PERI®

TRIO

The most successful panel formwork with only one connecting component

TRIO-L Alu
TRIO 330
TRIO Structure
TRIO Column

Edition 03/2010

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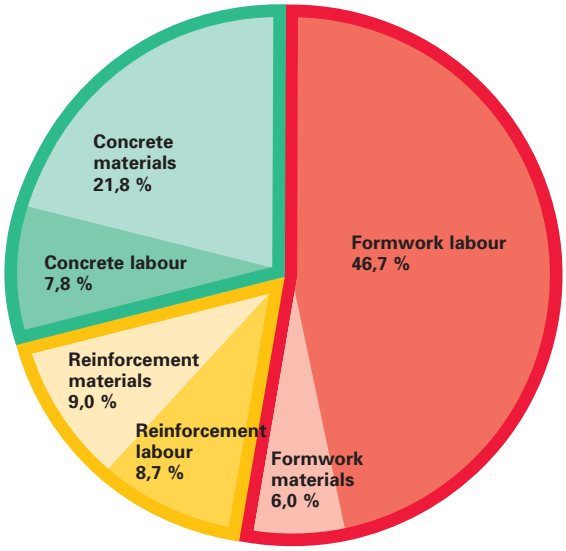
Contents

The continuing rise in site labour costs necessitates ever faster and simpler formwork systems, for the following reasons:

Most of the expenditure on a reinforced concrete frame is down to the shuttering work, where labour costs exceed material costs several times.

The number of individual parts to be moved determines the shuttering time and hence costs.

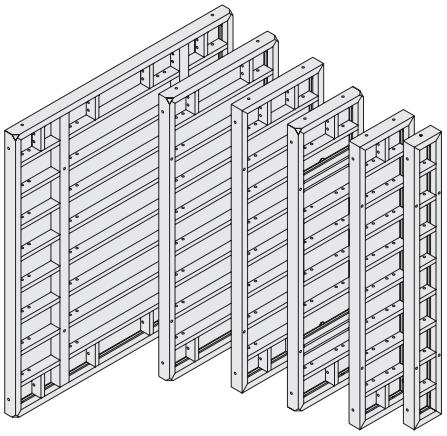


Cost of a 300 mm thick concrete wall:

The pie chart shows that almost 50% of the total costs are down to formwork labour. Reducing this contribution is the most effective way of improving your bottom line.

There has to be a reason why PERI TRIO has become the most successful panel formwork

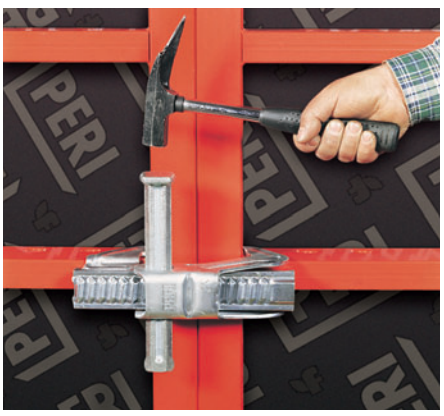
PERI's development engineers have focused on minimising the shuttering costs and the number of individual components.



Only 6 panel widths
for any layout

TRIO can be used
On small ...

... and large sites



The BFD **is the only coupler required.**

Standard panel joint

External and internal corners

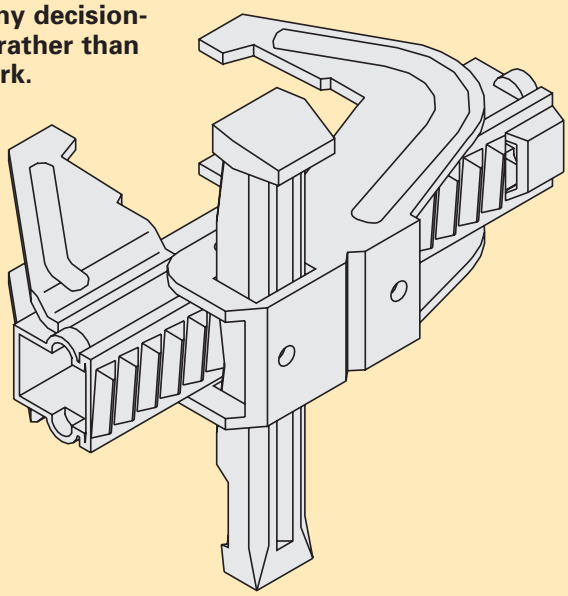
Height extensions

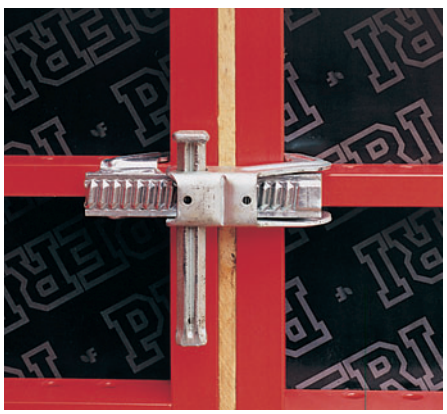
Just 1 component for all connections
The BFD Alignment Coupler

Articulated corners

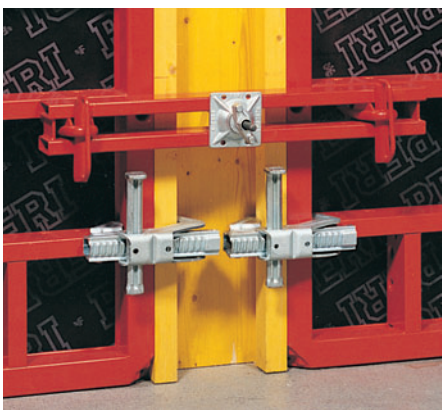
The BFD alignment coupler alone is sufficient reason for many decision-makers to choose TRIO rather than any other panel formwork.

BFD is the German acronym for fastening, aligning and tightening in a single operation.



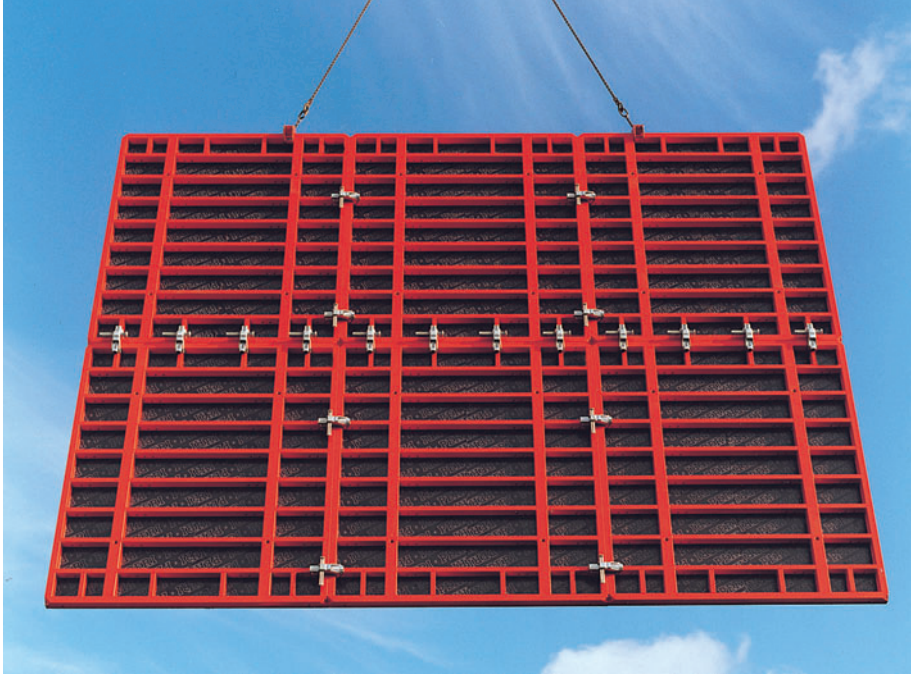


Spanning filler timbers up to 100mm thick



Holding plywood fillers

Acting as a clamp



Panel extensions

Timber extensions

Holding stopends

The BFD alignment coupler allows all departments to achieve their objectives faster and hence more cost-effectively:

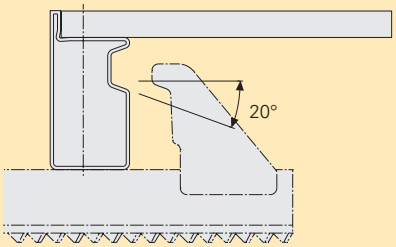
Design,
because just one multi-purpose component allows quicker design and equipment scheduling.

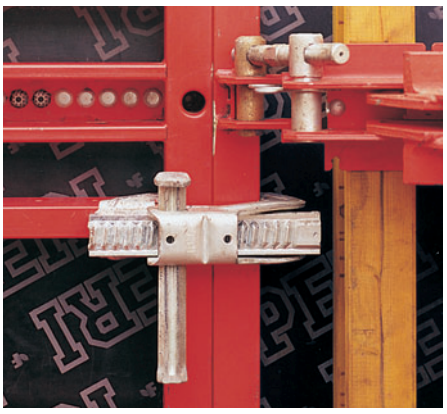
The yard,
because just one multi-purpose component simplifies stocking and prevents delivery errors.

The site,
because just one multi-purpose component avoids time-consuming searching and sorting.

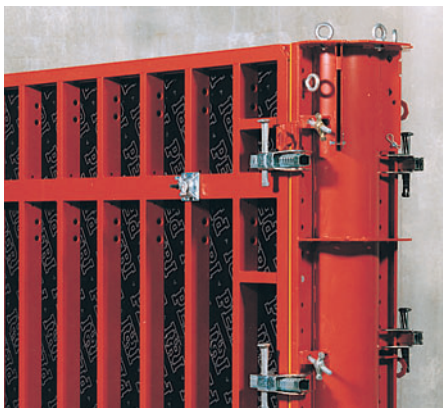
The angle of the engagement slot is a special feature of the BFD connection.

It directs the clamping force, fastens, aligns and tightens in that order.

