular columns
– Circular
– Multi-angular columns



Rectangular column formwork

(A) Spacer plank
(B) Wooden template



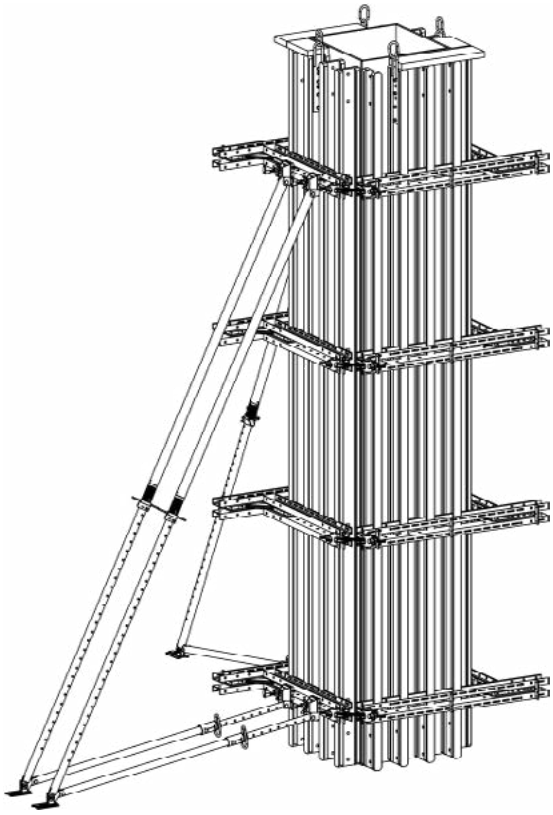
Circular column formwork

As far as possible, set the angles of the tie-rods in the same ratio as
the length-to-width ratio of the column cross section.

Always attach supporting struts to free-standingformwork halves to prevent them from falling over.

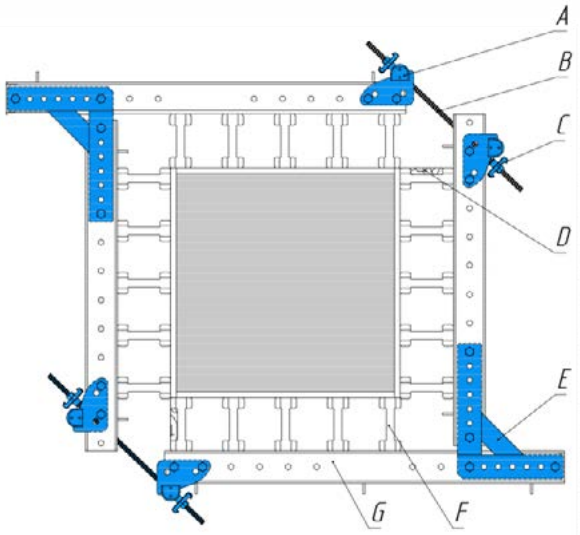
For each half of the column formwork,attach two lifting hooks to the timber beams symmetrically (so as to ensure the centre-of-gravity position).

Fit a pressure wooden bracing between the lifting brackets to transfer the oblique pull forces.



DESIGN OF COLUMN FORMWORK

The column corner plate connects the walings rigidly and precisely across the corner.
Together with tie-rods, the corner tie bracket enables the walings to be diagonally tension-braced.

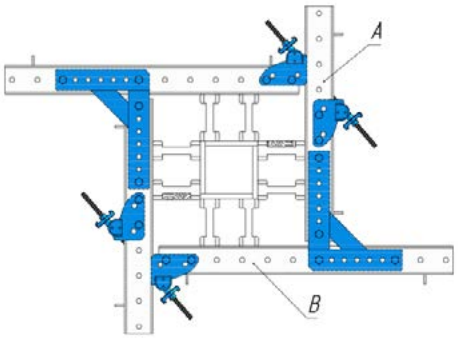


(A) Corner tie bracket
(B) Tie-rod 15.0
(C) Wing nut
(D) Flange reinforcement
(E) Column corner plate
(F) H20 beam
(G) Steel waling 10 or 12

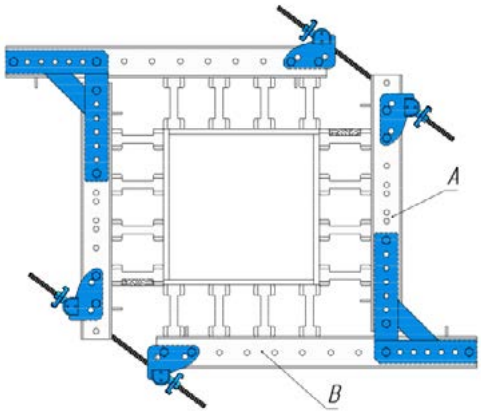
Column formwork section up to 700x700 mm

Column corner plate "outside"

Example 20 x 20 cm



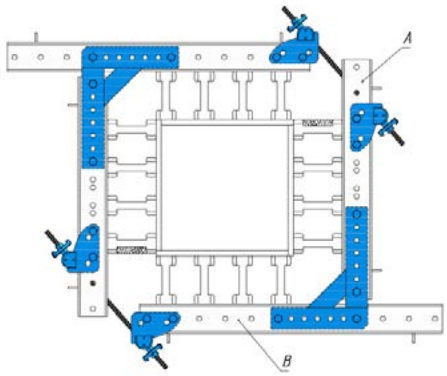
Example 56 x 56 cm



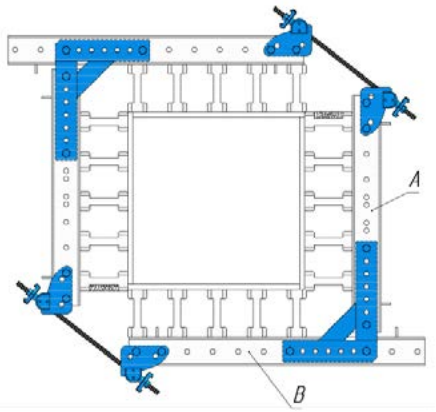
(A) Steel waling 10 or 12 (1.00 m)
(B) Steel walling 10 or 12 (1.25 m)

Column corner plate "inside"

Example 52 x 52 cm



Example 70 x 70 cm



(A) Steel waling 10 or 12 (1.00 m)
(B) Steel walling 10 or 12 (1.25 m)

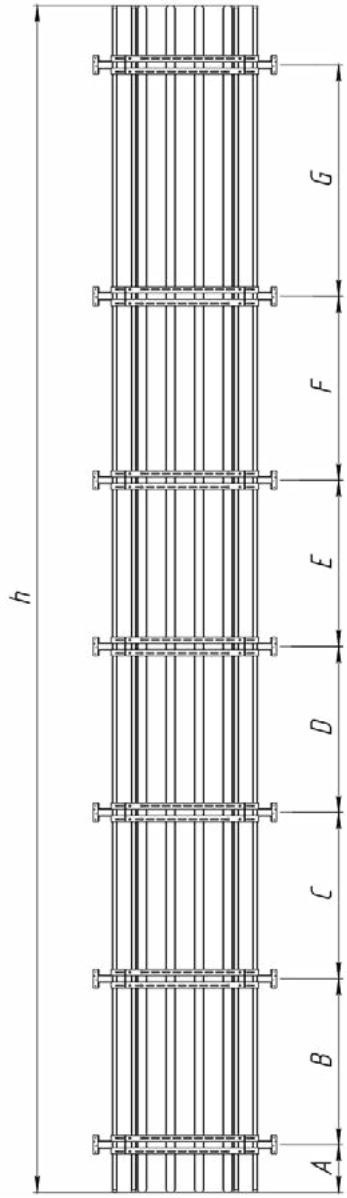
Materials needed per waling level

Designation	Column dementions [mm]					
	700x700	800x800	900x900	1000x1000	1100x1100	1200x1200
Steel waling 1.00 m	2	2	2	2	2	2
Steel waling 1.25 m	2	2	2	2	2	2
Column corner plate	2	2	2	2	2	2
Corner tie bracket	4	4	4	4	4	4
Flange-clamp	8	8	12	16	16	20
Connecting pin *)	16	16	16	16	16	16
Wing nut 15.0	4	4	4	4	4	4
Tie-rod 15.0 mm 1.0 mm	2	2	2	2	2	2

*) When column formwork is transported flat: Secure connecting pins with Spring cotters 6 mm.

Spacing of the walings with height

With rectangular columns, the longer of the two sides is the applicable dimension for structural design purposes.