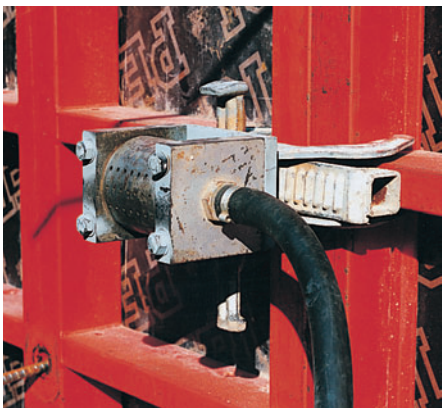




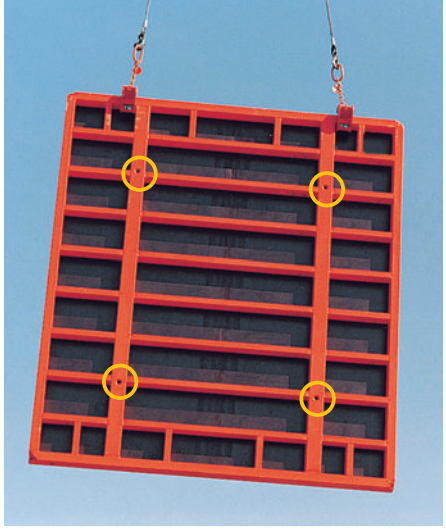
Combining TRIO with RUNDFLEX



Combining TRIO with SRS circular column formwork

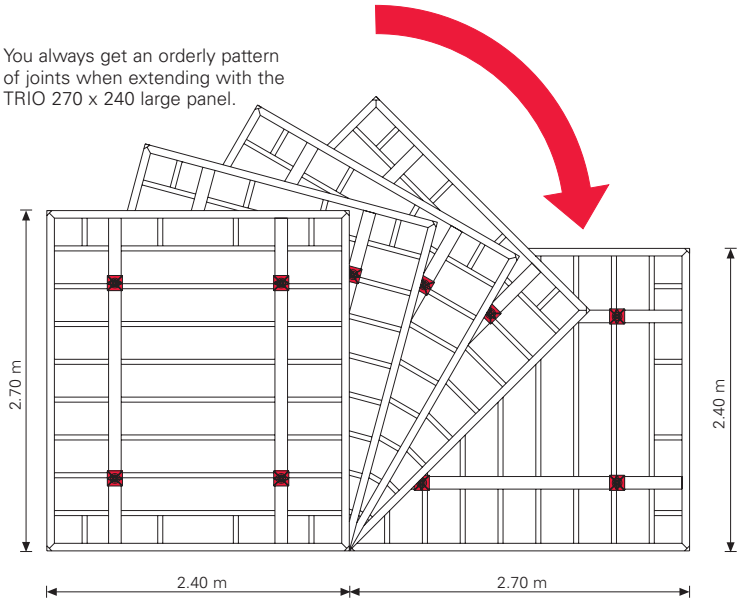


Connection of external vibrators

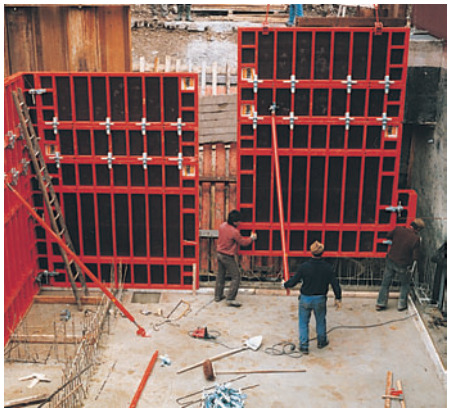


The large (2.70 x 2.40m) panel with internal tie holes.

You always get an orderly pattern of joints when extending with the TRIO 270 x 240 large panel.



The large panel with 2 heights and 2 widths



Extension **without** additional extension panels.

The large (2.70 x 2.40m) TRIO panel has major advantages:

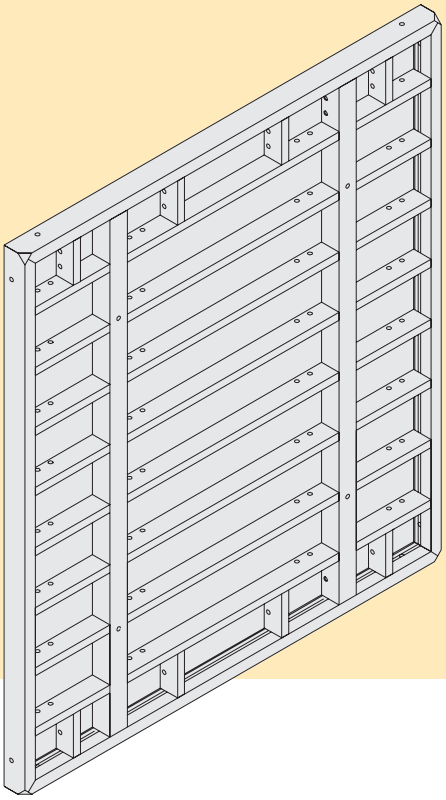
2 heights and 2 widths
for maximum utilisation of the full area of the panel

Internal tie points
no plugging of tie holes, simple stopends and wall junctions

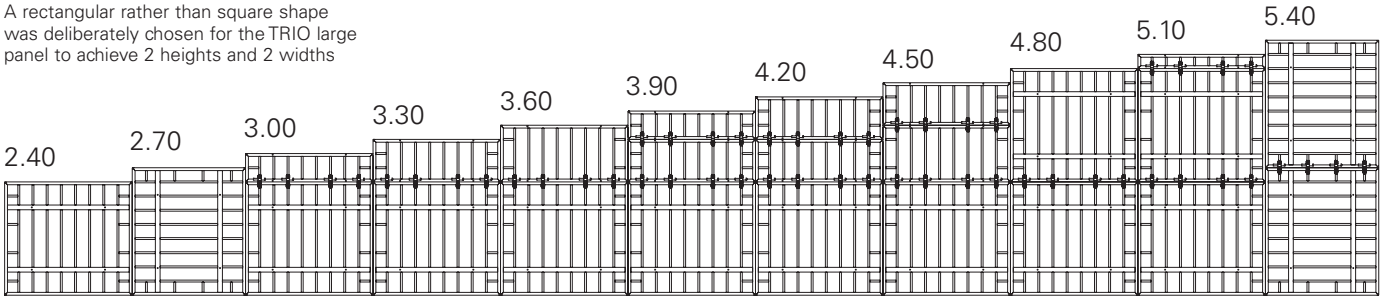
High structural stiffness
reduces deflection

Orderly pattern of joints
no extension panels required

Optimum size for transportation
2.40m wide panel fits on any lorry

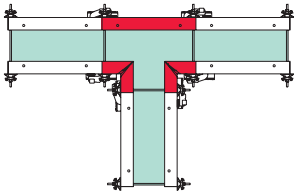


A rectangular rather than square shape was deliberately chosen for the TRIO large panel to achieve 2 heights and 2 widths

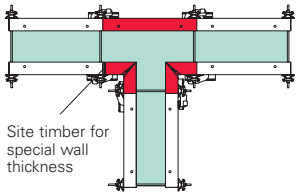


T-junctions
90 panel and internal corner only for any wall thickness

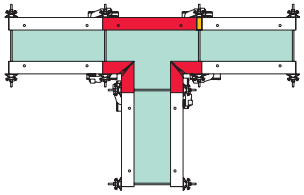
Standard wall thickness 300mm



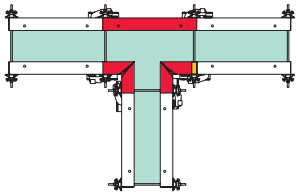
Special wall thickness



Wall thickness > 300mm
WDA on outside

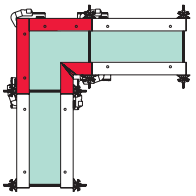


Wall thickness < 300mm
WDA on inside

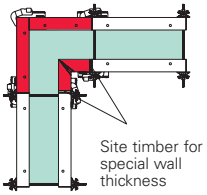


Corners
60 and 72 panel with internal corner for any wall thickness

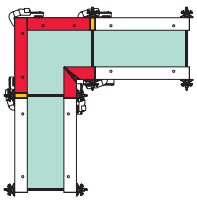
Standard thickness 300mm



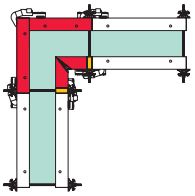
Special wall thickness



Wall thickness > 300mm
WDA on outside



Wall thickness < 300mm
WDA on inside



Only 6 panel widths for any layout

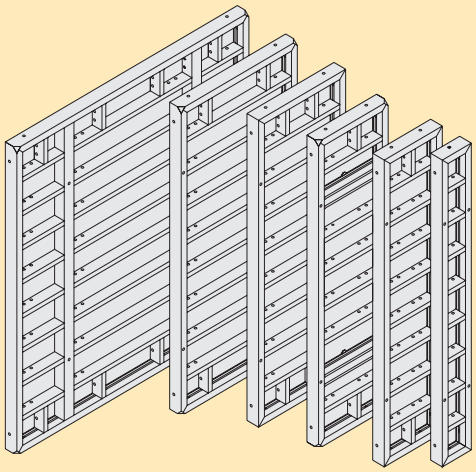
PERI TRIO requires only 6 different panel widths

Practical 300mm increments in panel size:

2.4m wide panel
1.2m wide panel
0.9m wide panel
0.6m wide panel
0.3m wide panel

and the 720mm wide TRIO panel reduce stocks and increase utilisation.

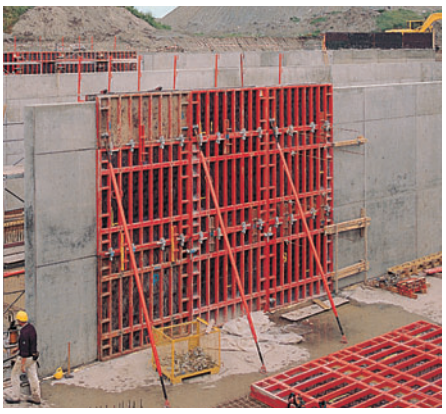
TRIO does not require any special corner panels.
The 600 and 720mm panels needed for corners can also be used in straight walls.



Typical example of modern housing construction:
oblique angles, returns and different wall thicknesses.

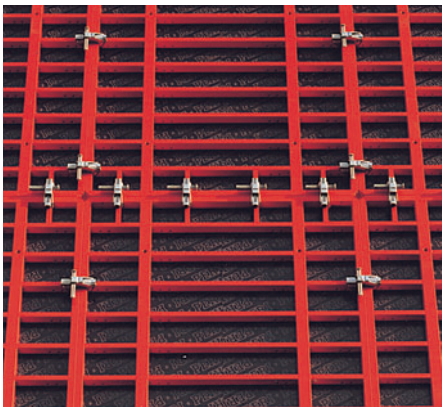
Standard panels for circular structures

Panels being used on their side for foundations



TRIO panels on their side and extended to a height of 6.0m

ECC powder coating
prevents concrete adhesion and makes cleaning easier.



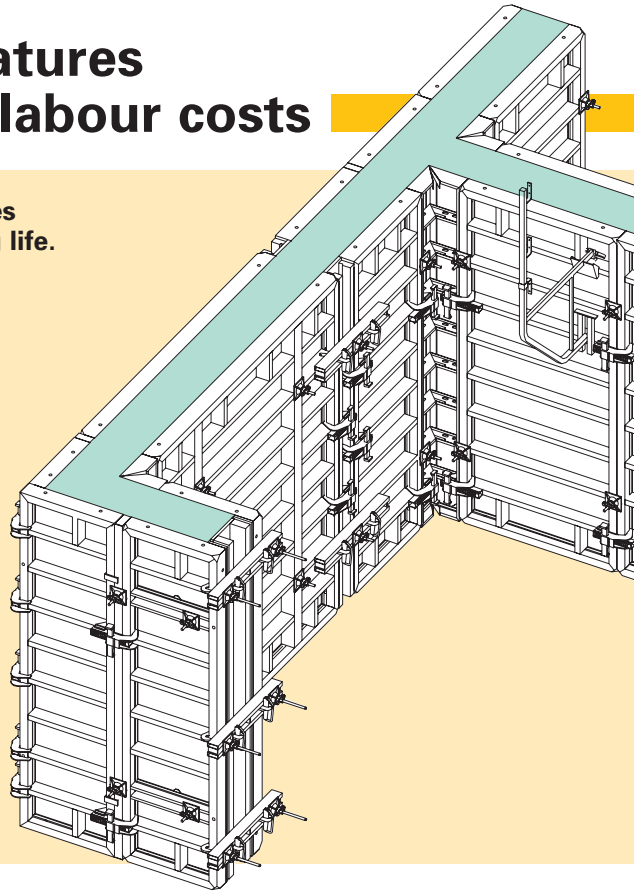
Closed panel sections
ensure high torsional stability and are easy to keep clean.

Struts all round
allow the TRIO panels to be used upright or on their sides, and ensure a stiff connection for extensions.

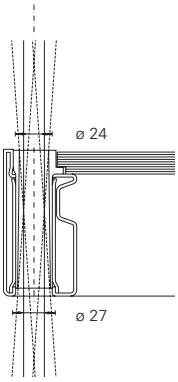
Special TRIO features
Details that cut labour costs

Carefully thought out features for quick shuttering and long life.

The life of a form and speed of shuttering are substantially improved by these details.



Patented tie holes allow tie points blocked with concrete to be cleared easily, since TRIO panels have tapered plastic sleeves that pass right through the frame



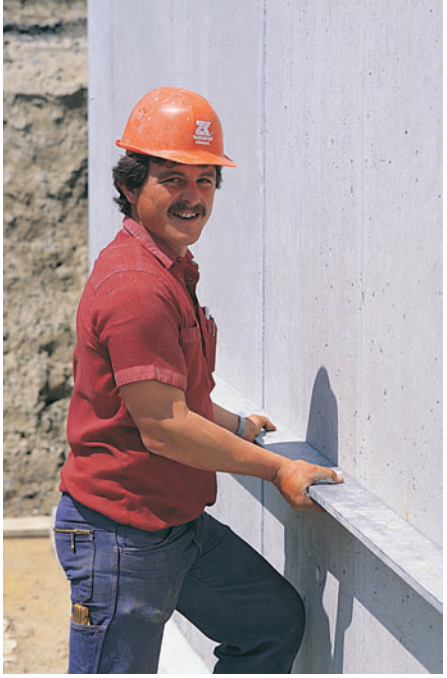
One blow is enough to unblock tie holes.

to allow DW 15 tie rods **angled** at 6° in any direction, as well as the use of the DW 20 tie rod.

Levering corners
make it possible to move the panel into position without using a hammer.

Repeated use of standard system components: ingenious solutions increase the versatility of individual components.

A single articulated panel for inside and outside corners
reduces the number of different components.



TRIO is ideal where extremely flat surfaces are required

TRIO satisfies highest demands on evenness.

With panel height of 2.70 m:
81 kN/m² uniformly distributed load, line 6, Table 3, DIN 18202
67.5 kN/m² triangular load, line 7, Table 3, DIN 18202

With panel height of 3.30 m:
83 kN/m² uniformly distributed load, line 6, Table 3, DIN 18202
82.5 kN/m² triangular load, line 7, Table 3, DIN 18202

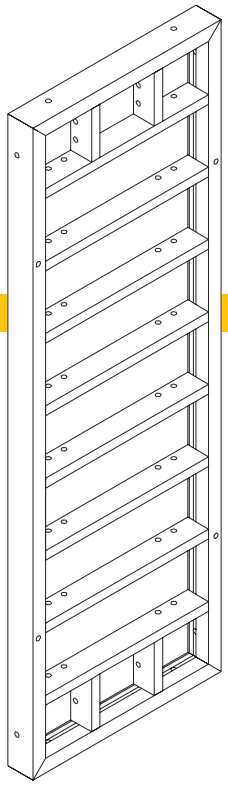
PERI TRIO has met these requirements since production start. That is why also older models of TRIO panels permit these high fresh concrete pressures.
P.S.: Send for the test report.

In practice this means:
Fast concreting
Smaller deflections

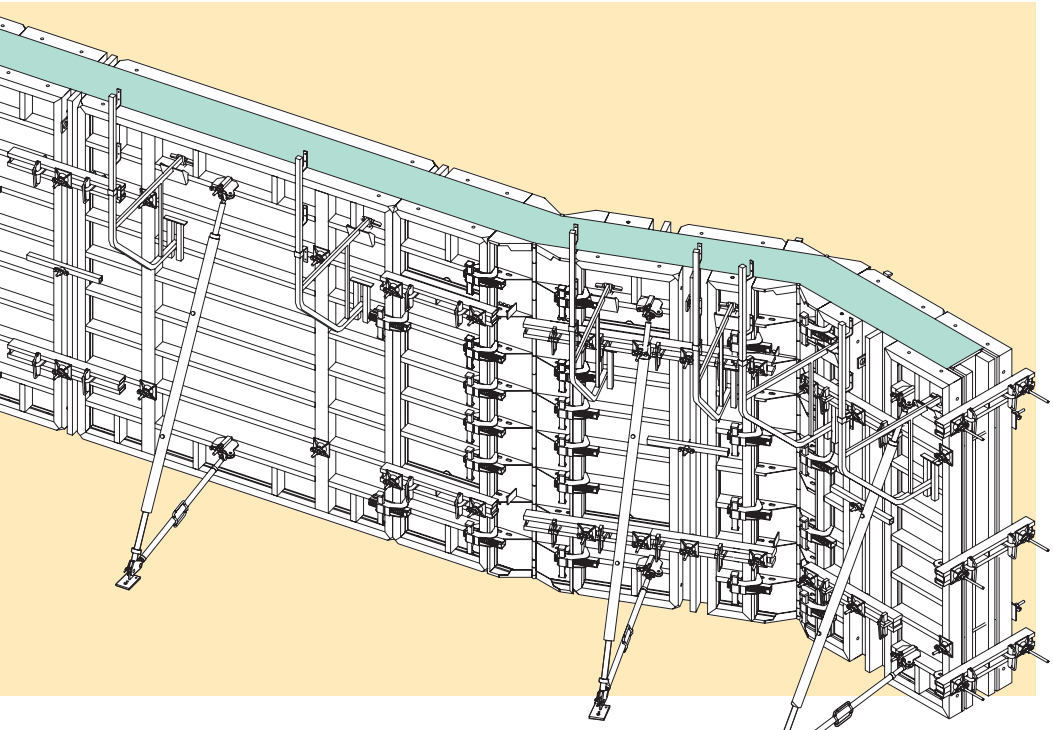
GSV

geprüft
durch neutrales Prüfinstitut

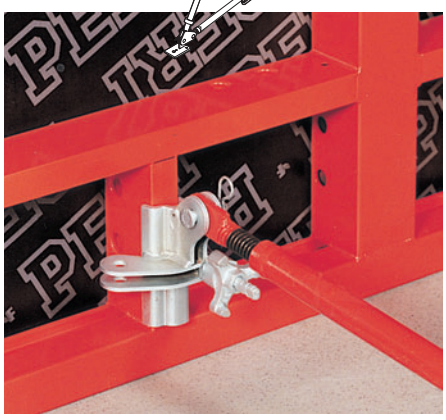
Güteschutz**v**erband
Beton**s**chalungen



TRIO panels have connection holes for accessories in all struts.



Connection holes everywhere with securely fitted sleeves in the TRIO panels. Accessories such as push-pull props and concreting scaffolds can be used wherever they are needed.



Push-pull prop and kicker brace on horizontal or vertical strut.

Scaffold brackets on horizontal or vertical strut.

TRIO-L (aluminium)

TRIO 330

TRIO Structure

TRIO column

Adaptable and versatile, TRIO for all applications

PERI TRIO for all projects
The universal panel formwork that is versatile in application. For small and large contractors alike.

It doesn't matter where:
Housing projects
Industrial structures
Transport Infrastructures
Special projects
etc, etc ...