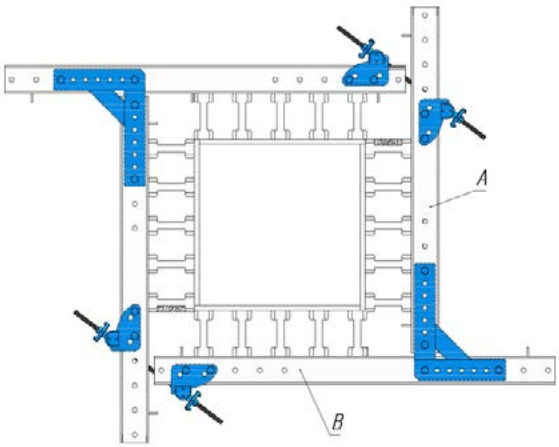


Column dimensions [mm]		200x200	300x300	400x400	500x500	600x600	700x700
Number of H20 beams on each side		2	2	3	4	4	5
Column height h [m]		Space [cm] between walings					
10.0	G	–	–	1950	1950	1950	1950
	F			1550	1550	1550	1550
	E			1400	1400	1400	1400
	D			1400	1400	1400	1400
	C			1400	1400	1400	1400
	B			1400	1400	1400	1400
	A			400	400	400	400
9.0	G	–	–	1400	1400	1400	1400
	F			1400	1400	1400	1400
	E			1400	1400	1400	1400
	D			1400	1400	1400	1400
	C			1400	1400	1400	1400
	B			1300	1300	1300	1300
	A			400	400	400	400
8.0	F	–	–	1500	1500	1500	1500
	E			1400	1400	1400	1400
	D			1400	1400	1400	1400
	C			1400	1400	1400	1400
	B			1400	1400	1400	1400
	A			400	400	400	400
7.0	E	–	–	1800	1800	1800	1800
	D			1500	1500	1500	1500
	C			1400	1400	1400	1400
	B			1400	1400	1400	1400
	A			400	400	400	400
6.0	E	–	–	1300	1300	1300	1300
	D			1300	1300	1300	1300
	C			1300	1300	1300	1300
	B			1300	1300	1300	1300
	A			4000	4000	4000	4000
5.0	D	1500	1500	1500	1500	1500	1500
	C	1300	1300	1300	1300	1300	1300
	B	1300	1300	1300	1300	1300	1300
	A	400	400	400	400	400	400
4.0	C	1700	1700	1700	1700	1700	1700
	B	1400	1400	1400	1400	1400	1400
	A	400	400	400	400	400	400
3.0	B	1650	1650	1650	1650	1650	1650
	A	400	400	400	400	400	400

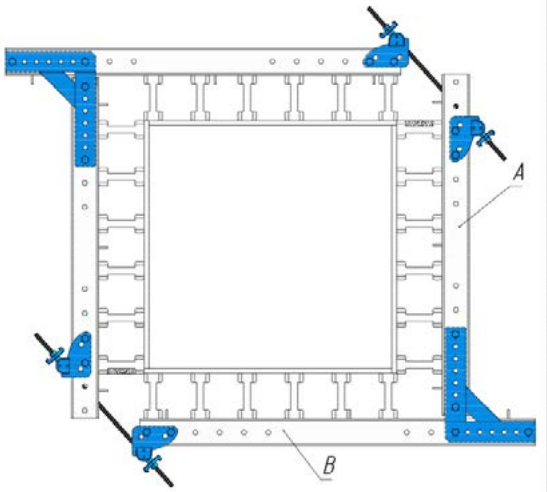
Column formwork section from 700x700 mm up to 1200x1200 mm

Column corner plate "outside"

Example 70 x 70 cm

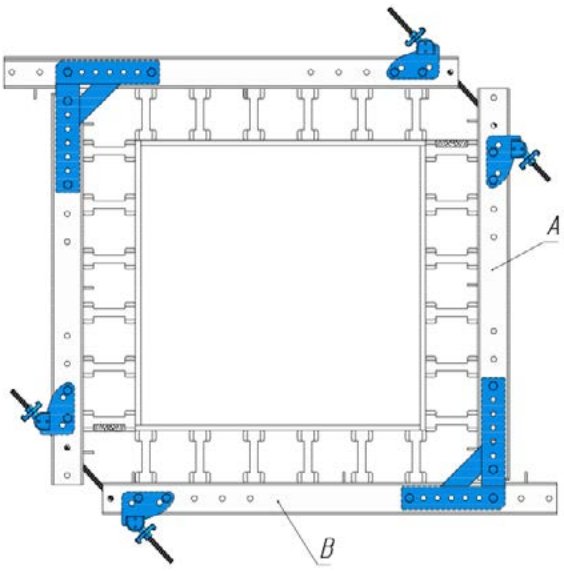


Example 107 x 107 cm

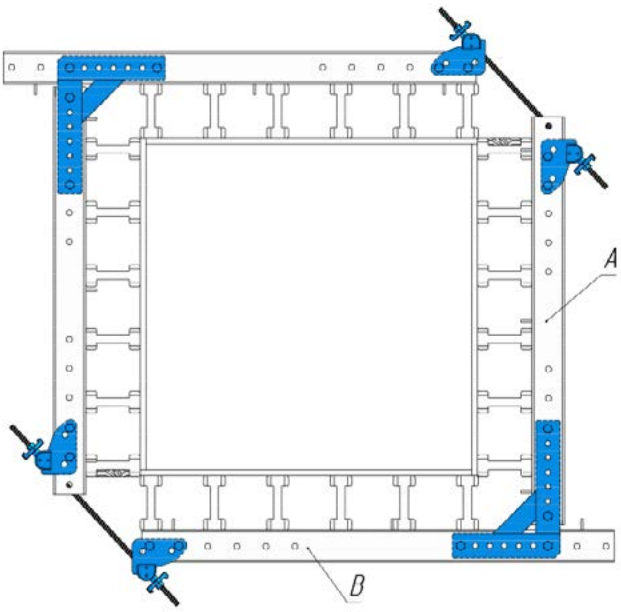


Column corner plate "inside"

Example 107x107 cm



Example 120x120 cm



(A) Waling 10 or 12 (1.50 m)
(B) Walling 10 or 12 (1.75 m)

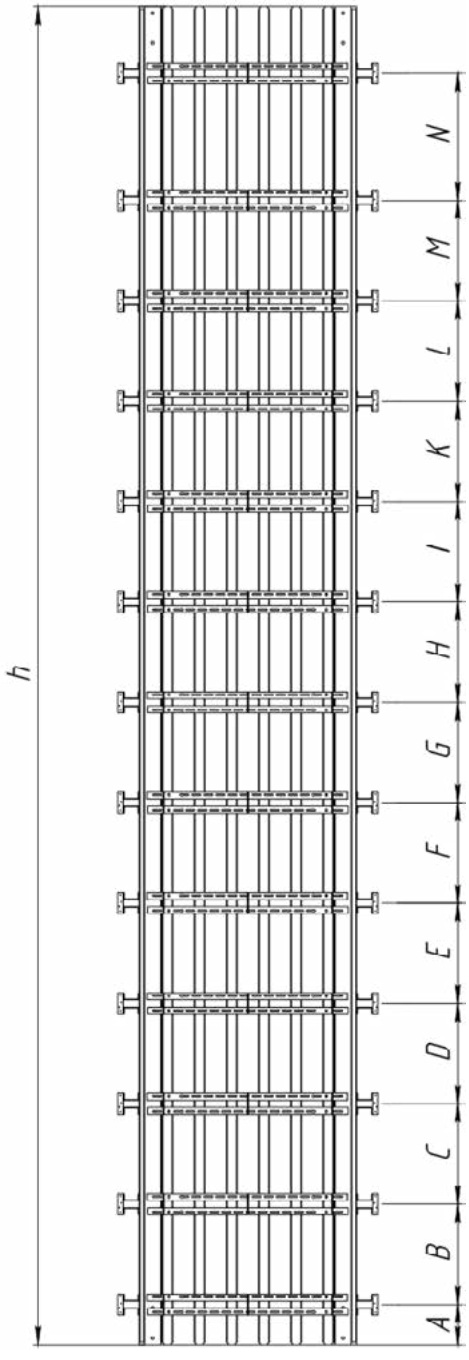
Materials needed per waling level

Designation	Column dementions [mm]					
	700x700	800x800	900x900	1000x1000	1100x1100	1200x1200
Steel waling 1.50 m	2	2	2	2	2	2
Steel waling 1.75 m	2	2	2	2	2	2
Column corner plate	2	2	2	2	2	2
Corner tie bracket	4	4	4	4	4	4
Flange-clamp	20	20	20	20	24	24
Connecting pin 10 cm *)	16	16	16	16	16	16
Wing nut 15.0	4	4	4	4	4	4
Tie-rod 15.0 mm 1.0 mm	2	2	2	2	2	2

*) When column formwork is transported flat: Secure connecting pins with Spring cotters 6 mm.

Spacing of the walings with height

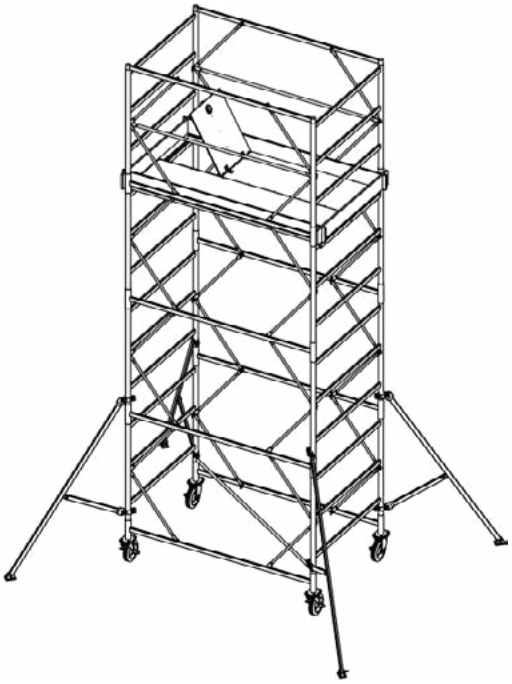
With rectangular columns, the longer of the two sides is the applicable dimension for structural design purposes.



Column dimensions [mm]		700x700	800x800	900x900	1000x1000	1100x1100	1200x1200
Number of H20 beams on each side		5	5	5	5	6	6
Column height h [m]		Space [mm] between walings					
10.0	N	-	-	-	-	950	950
	M	-	-	-	-	750	750
	L	-	-	-	1000	750	750
	K	-	1450	1450	1000	750	750
	I	1600	1100	1100	950	750	750
	H	1200	950	950	950	750	750
	G	1050	950	950	950	750	750
	F	1050	950	950	950	750	750
	E	1050	950	950	950	750	750
	D	1050	950	950	950	750	750
	C	1050	950	950	750	750	750
	B	1050	950	950	750	750	750
	A	400	300	300	300	300	300
9.0	M	-	-	-	-	-	800
	L	-	-	-	-	950	750
	K	-	-	-	1000	950	750
	I	-	1550	1550	1000	950	750
	H	1650	1100	1100	950	950	750
	G	1200	950	950	950	750	750
	F	1050	950	950	950	750	750
	E	1050	950	950	950	750	750
	D	1050	950	950	950	750	750
	C	1050	950	950	750	750	750
	B	1050	950	950	750	750	750
	A	400	300	300	300	300	300
8.0	K	-	-	-	-	950	950
	I	-	-	-	1200	950	950
	H	-	1350	1350	1100	950	950
	G	1700	1100	1100	1000	750	750
	F	1200	950	950	950	750	750
	E	1050	950	950	750	750	750
	D	1050	950	950	750	750	750
	C	1050	950	950	750	750	750
	B	1050	950	950	750	750	750
	A	400	300	300	300	300	300
7.0	I	-	-	-	-	900	900
	H	-	-	-	1000	900	900
	G	-	1350	1350	1000	750	750
	F	1400	1050	1050	900	750	750
	E	1200	950	950	900	750	750
	D	1200	950	950	900	750	750
	C	1200	950	950	750	750	750
	B	1200	950	950	750	750	750
	A	400	300	300	300	300	300
6.0	H	-	-	-	-	800	800
	G	-	-	-	1000	750	750
	F	-	1350	1350	900	750	750
	E	1500	1000	1000	900	750	750
	D	1200	950	950	900	750	750
	C	1200	950	950	750	750	750
	B	1200	950	950	750	750	750
	A	400	300	300	300	300	300
5.0	F	-	-	-	-	1100	1100
	E	-	1350	1350	1350	1000	1000
	D	1700	1000	1000	1000	750	750
	C	1300	950	950	950	750	750
	B	1100	950	950	950	750	750
	A	400	300	300	300	300	300
4.0	E	-	-	-	-	1000	1000
	D	-	-	1350	1350	750	750
	C	1700	1700	950	950	750	750
	B	1400	1400	950	950	750	750
	A	400	400	300	300	300	300
3.0	D	-	-	-	-	-	800
	C	-	-	1350	1350	1350	750
	B	1650	1650	950	950	950	750
	A	400	400	400	400	300	300

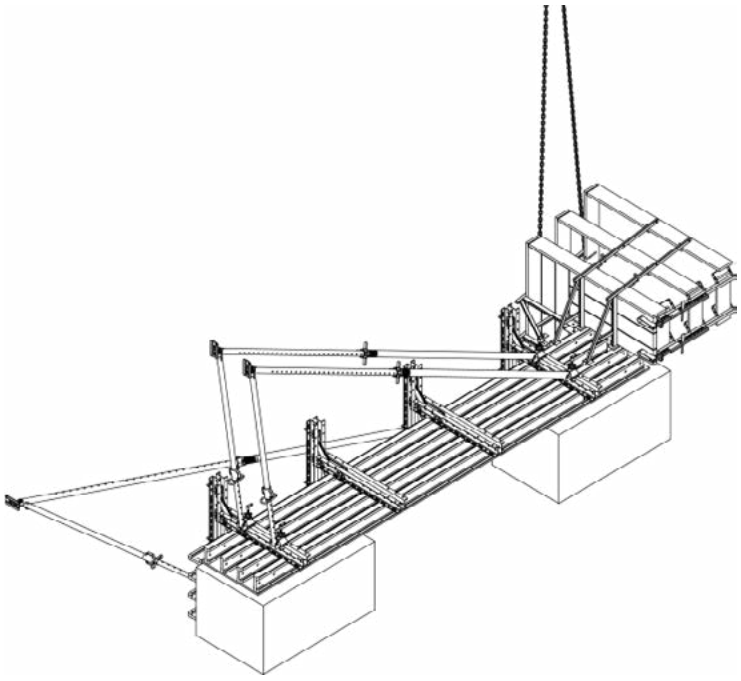
INSTRUCTIONS FOR ASSEMBLY AND USE

Platforms and all accessories must only be mounted to the element when it is face-down on the ground.
It must be possible for all formwork set-up, pouring and stripping operations to be carried out from safe workplaces.
A good way of creating safe workplaces is to use a mobile scaffold tower.



Preparations

-The half-shells are pre-assembled face-down on an assembly bench.
-Mount the beam wall brackets with timber deck to the face-down element.
-Mount the support braces to the face-down element.



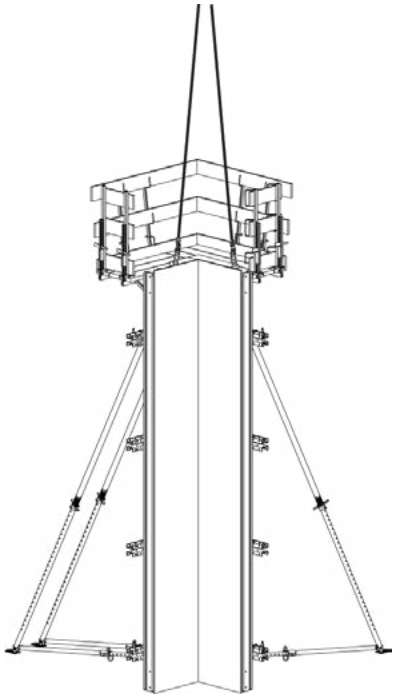
Erecting the formwork

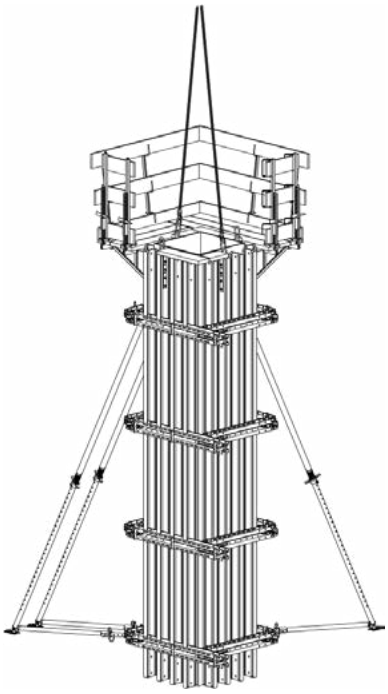
-Attach the crane slings to the lifting hooks provided.
-Raise the half-shell by crane and lift it to the erection location.
-Fix the supporting struts to the ground stably.
-Mount the top guard-rail boards.
-Detach the half-shell from the crane.