Housing projects

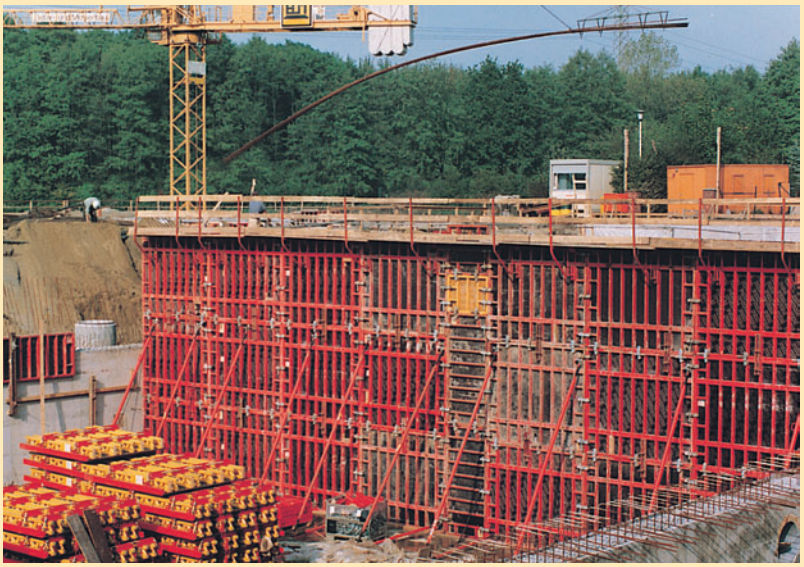
TRIO Repliable

TRIO Housing

Foundations

Retaining walls

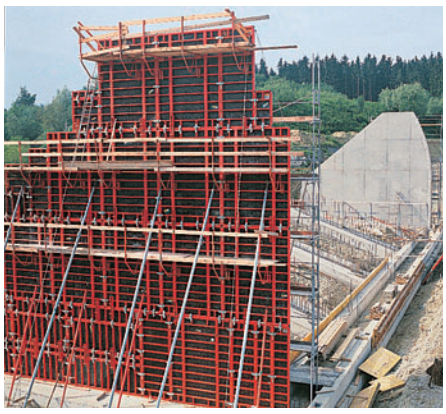
Circular structures



Sewage works

Special projects

TRIO on climbing brackets



13.20m high wall

Single sided formwork

With large hire depots

PERI offers more than just the formwork

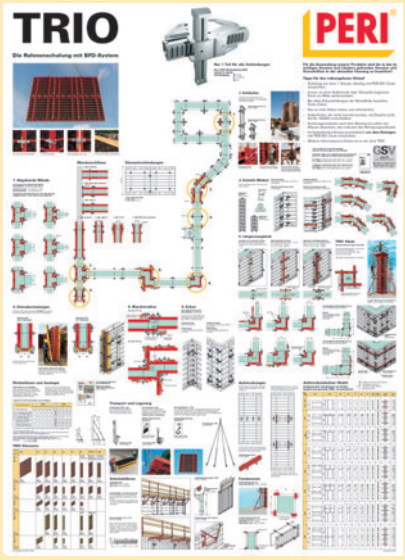
With our experienced representatives

Cost-cutting design and site aids

Our service ensures that your site can operate at maximum efficiency.

The training video

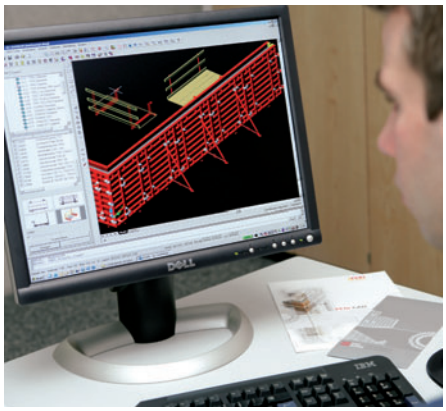
The TRIO poster and brochures



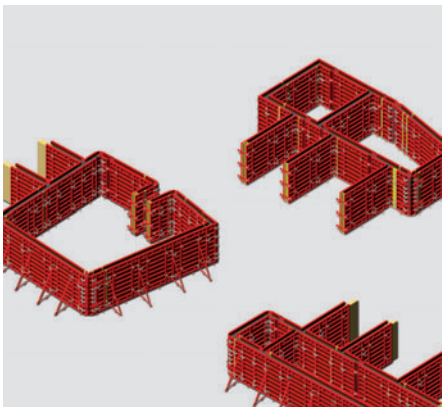
Prompt, 24 hour, delivery service

On-site Instruction

Through training and seminars

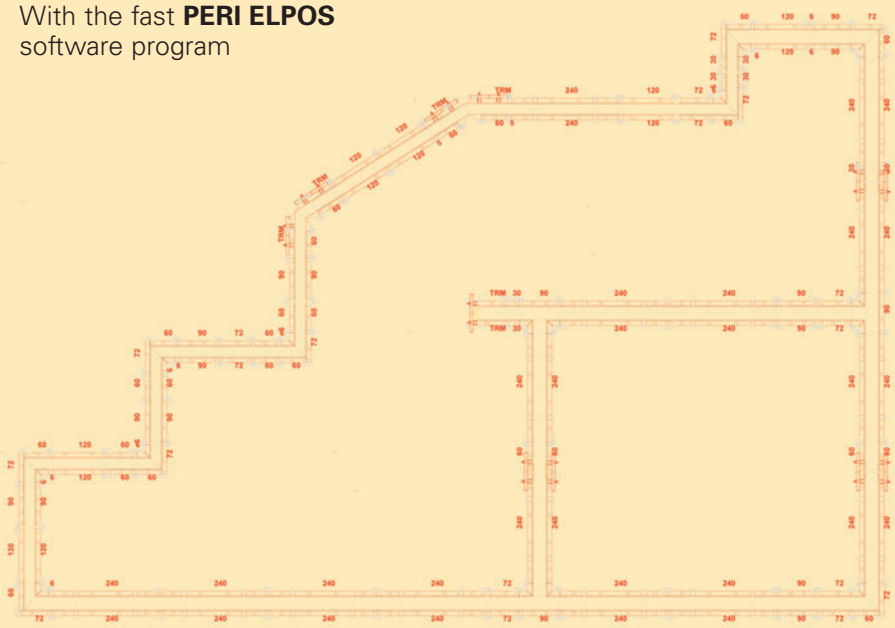


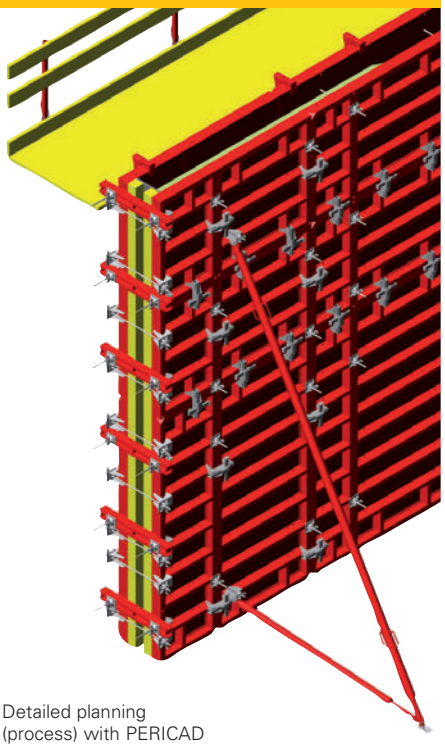
Through formwork design in
our technical office



Through 3D cycle planning
in ELPOS and PERICAD

With the fast **PERI ELPOS**
software program





Detailed planning
(process) with PERICAD

With the PERI panel cleaning machine

Through the Repair and
Reconditioning Service.

Standard details
Corner, T-junctions, infills

Corners

The 60 and 72 panels form the external corner for all standard wall thickness from 180 to 400mm.

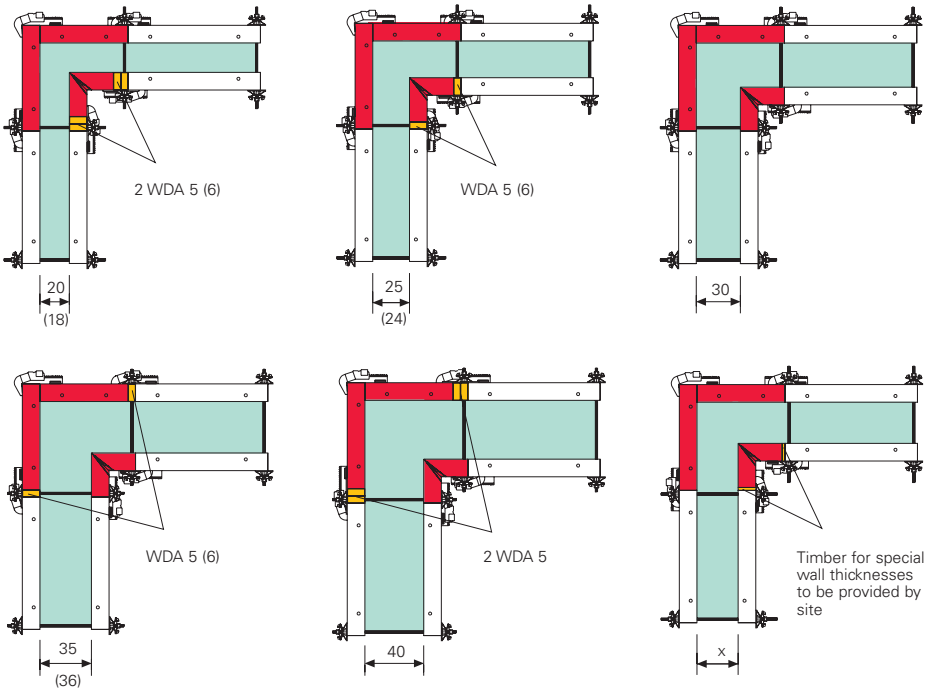
Basic rules for corners:

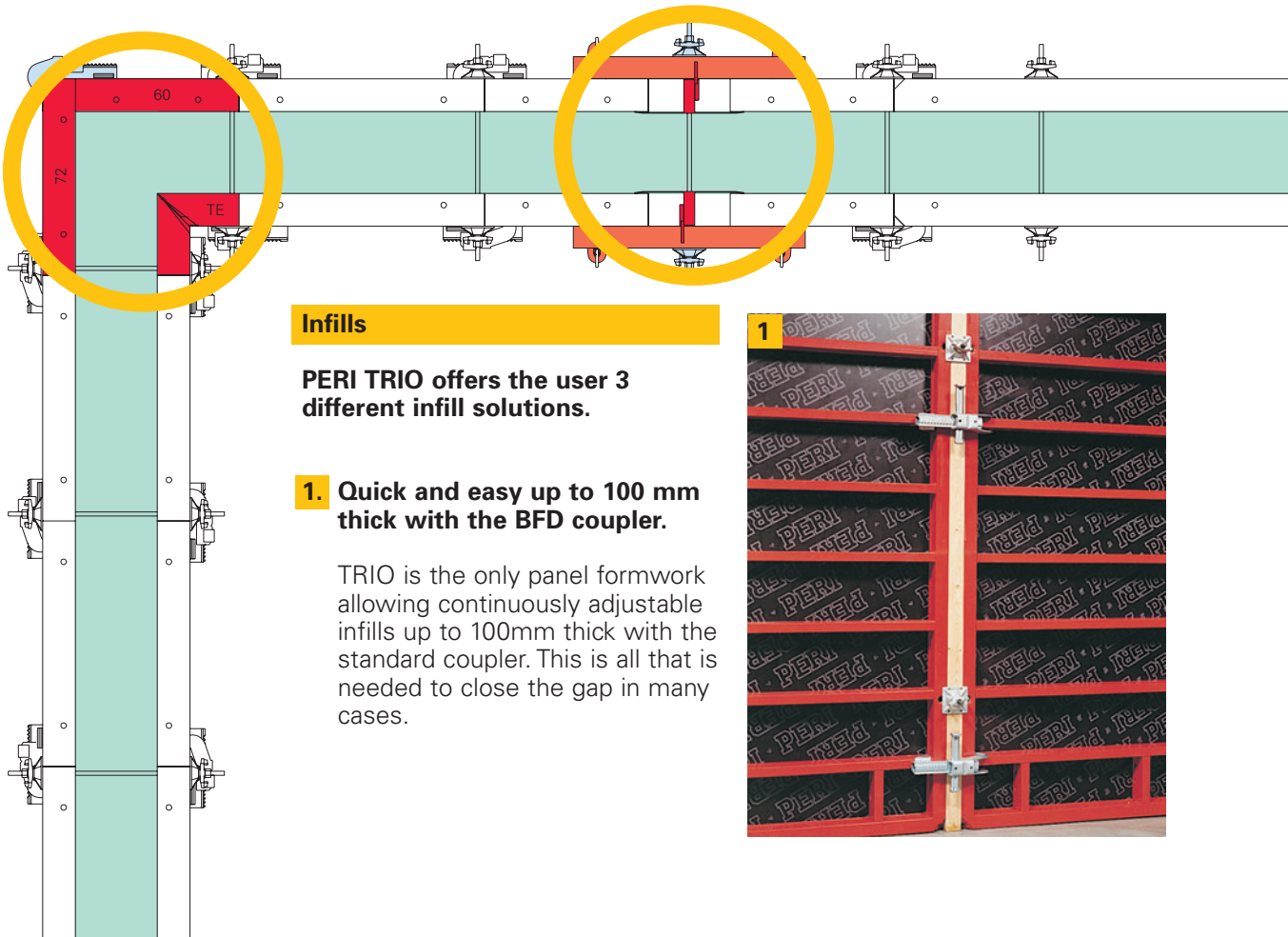
External corner:
with TR 60 and TRM 72 panels
Internal corner:
with TRIO TE corner

TRIO WDA 5 or WDA 6 wall thickness compensator, or timber to adjust for wall thickness variation
without WDA for 300mm
WDA inside for < 300mm
WDA outside for > 300mm

Connection:
With TRIO BFD alignment coupler.

5 BFD Couplers are required at 2.70 m formwork height.





Infills

PERI TRIO offers the user 3 different infill solutions.

1. Quick and easy up to 100 mm thick with the BFD coupler.

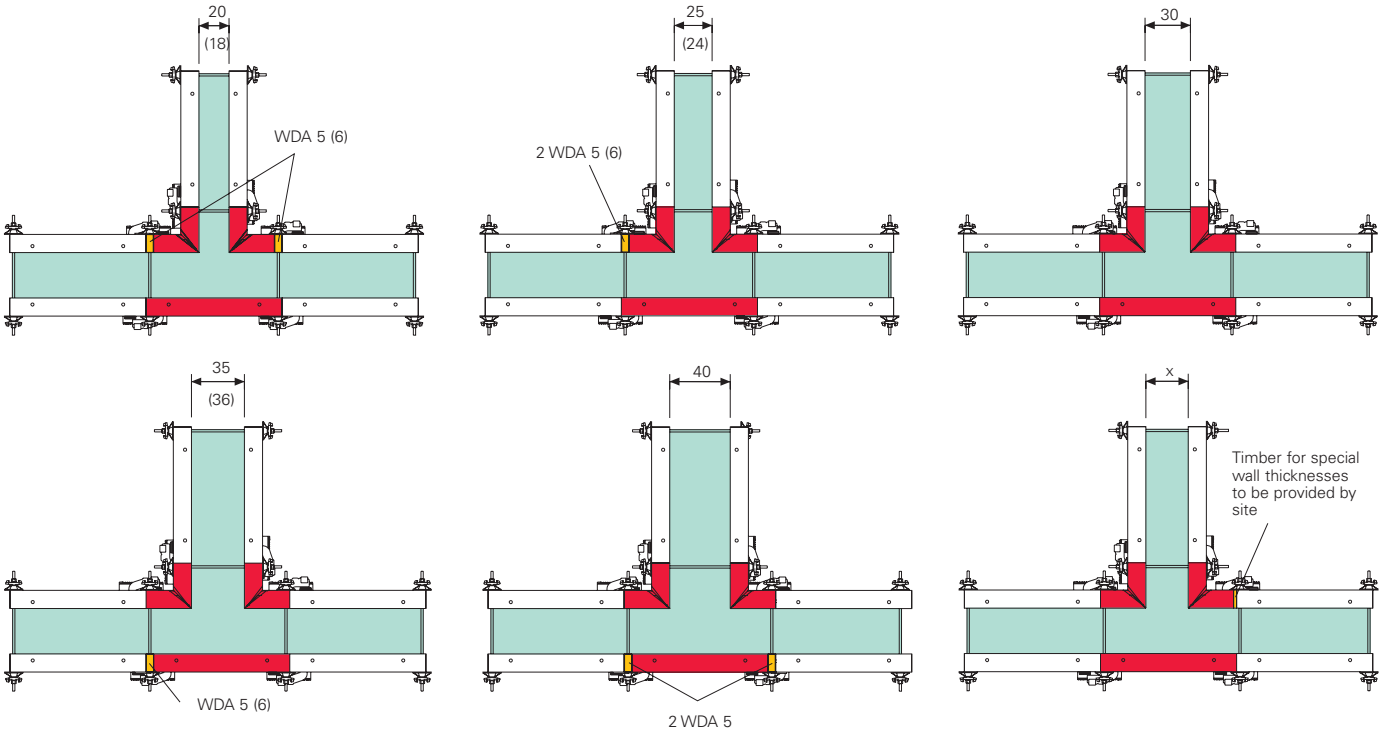
TRIO is the only panel formwork allowing continuously adjustable infills up to 100mm thick with the standard coupler. This is all that is needed to close the gap in many cases.

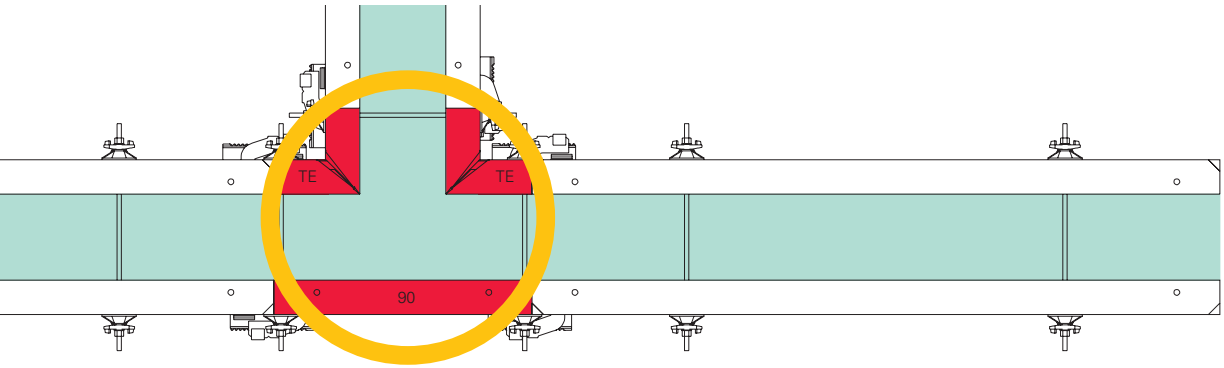
T-junctions

Basic rules for T-junction:

Outside formwork:
TR 90 panel
Inside formwork:
TRIO TE corner

TRIO WDA 5 or WDA 6 wall thickness compensator, or timber to adjust for wall thickness variation



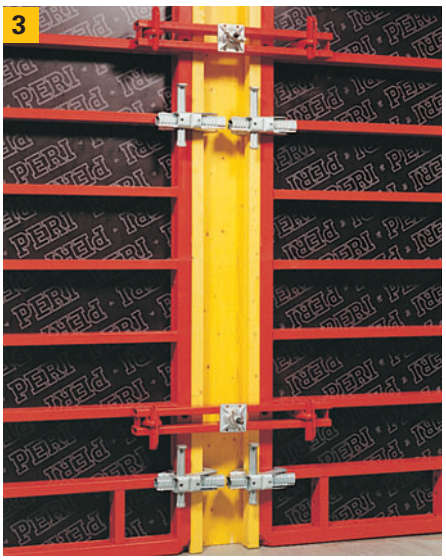


2. Reusable for maximum cost-effectiveness

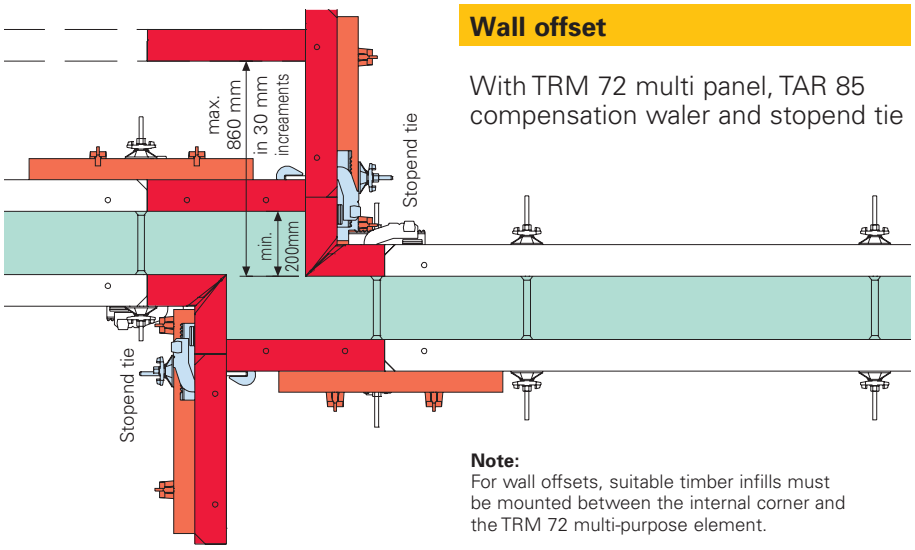
Infills from 60mm to 360mm with the Filler Plate LA.