Setting up the second half-shell

Once the reinforcement has been placed, the form- work can be closed.
-Raise the second half-shell by crane and lift it to a erection location.
-Join the second half-shell to the first half-shell.
-Detach the half-shell from the crane.

Max. load:
1300 kg per lifting hook





Striking

-Remove any loose items from the formwork and platforms, or secure them firmly.
-Attach the first half-shell (the one without supporting strut) to a crane.
-Undo the connections between the first and second half-shell.
-Lift away the first half-shell by crane and place it down flat for intermediate storage.
-Attach the second half-shell (the one with supporting struts) to the crane.
-Undo the ground anchors of the supporting struts.
-Lift away the second half-shell by crane and transfer it to its next location, or place it down flat for intermediate storage.

The formwork tends to adhere to the concrete. When stripping the formwork, do not try to break concrete cohesion using the crane!
Risk of crane overload.
Use suitable tools such as wooden wedges or a special pry-bar to detach the formwork from the concrete.

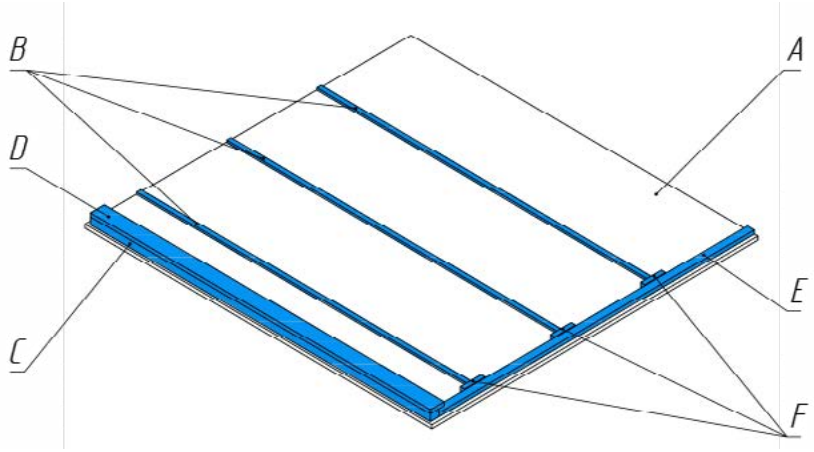
PANEL ASSEMBLING

To optimize the concrete finish and to ensure that the large-area formwork functions at its best, the elements must be assembled correctly and precisely.
Timber beams and steel walings are quickly assembled into finished elements, using simple connecting devices.

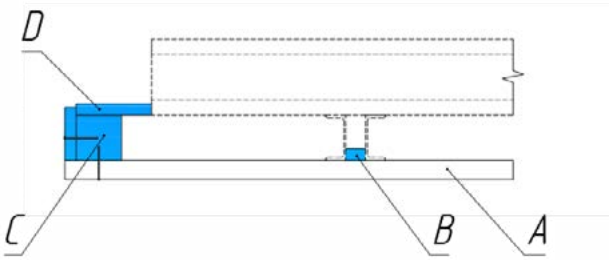
Assembly bench with stop bars

There must be a flat assembly bench (A) within reach of a crane, for assembling the formwork elements:

- Attach the end stop-bar for the H20 beams (C);
- Nail on the stop-bars for the steelwalings (B) (as per the prescribed spacing of the walings);
- Attach the end stop-bar for steel walings (D).

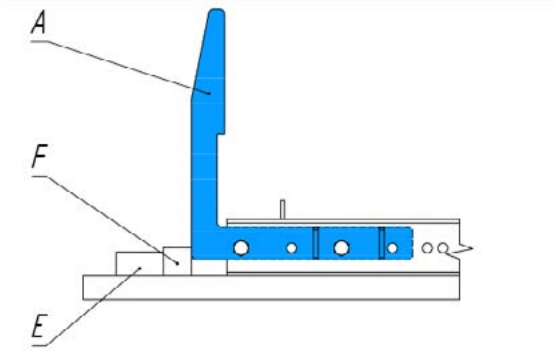


(A) Assembly bench
(B) Stop-bar for steel walings
(C) End stop-bar for H20 beams
(D) Detachable spacer batten
(E) End stop-bar for steel walings
(F) Squared tube 60x60x300 mm



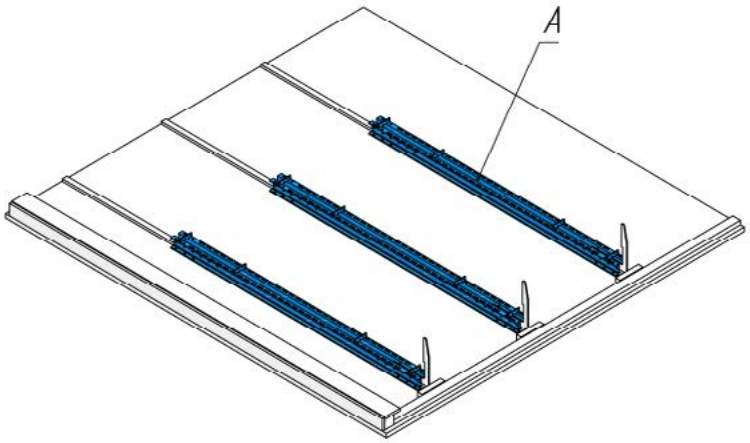
Placing the walings

• Use pins to fix Assembly angles (A) into the steelwalings(the steelwalings with connection plates facing upwards).
• The assembly angles are used to ensure exact alignment of the timber beams, and as stop-bars for the formwork sheets (B).



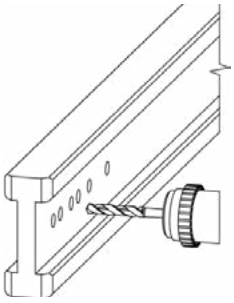
(A) Assembly angle
(B) Stop-bar for formwork sheets
(C) End stop-bar for steel walings
(D) Squared tube 60x60x300 mm

• Clean the assembly bench.
• Place the steelwalings, complete with the mounted assembly angles, onto the assembly bench.



(A) Steel waling

Use nails to prevent the walings sliding off.



Drilling extra holes in H20 beams

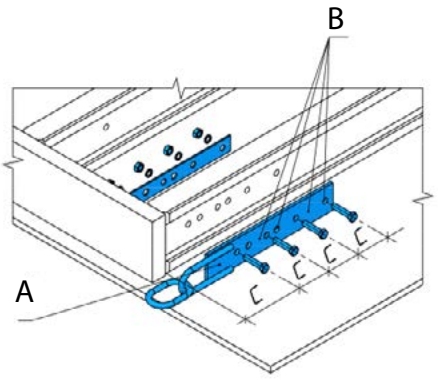
– Prepare the required number of wooden beams with such extra holes as are needed. Extra holes must be drilled for lifting hooks and stacking plates.

Installation of the lifting hooks

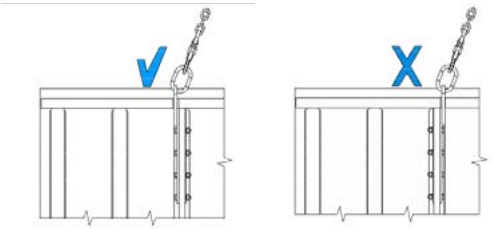
– Bolt the lifting-bracket (A) into 4 drilled holes. Tools needed: Reversible ratchet 1/2», Box nut 24, Fork spanner 24.

c ... 11.2 cm

– Extra drilled holes (B) Ø 18 mm.

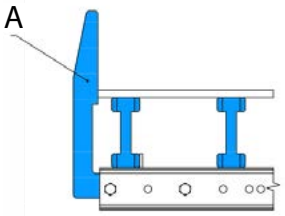


To make sure that the Lifting hooks are more mounted in the correct position!



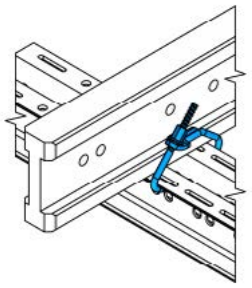
Placing and attaching the H20 beams

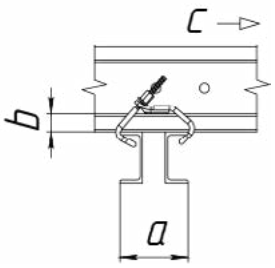
– Fasten on the H20 beams at the desired centers.



Fastening the H20 beams using Flange clamp

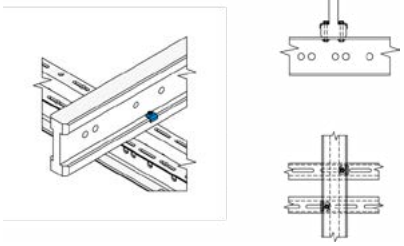
– for fastening a wooden H20 beam to a steel waling. (make sure that a space of at least 4 cm is left between the tie-rod and the H20 beam).
– Tools needed: Reversible ratchet 1/2»; Nut for box spanner 19; Extension piece 22 cm.
– Push the Flange-clamps into a H20 beam.
– Before tightening them to the steel waling, make sure that they are centrically positioned.
– Gently tighten on one side. Tap the stirrup with a hammer to ensure that the clamp is sitting correctly.
– Tighten the clamp on the other side and tap the stirrup with the hammer.
– Tighten the first side of the clamp completely.
a ... 13.5 - 17.0 cm
b ... 4.0 cm
c ... bottom of formwork
– Mount the flange clamps with the hexagonal nuts facing downwards (towards the bottom of the formwork). This protects the nuts against soiling during pouring.
Tools needed:
• Reversible ratchet 1/2";
• Box nut 19 1/2" L;
• Extension piece 22 cm.





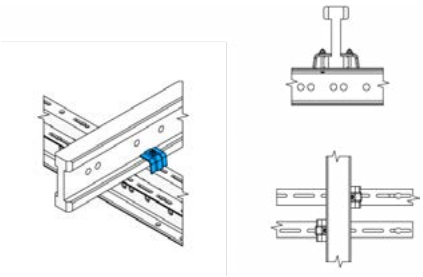
Fastening the H20 beams using Beam screws

• for screwing H20 beams anywhere onto the steel waling.
Tools needed:
• Drill bit, diam. 10 mm;
• Fork spanner 13/17.



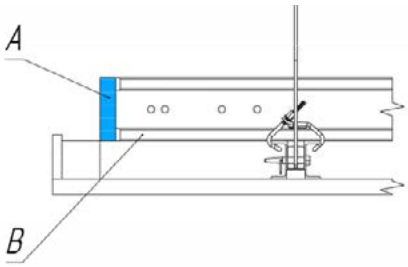
Fasting the H20 beams using Waling clamp

For clamping H20 beams anywhere onto the waling. Can also be used for adding H20 beams at the later stage.
Tools needed:
• Reversible ratchet 1/2";
• Box nut 13 1/2".



Mounting a bottom plank

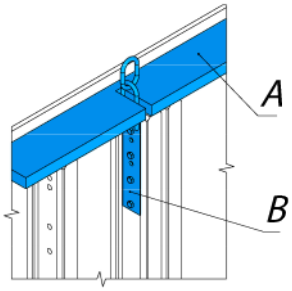
A bottom plank should be fitted to the bottom ends of the H20 beams.
• Remove the detachable spacer batten from the assembly bench.
• Fasten the bottom plank to each beam-flange using a 3.1x90 nail.



(A) Bottom plamk
(B) H20 beams

Mounting the pressure bracing

• There must always be a pressure bracing (A) between the Lifting hooks (B). Standard size of the pressure plate 200x50 mm
• The gap between the two Lifting hooks must be firmly braced, without any play, to prevent any oblique pull being applied to the H20 beams. This means that the recesses must be profiled very precisely into the web of the beam.
• Fasten the pressure bracing to each beam-flange using a 3.1x90 nail.



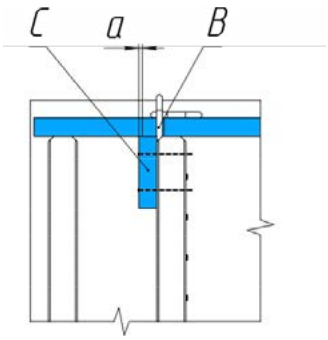
(A) Pressure bracing
(B) Lifting hook

If the lifting hook is mouted on the 2nd beam from the outside, the top plank must be supported where it has been recessed.

Nail a supporting board onto the H20 beam.

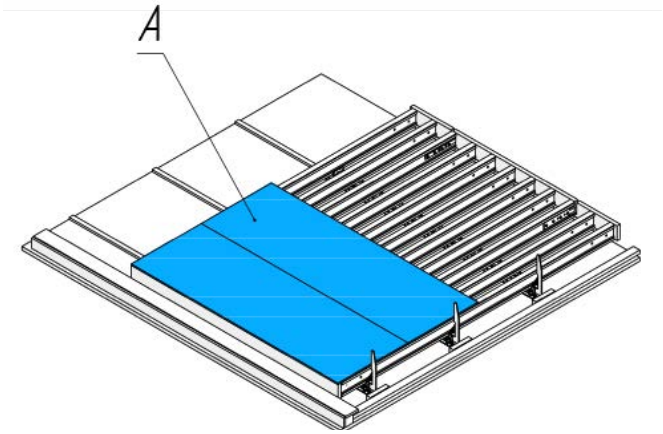
min. 10 mm (minimum support surface)

(B) Lifting hook
(C) e.g. 200x200 mm board



Fixing the formwork sheets

- Place the formwork sheets (A) up against the assembly angles and nail them onto each H20 beam. Make sure that the grain of the face layer runs at right angles to the timber beams.
- Press the joints between the sheets tightly together prior to fixing.

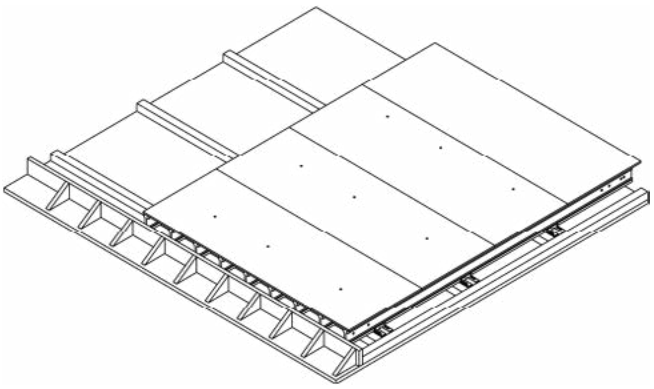


Drilling the form-tie holes

- Drill as specified in the formwork plan.

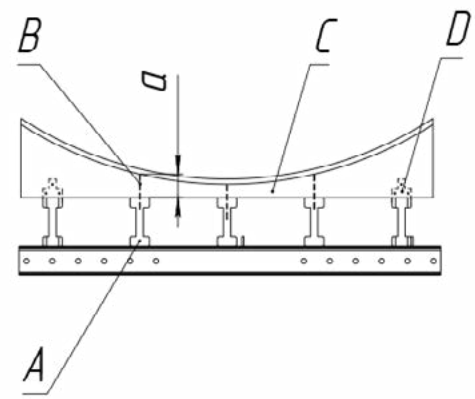
Form-tie system 15.0: Ø 20 mm (can be sealed with Universal plug R20/25) .

Lift the assembled elements upright with the crane and complete them by adding brackets and support braces. Number the elements as specified in the formwork plan, and transport them by crane either to the intermediate storage location or directly to where they are to be used.

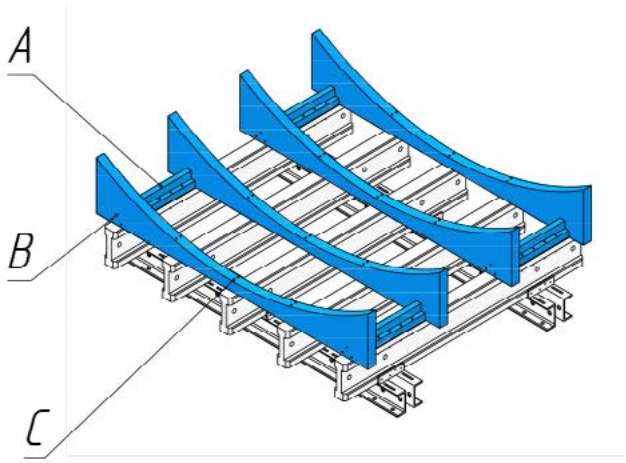


Mounting profiled wooden templates

Up to a max.nailing thickness (a) of 50 mm, the profiled wooden template can be nailed directly onto the beam.
Where the profiled wooden template are thicker than this, they are nailed from the side through blocks screwed onto the beams. These 'beam-blocks' also prevent the profiled wooden template from tipping over on their sides.
The blocks are cut to size from used wooden beams.