3. The cleanest solution

With TRIO Filler Support TPP and plywood cut to size on site.



Standard details
Wall offset, oblique angle, stopend



Wall offset

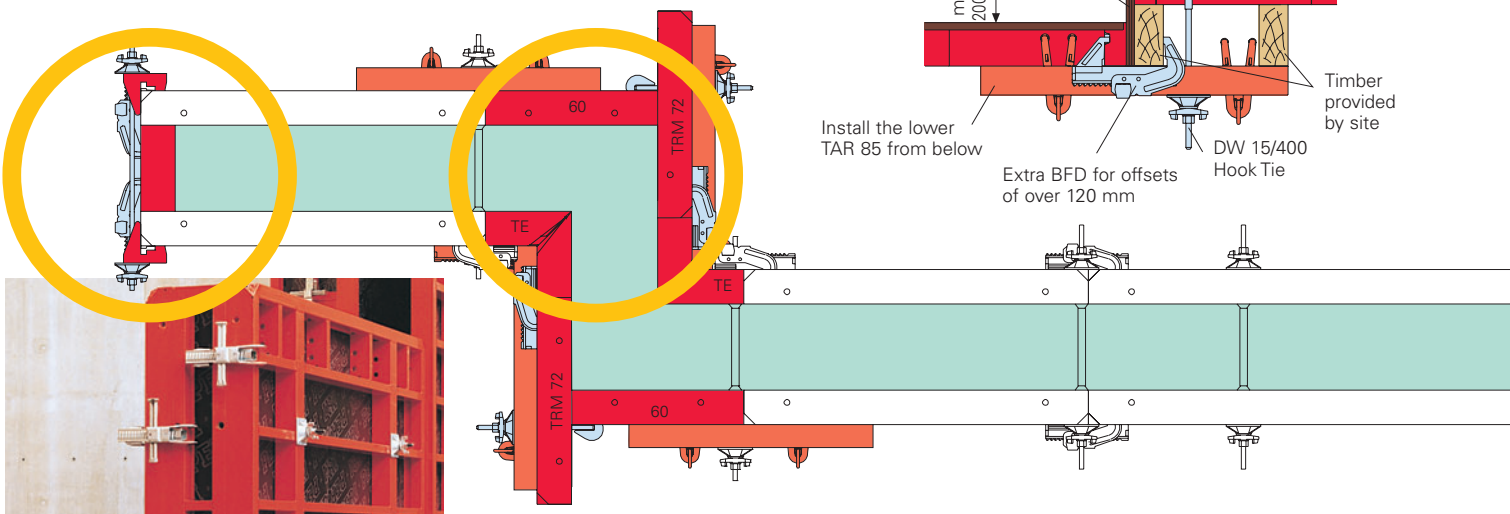
With TRM 72 multi panel, TAR 85 compensation waler and stopend tie

Note:
For wall offsets, suitable timber infills must be mounted between the internal corner and the TRM 72 multi-purpose element.

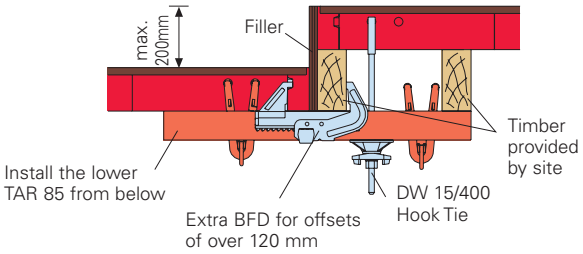
The TRM 72 multi panel, standard component for forming wall offsets.

Stopend

With 24 stopend panel for wall thickness of 240mm, or 30 panel for wall thickness of 300mm.



Wall offsets up to 200mm



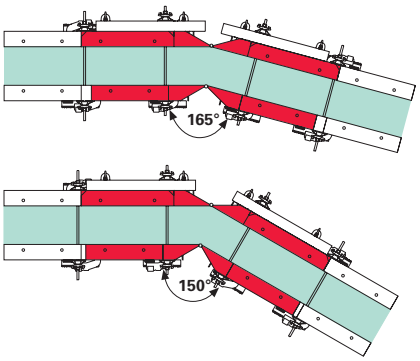
TRIO stopend panel for 240mm thick wall.

With internal tie (in 270 x 240 large panel or TRM 72 multi panel).

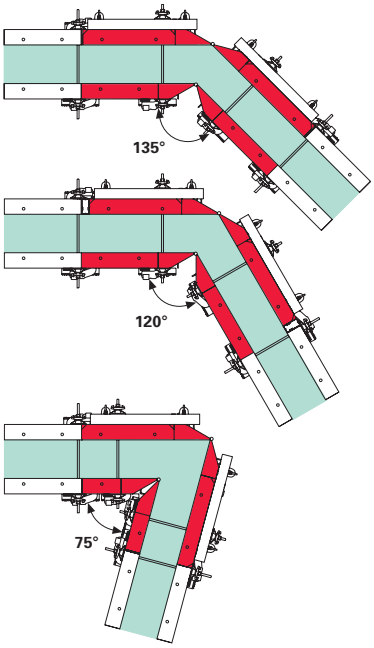
The TRIO stopend tie in combination with the TAR 85 compensation waler holds stopends in position.

Oblique angles

With the TGE articulated corner - for inside and outside - and the TRM 72 universal panel.



The TRIO TRM multi panel fitted with rowsof tie holes allows the panel to be tied at 30mm centres.

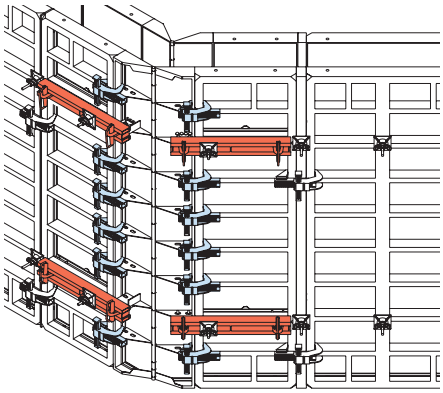


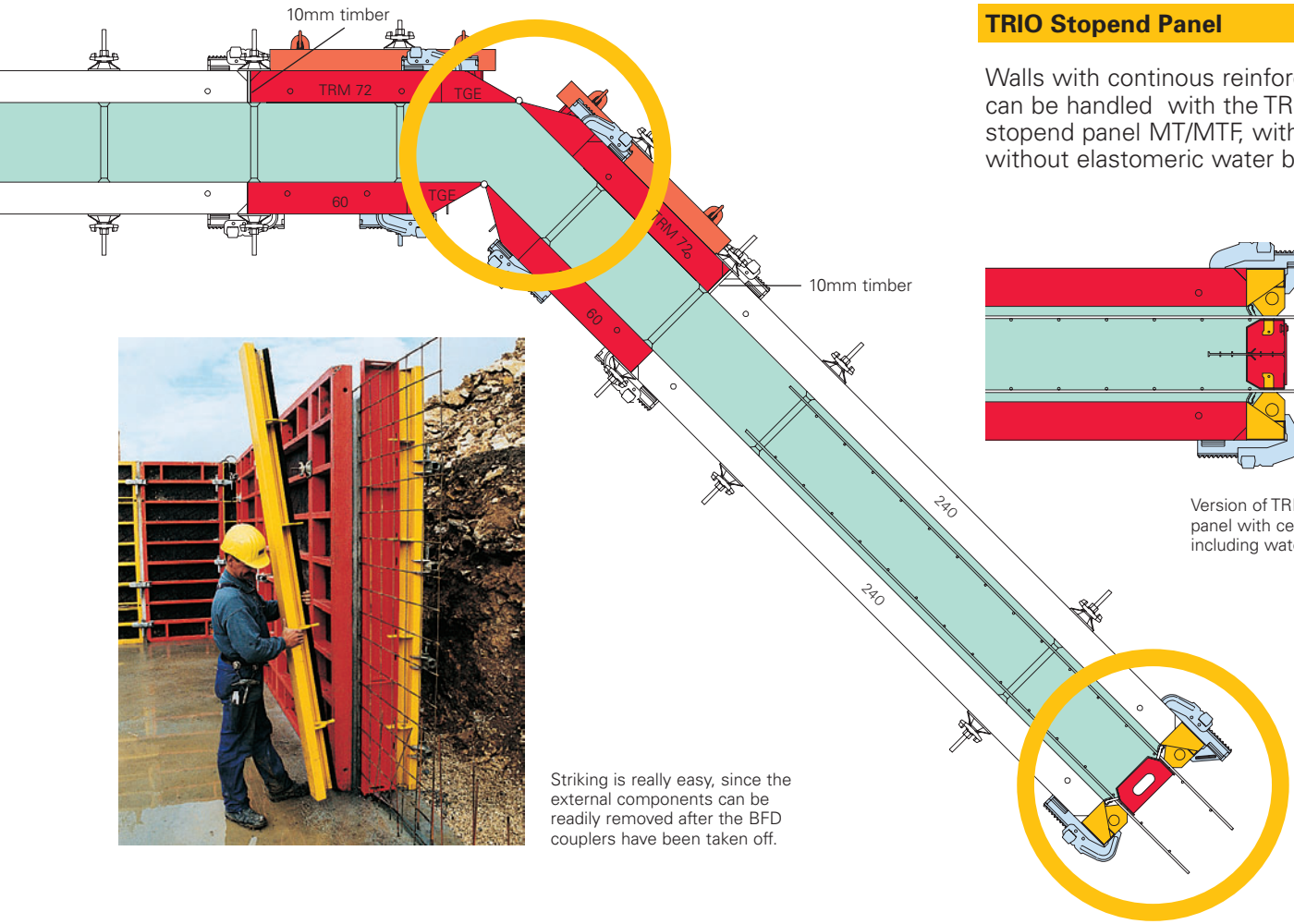
The rows of holes are at the same height as the standard tie positions.

Basic rules for oblique angles
Details relate to a panel height of 2.70m

Internal articulated corner:
Four BFDs

External articulated corner:
Six BFDs
Two TAR 85 walers

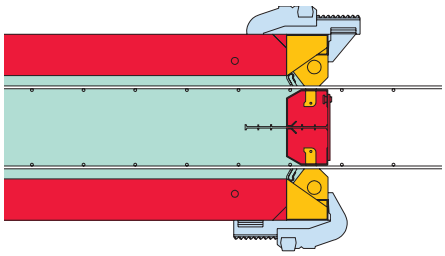




Striking is really easy, since the external components can be readily removed after the BFD couplers have been taken off.

TRIO Stopend Panel

Walls with continous reinforcement can be handled with the TRIO stopend panel MT/MTF, with or without elastomeric water bars.



Version of TRIO stopend panel with centre section including water bar holder.

Care, cleaning and maintenance
Keeps your formwork serviceable year after year

Care

Formwork elements must be cleaned and cared for to keep them cerviceable and maintain their value over a long period.

Hard use makes occasional repairs unavoidable.

PERI BIO Clean, the rapidly bio-degradable release agent for all forms.

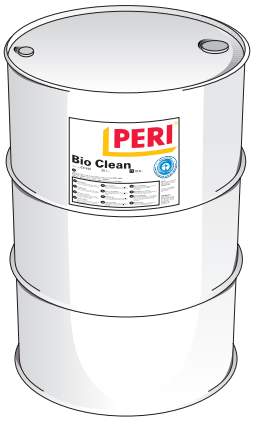
– Manufactured on a mineral oil basis
– Water Pollutant Class 1
– Acts as a penetrating oil to regenerate formwork surfaces contaminated with resin
– Allows threads to operate smoothly
– Protects timber components against rot, and construction equipment and machinery against rust

Consumption: 1 litre covers 50 to 90m² of formwork

PERI recommends the use of **BIO CLEAN**, the environmentally friendly concrete release agent, to ensure the formwork can be cleaned quickly and easily.

NB
Apply thinly and evenly

		Weight kg:	Item no:
Can	20 L	0.91/L	031440
Drum	208 L	0.91/L	031455



Cleaning

PERI's special machine cleans panels of any width, from 300mm to 3.30m in height, and up to 180mm thick.

The latest technology ensures efficient, economical cleaning. Dust extraction, continuously adjustable feed rate and individually adjustable brush pressures ensure thorough yet gentle cleaning.

PERI's cleaning machine in operation.

Maintenance

Even the best formlining eventually has to be replaced.

PERI also takes responsibility for disposing of all of the non-reusable parts in an ecologically sensitive manner.

PERI offers a special reconditioning service for panels subjected to hard use:

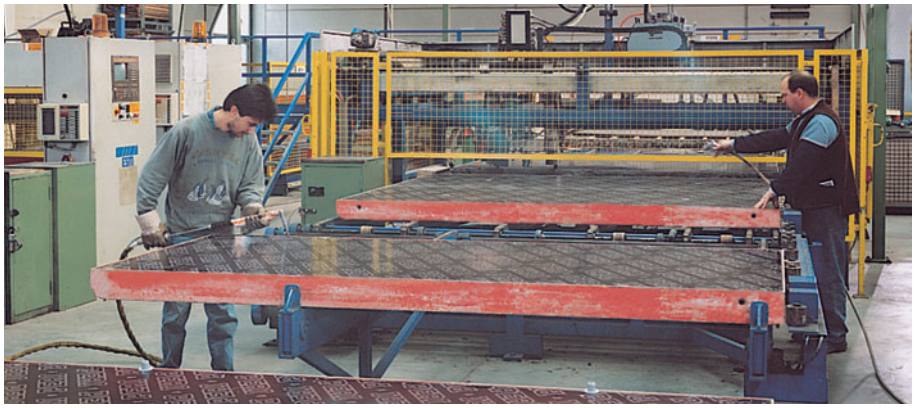
Minor repair service
Thorough cleaning, fitting of new sheets of plywood

Major repair service
Sandblasting of frames, alignment checking, welding if necessary. Renewing frame's powder coating. Fitting new sheets of plywood

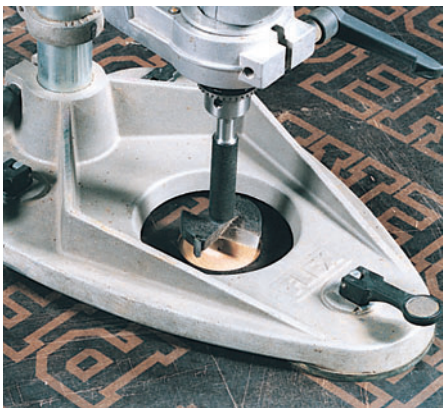
Damage to the formlining is unavoidable in everyday use on site.

Sealing of site drilled tie holes and repair of major damage is carried out with end grain plugs or plywood repair discs.

Removing the rivets and cleaning the frame.



This machine rivets the new formlining into the cleaned panel frame accurately. The edge joints are filled with silicone.



The diameter of 60mm allows even major damage to be repaired.

Apply glue and hammer plywood repair disc into place.

PERI's service is particularly advantageous for the contractor when personnel and time are at a premium.

Transportation, Handling and Storage
Working safely with TRIO

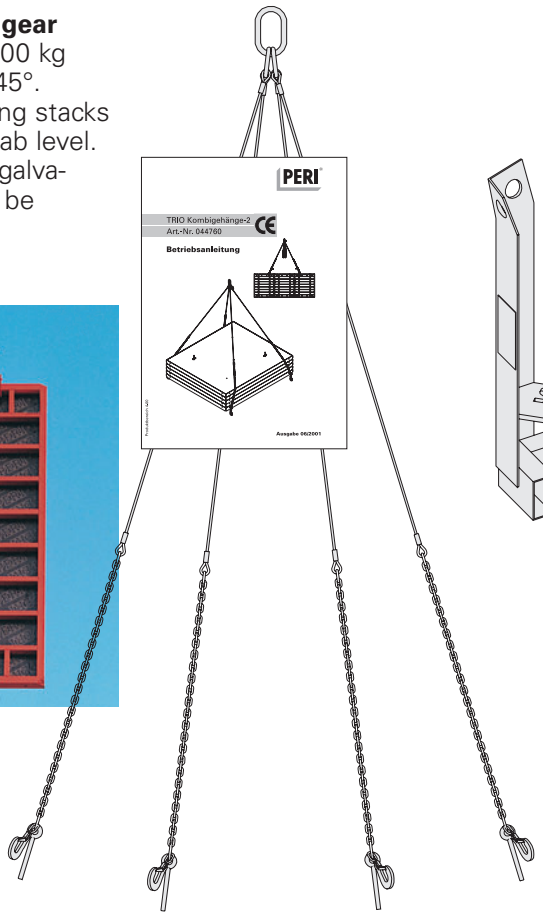
Extremely slow shuttering and damage to the formwork are the result of sites like this:

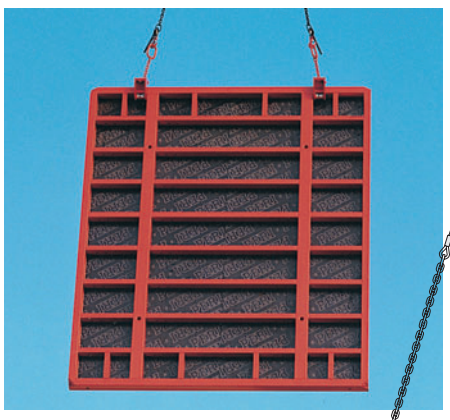
Time and motion improvements can slash costs. Loading and unloading in the yard, on site, and moving from one part of the site to another, are major cost factors.

PERI's range therefore includes special accessories for transportation, handling and storage of standard TRIO components.

Shifting a stack of panels with TRIO galvanised stacking devices and TRIO combination lifting gear.

TRIO combination lifting gear
Safe working load up to 2000 kg with chains at an angle of 45°.
The pins are used for shifting stacks of panels near ground or slab level.
TRIO lifting hooks or TRIO galvanised stacking devices can be connected to the hooks.





Combination lifting gear in conjunction with lifting hooks during shuttering.

The TRIO stacking device
Safe working load 500kg/device.
For stacking 5 TRIO panels of any size safely.

TRIO panels stacked neatly and compactly.

PERI pallets and crates are available for a wide variety of applications to allow safe, orderly stacking in the yard and on site.

All pallets are suitable for lifting with the crane and moving with forklift trucks.

Easily identified lifting eyes allow safe and efficient lifting with the crane.

Lorry turnaround is improved by faster loading and unloading.

Compact and efficient storage.

Hot dip galvanised or powder coated welded all-steel construction for long life.

Crate pallet 80x120/K
Item no 065016, safe working load 1500kg. For handling objects that are difficult to stack.

Crate palett 80x120 filled with 160 TRIO BFD alignment couplers.

Post pallet
RP 80 x 120 Item no.: 025640
RP 80 x 150 Item no.: 025630
Safe working load 1500kg

The stacked items in the photographs are only examples. Provided the individual safe working loads are not exceeded, the pallets and crates may be loaded with other items.

SAFETY PRECAUTION!
All 4 chains of the lifting gear must be used when moving the pallets with the crane.

RP 80 x 150 post pallet, stacked with twenty TRG 80s, being lifted with the crane.

PERI post pallets can be shifted easily with a fork-lift truck.

Safety from the outset
TRIO safety precautions

Our product development always gives top priority to the safety of site personnel.

The following precautions are to be adopted when using PERI TRIO panel formwork.

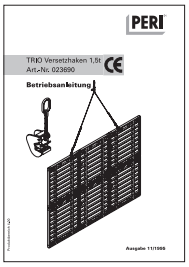
Handling large panels
The local safety regulations and professional codes of practice must always be followed.