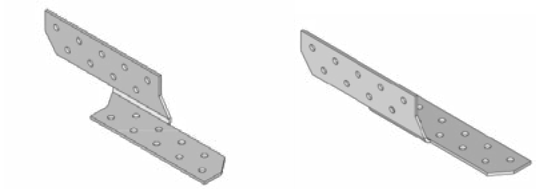
(A) H20 beam
(B) Nailed joint
(C) Wooden template
(D) Beam block



(A) Beam block screwed onto H20 beam
(B) Profiled wooden template nailed onto wooden beam
(C) Profiled wooden template nailed onto beam-block

Rafter plates right / left

Can be used for various timber joints such as H20 beams that cross over one another, or joints between H20 beams and squared timbers or profiled wooden templates.



STRUCTURAL DESIGN

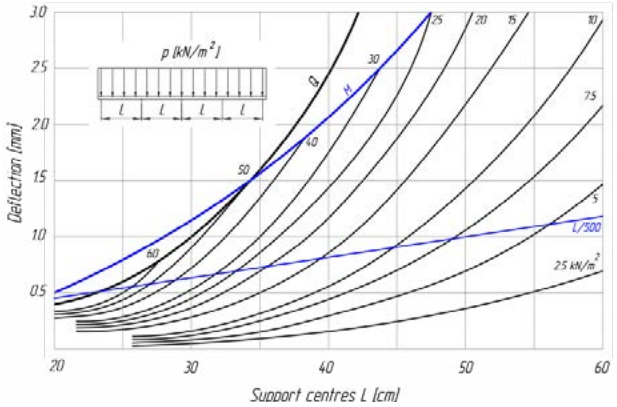
Deflection diagrams

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

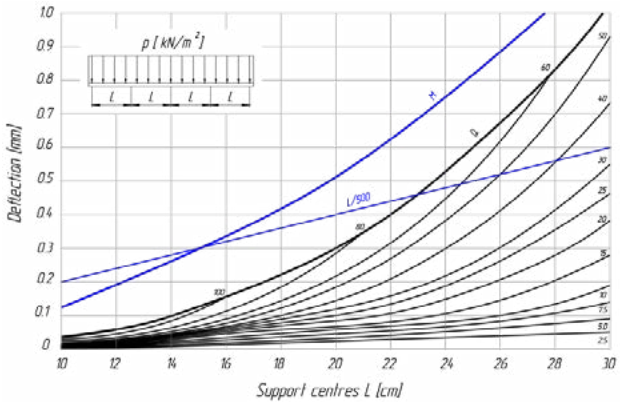
The fibre direction of the face ply relative to the supports is of no significance.

18 mm



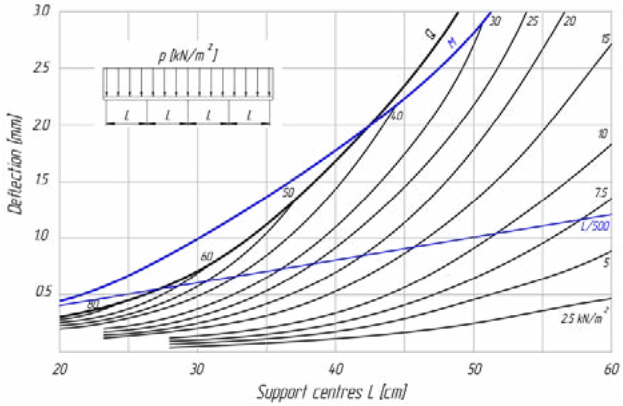
Flexural stiffness EI=3.1 kNm²/m (15% timber moisture content)
M ... permitted bending moment
Q ... permitted shear force

18 mm - detail view



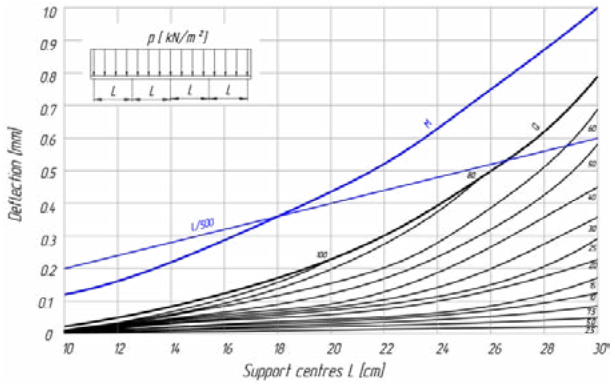
Flexural stiffness EI=3.1 kNm²/m (15% timber moisture content)
M ... permitted bending moment
Q ... permitted shear force

21 mm



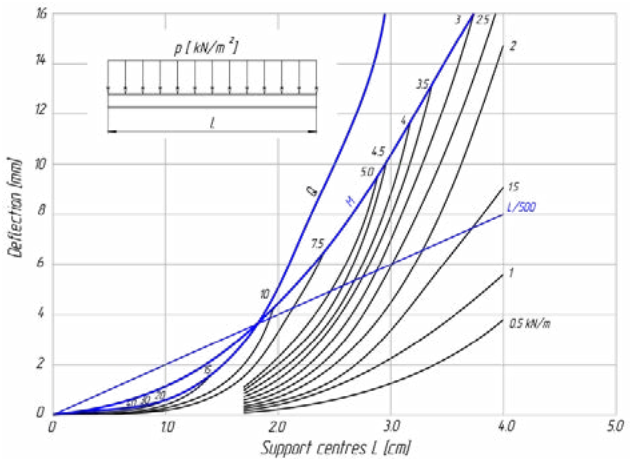
Flexural stiffness EI=4.7 kNm^2/m (15% timber moisture content)
M ... permitted bending moment
Q ... permitted shear force

21 mm- detail view



Flexural stiffness EI=4.7 kNm^2/m (15% timber moisture content)
M ... permitted bending moment
Q ... permitted shear force

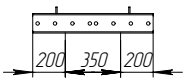
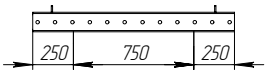
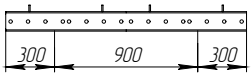
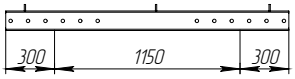
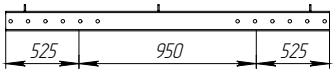
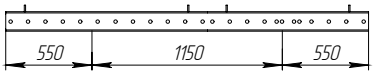
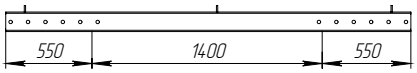
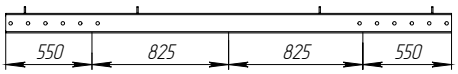
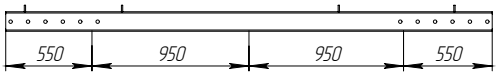
H20 beam



M ... permitted bending moment
Q ... permitted shear force
p ... actual load (service load)

Vertex 60 panel design

Waling 12 (Waling 10) spacing of tie-rods on standard elements

Length [m]	Spacing of form-ties on standard elements
0.75*	
1.00*	
1.25	
1.50	
1.75	
2.00	
2.25	
2.50	
2.75	
3.00	
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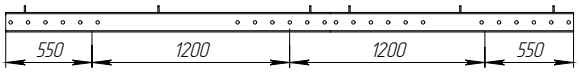
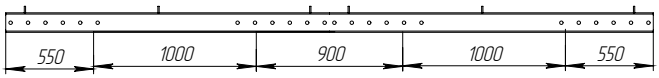
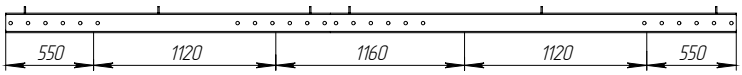
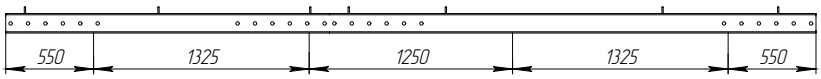
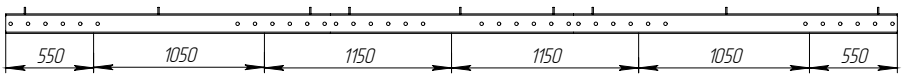
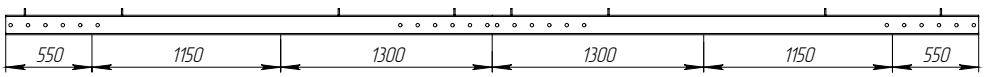
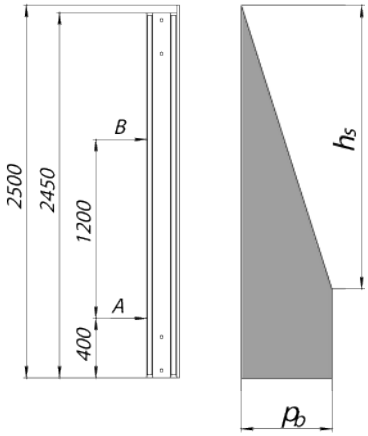
3.50	
4.00	
4.50	
5.00	
5.50	
6.00	

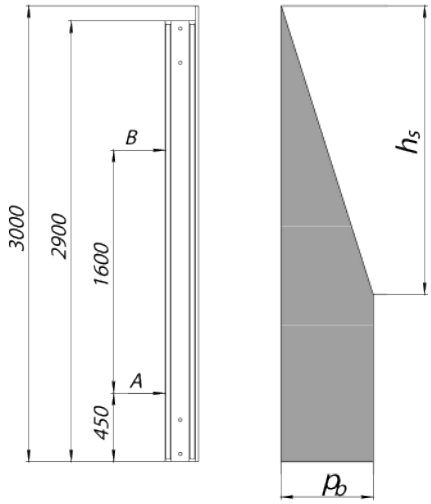
* - Normally only used as a compensating element, with one central tie-rod

Concrete height 2.50 m



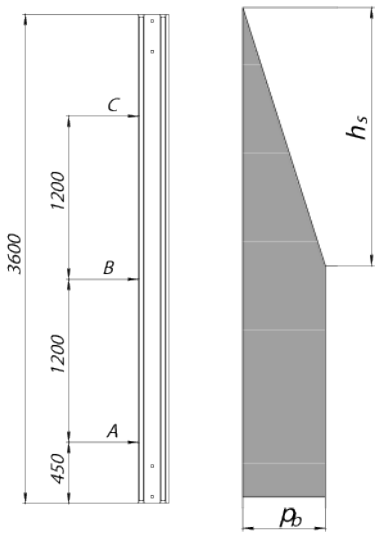
Pressure of fresh concrete [kN/m^2]	30	40	50	60	70
Beam centres [cm] plywood 21 mm thick	63	48	42	41	0
Bean centres [cm] plywood 18 mm thick	54	41	36	35	0
Max. span deflection [mm]	0.43	0.43	0.35	0.29	0
Max. cantilever deflection [mm]	0.15	0	0	0.06	0
Waling load B [kN/m]	28	29	29	28	0
Waling load A [kN/m]	29	39	46	50	0

Concrete height 3.00 m



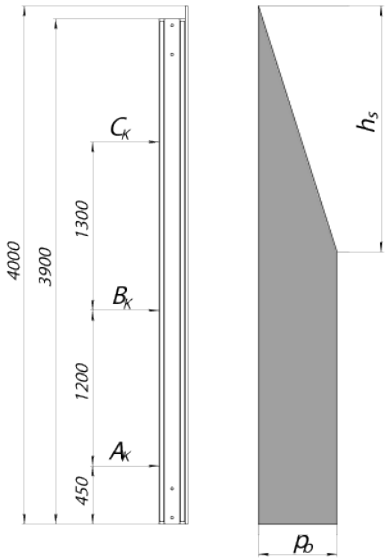
Pressure of fresh concrete [kN/m^2]	30	40	50	60	70
Beam centres [cm] plywood 21 mm thick	47	35	29	26	26
Bean centres [cm] plywood 18 mm thick	40	30	25	22	21
Max. span deflection [mm]	1.54	1.56	1.45	1.28	1.17
Max. cantilever deflection [mm]	0	0	0	0	0
Waling load B [kN/m]	35	38	40	39	39
Waling load A [kN/m]	37	50	60	69	73

Concrete height 3.60 m



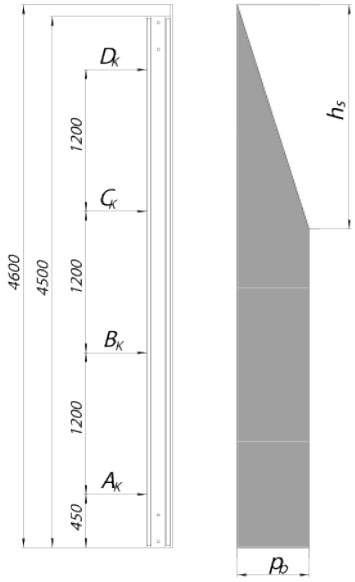
Pressure of fresh concrete [kN/m²]	30	40	50	60	70
Beam centres [cm] plywood 21 mm thick	56	44	36	31	27
Bean centres [cm] plywood 18 mm thick	48	38	31	26	23
Max. span deflection [mm]	0.31	0.26	0.29	0.32	0.29
Max. cantilever deflection [mm]	0	0.10	0.06	0.05	0.09
Waling load C [kN/m]	21	21	21	20	20
Waling load B [kN/m]	39	50	57	61	62
Waling load A [kN/m]	31	41	52	62	72

Concrete height 4.00 m



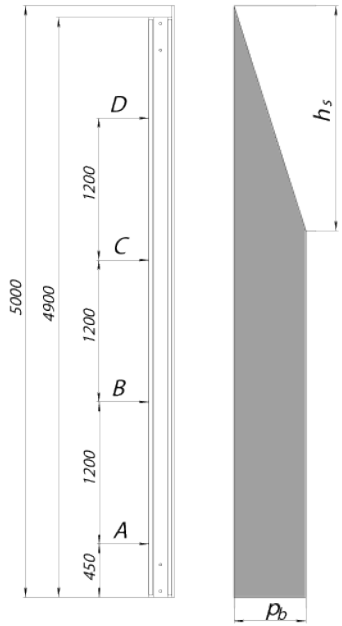
Pressure of fresh concrete [kN/m²]	30	40	50	60	70
Beam centres [cm] plywood 21 mm thick	52	39	33	28	26
Bean centres [cm] plywood 18 mm thick	44	33	28	24	22
Max. span deflection [mm]	0.41	0.42	0.36	0.32	0.37
Max. cantilever deflection [mm]	0.32	0.08	0.05	0.05	0.11
Waling load C [kN/m]	30	32	32	31	31
Waling load B [kN/m]	41	55	66	74	77
Waling load A [kN/m]	31	41	52	63	74

Concrete height 4.60 m



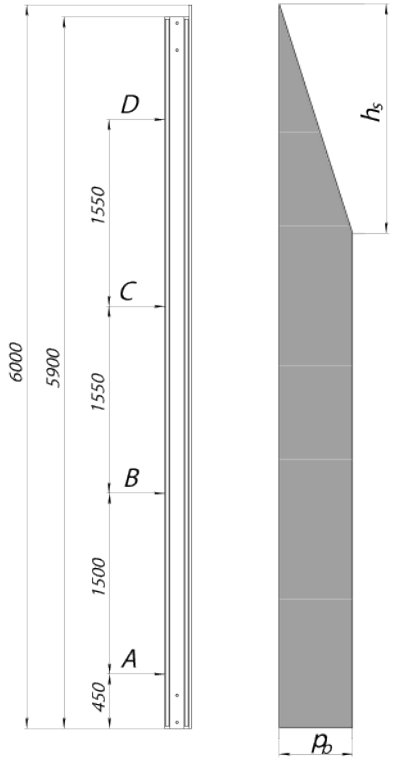
Pressure of fresh concrete [kN/m²]	30	40	50	60	70
Beam centres plywood 21 mm thick	55	44	35	29	25
Bean centres plywood 18 mm thick	47	38	30	25	21
Max. span deflection [mm]	0.4	0.3	0.2	0/3	0.3
Max. cantilever deflection [mm]	0.1	0.1	0.1	0/1	0.1
Waling load D [kN/m]	15	15	14	14	14
Waling load C [kN/m]	39	47	53	54	54
Waling load B [kN/m]	37	49	62	74	84
Waling load A [kN/m]	31	41	51	62	72

Concrete height 5.00 m



Pressure of fresh concrete [kN/m²]	30	40	50	60	70
Beam centres [cm] plywood 21 mm thick	60	44	35	29	25
Bean centres [cm] plywood 18 mm thick	51	38	30	25	21
Max. span deflection [mm]	0.26	0.26	0.26	0.25	0.25
Max. cantilever deflection [mm]	0.85	0.45	0.38	0.38	0.35
Waling load D [kN/m]	29	30	30	30	29
Waling load C [kN/m]	36	48	57	57	64
Waling load B [kN/m]	37	49	62	62	87
Waling load A [kN/m]	31	41	52	52	72

Concrete height 6.00 m

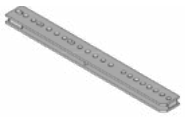
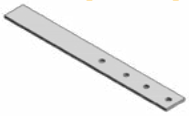


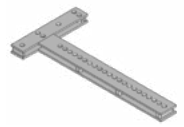
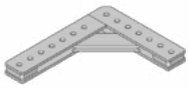
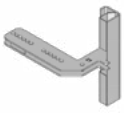
Pressure of fresh concrete [kN/m²]	30	40	50	60	70
Beam centres [cm] plywood 21 mm thick	44	33	27	22	19
Bean centres [cm] plywood 18 mm thick	38	28	23	19	16
Max. span deflection [mm]	0.71	0.73	0.64	0.62	0.61
Max. cantilever deflection [mm]	0	0	0	0	0
Waling load D [kN/m]	32	34	35	35	34
Waling load C [kN/m]	48	65	79	89	95
Waling load B [kN/m]	48	64	80	97	114
Waling load A [kN/m]	34	45	56	67	78

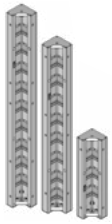
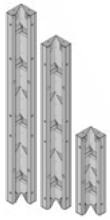
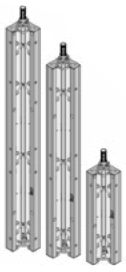
COMPONENT OVERVIEW

Item		[kg]	Article nº
Waling 12 	0.50m	10,92	21 050 000
	0.75m	15,96	21 075 000
	1.00m	21,00	21 100 000
	1.25m	26,25	21 125 000
	1.50m	31,82	21 150 000
	1.75m	37,07	21 175 000
	2.00m	42,32	21 200 000
	2.25m	47,46	21 225 000
	2.50m	52,71	21 250 000
	2.75m	58,28	21 275 000
	3.00m	63,53	21 300 000
	3.25m	69,00	21 325 000
	3.50m	75,33	21 350 000
	3.75m	80,21	21 375 000
	4.00m	85,47	21 400 000
	4.50m	95,99	21 450 000
	5.00m	106,37	21 500 000
	6.00m	128,63	21 600 000
Waling 10 	0.50m	10,92	22 050 000
	0.75m	16,17	22 075 000
	1.00m	21,42	22 100 000
	1.25m	26,67	22 125 000
	1.50m	32,45	22 150 000
	1.75m	37,70	22 175 000
	2.00m	41,00	22 200 000
	2.25m	48,30	22 225 000
	2.50m	53,55	22 250 000
	2.75m	59,22	22 275 000
	3.00m	64,48	22 300 000
	3.25m	70,04	22 325 000
	3.50m	76,34	22 350 000
	3.75m	81,27	22 375 000
	4.00m	86,94	22 400 000
Joint plate Vertex 	3.00m	42,85	23 104 000
	4.00m	55,35	23 106 000

Item		[kg]	Article nº
Stripping plate Vertex 	3.00m 4.00m	71,93 79,80	23 108 000 23 110 000
Corner waling Vertex 	10 12	24,17 23,81	23 102 000 23 100 000
Lifting hook Vertex 		6,41	23 200 100
Stacking plate Vertex 		8,82	23 202 100
Flange clamp Vertex 		1,16	23 300 100
Beam screw 	60 110	0,07 0,09	23 302 100 23 304 100

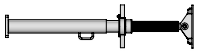
Item		[kg]	Article nº
Beam screw Vertex W 		0,24	23 306 100
Beam clamp Vertex 	12 10	1,38 1,27	23 308 100 23 310 100
Connecting pin 		0,39	23 400 100
Spring cotter 		0,05	23 402 100
Connecting plate Vertex 		6,47	23 404 000
Adjustable connecting plate Vertex 		9,69	23 406 000
Anchoring plate Vertex 		7,17	23 408 100
Half splice plate Vertex 		5,64	23 410 000

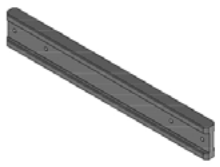
Item		[kg]	Article nº
Shaft corner plate Vertex 		11,87	23 412 000
Column corner plate Vertex 		13,34	23 414 000
Shaft waling squaring plate 		9,18	23 416 000
Corner tie bracket Vertex 		4,46	23 418 000
Corner hinge plate Vertex 		18,43	23 420 100
Corner spindle Vertex 		20,10	23 422 100
Transition plate 	12/18 12/21 10/18 10/21	18,70 19,05 17,90 18,25	23 500 100 23 502 100 23 504 100 23 506 100

Item		[kg]	Article nº
Clamp device Varimax 		3,90	11 902 100
Adjustable clamp Varimax 		6,00	11 904 100
Internal angle Varimax  Options available: xx xxx 000 - Powder coated; xx xxx 200 - Hot dip galvanized; Custom size on inquiry	0.30x3.30m 0.30x3.00m 0.30x2.85m 0.30x2.70m 0.30x1.35m	121,80 98,70 108,47 103,49 51,90	11 710 000 11 720 000 11 730 000 11 740 000 11 750 000
Joint angle internal Varimax  Options available: xx xxx 000 - Powder coated; xx xxx 200 - Hot dip galvanized; Custom size on inquiry	0.30x3.30m 0.30x3.00m 0.30x2.85m 0.30x2.70m 0.30x1.35m	141,23 129,15 120,44 116,55 61,36	11 712 000 11 712 000 11 732 000 11 742 000 11 752 000
Stripping corner Varimax  Options available: xx xxx 000 - Powder coated; xx xxx 200 - Hot dip galvanized; Custom size on inquiry	0.30x3.30m 0.30x3.00m 0.30x2.85m 0.30x2.70m 0.30x1.35m	207,90 190,30 176,20 168,70 97,65	11 718 000 11 728 000 11 738 000 11 748 000 11 758 000

Item		[kg]	Article nº
Stripping spindle Varimax 		3,71	11 942 100
Wall bracket H20 		11,46	23 700 100
Guide rail clamp 		12,40	52 400 100
Handrail post 		12,85	52 402 100
Spindle strut T7 	1.26-1.89m 1.42-2.05m 1.92-2.55m 2.42-3.05m 2.97-3.60m	23,26 24,29 27,56 33,41 36,89	23 800 100 23 802 100 23 804 100 23 806 100 23 808 100

Item		[kg]	Article nº
Supporting strut 340 		37,38	11 928 100
Supporting strut 540 		56,91	11 930 100
Rafter plates 	right left	0,09 0,09	52 306 100 52 308 100
Superplate 	15	1,22	95 200 100
Wing nut 	15	0,38	95 204 100

Item	[kg]	Article nº
Adjustable plumbing strut 		
Spindle head 	3,48	11 932 100
Spindle element without end-hinge 	36,62	11 934 000
Extension strut 3.70 m 	78,75	11 936 000
Extension strut 2.40 m 	54,13	11 938 000
Spindle element with end-hinge 	43,81	11 940 000
Star-shaped nut 15 	0,40	95 206 100

Item		[kg]	Article nº
Tie rod 15.0 mm 	0.50m	0,80	92 050 300
	0.75m	1,20	92 075 300
	1.00m	1,60	92 100 300
	1.25m	2,00	92 125 300
	1.50m	2,40	92 150 300
	1.75m	2,80	92 175 300
	2.00m	3,20	92 200 300
	2.25m	3,60	92 225 300
	2.50m	4,00	92 250 300
	2.75m	4,40	92 275 300
	3.00m	4,80	92 300 300
	6.00m	14,40	92 600 300
H20 beam 	1.45m	7,25	91 145 500
	1.80m	9,00	91 180 500
	1.95m	9,75	91 195 500
	2.15m	10,75	91 215 500
	2.45m	12,25	91 245 500
	2.65m	13,25	91 265 500
	2.90m	14,50	91 290 500
	3.30m	16,50	91 330 500
	3.60m	18,00	91 360 500
	3.90m	19,50	91 390 500
	4.50m	22,50	91 450 500
	4.90m	24,50	91 490 500
	5.90m	29,50	91 590 500

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