TRIO lifting hook:

Quick and easy handling

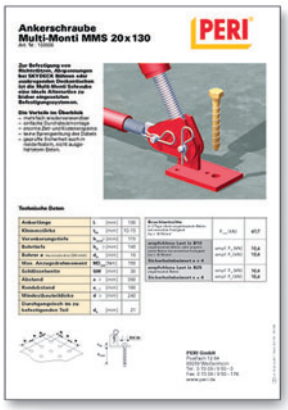
Self-locking

Can be released from the slab or ground with a tie rod or board



Instructions for using the TRIO lifting hook safely.

Push-pull props and kicker braces are to be arranged as shown on the adjacent diagram and specified in the table below. The first panel must always be braced with 2 push-pull props, and subsequent ones according to the following table. They are connected to the panel with the TRIO brace connector. Fixing to the slab with the matching base plate and PERI anchor bolt MMS 20x130.



The safe working load of the TRIO lifting hook is 1.5 t with a maximum angle of inclination of 30°. **Always follow the instructions for the use of this hook!**

PERI Push-Pull-Props and Kicker Braces

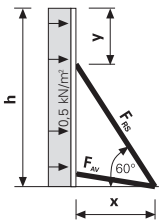
Formwork height **h** [m]	picture 1							picture 2			
	3.0	4.0	5.0	6.0	7.0	8.0		9.0	10.0	11.0	12.0
Allowable prop spacing [m]	3.53	2.73	2.19	1.82	1.58	1.42		1.93	1.67	1.49	1.35
Actual prop load F_{RS} [kN] at maximum prop spacing	9.7	9.7	9.8	9.8	9.8	9.6	F_{RS1} F_{RS2}	9.4 9.5	11.3 8.5	11.3 9.3	11.3 10.1
Actual kicker load F_{AV} [kN] at maximum prop spacing	2.1	2.3	2.2	2.2	2.3	2.6		2.6	2.3	2.1	1.9
x = Dist. of base plate [m] from front face of formwork	1.2	1.6	2.0	2.4	2.9	3.5	x_1 x_2	4.3 2.6	4.7 2.6	5.3 2.8	5.9 3.0
y = *Top connection point [m] from top of formwork	1.0	1.2	1.5	1.8	2.0	2.0	y_1 y_2	1.5 4.5	1.8 5.5	1.8 6.2	1.8 6.9

*If necessary, the distance from top of formwork must be adapted to the system.

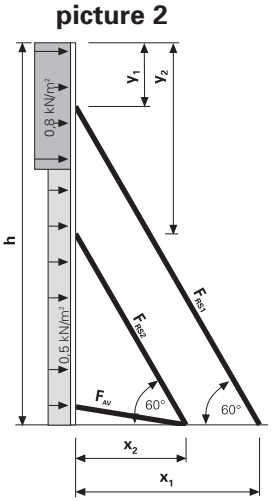
A maximum force of 11.3 kN is to be led into the building at the foot of the push-pull-prop for the given width of influence.

Wind loads: h < 8 m = 0.5 kN/m²
8 m < h < 20 m = 0.8 kN/m²

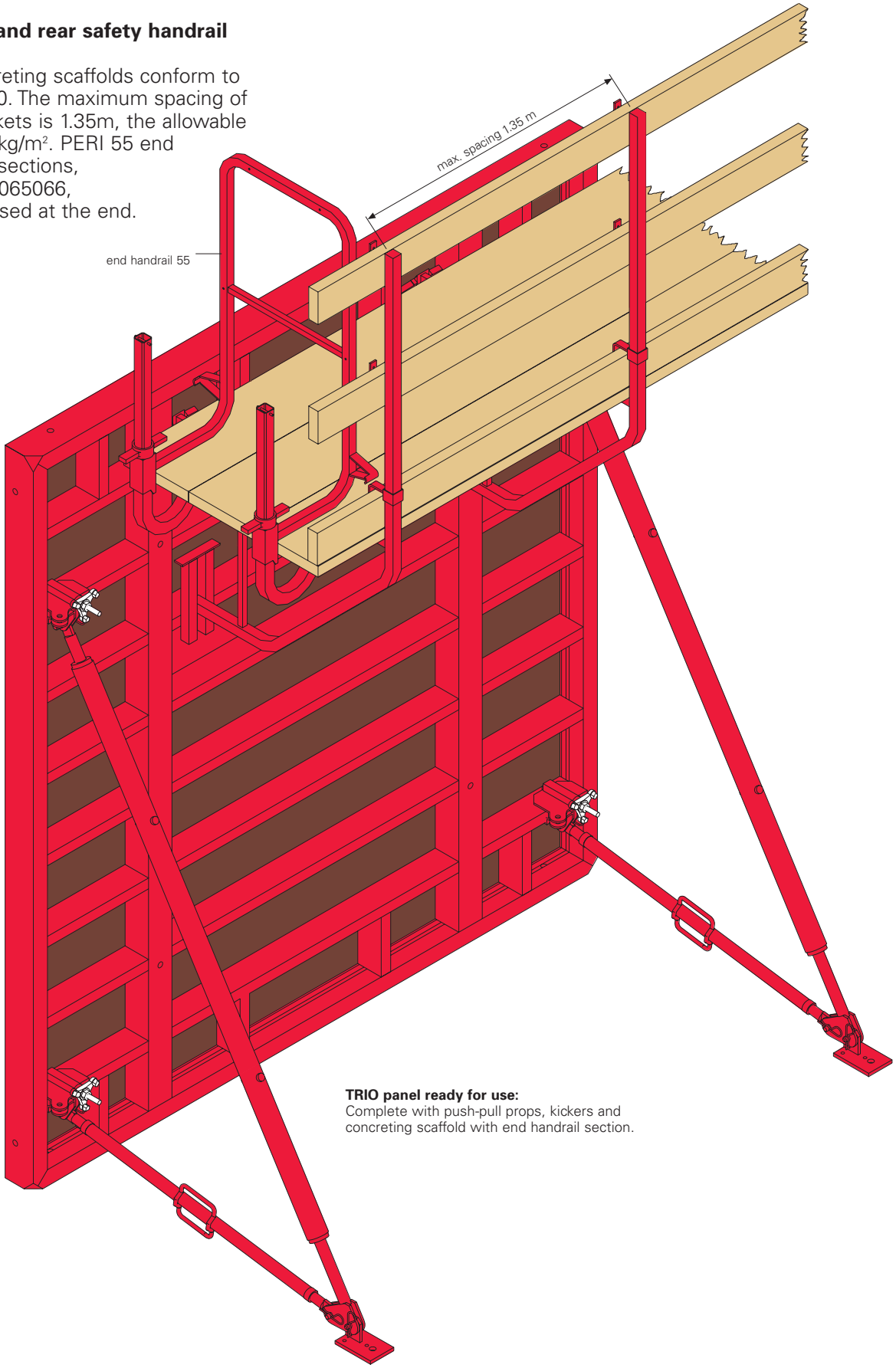
picture 1



picture 2



Boards and rear safety handrail system
for concreting scaffolds conform to DIN 4420. The maximum spacing of the brackets is 1.35m, the allowable load 150kg/m². PERI 55 end handrail sections, Item no 065066, can be used at the end.

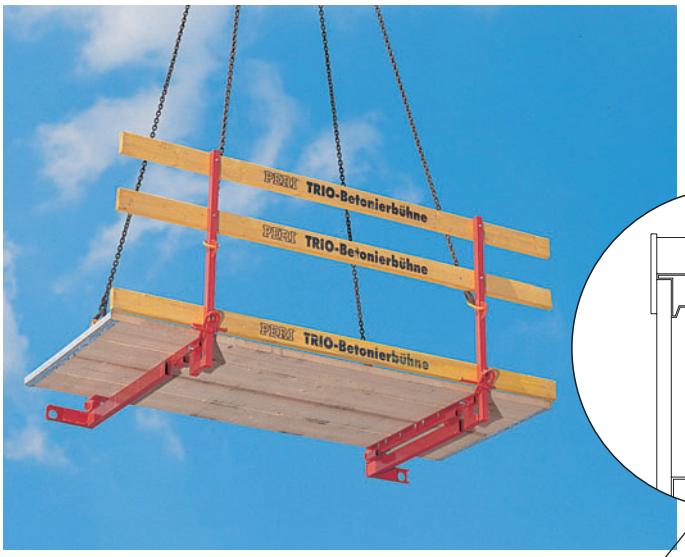


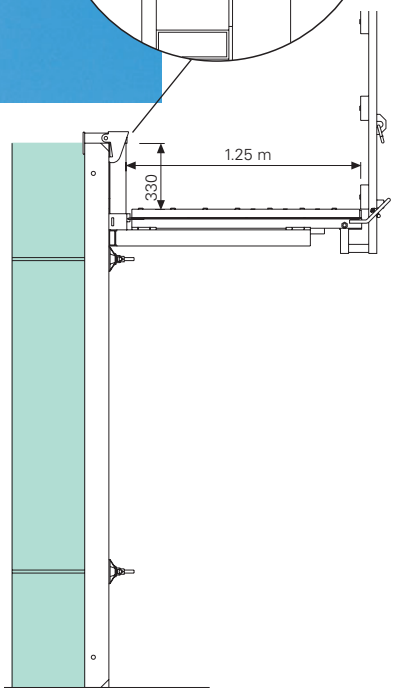
TRIO panel ready for use:
Complete with push-pull props, kickers and concreting scaffold with end handrail section.

Safe Concreting
TRIO concreting platform and concreting scaffold brackets

TRIO concreting platform

Concreting is faster with the TRIO platform.

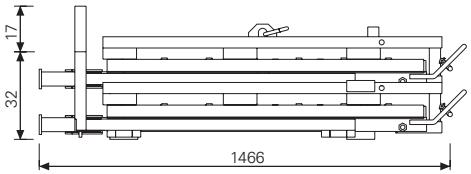




Instead of the usual laborious procedure (mount brackets, lay boards and connect rear safety handrail system), with the TRIO concreting platform the formwork is ready for concreting immediately:

– Raise concreting platform, suspend from the crane and mount.
– The 1.25m wide boarding offers sufficient space.
– The level of the platform boards, 330mm below the top of the formwork, allows you to work in comfort.

Work in confined spaces with the TRIO concreting platform.



An individual TRIO platform unit folds up so that it is only 320mm high. Each additional one stacked on top only adds 170mm.
Thus 13 stacked TRIO concreting platforms (35m run) are within a lorry's maximum loading height.

Work is safer with the TRIO concreting platform.

1. Raise safety handrail and lock with captive pins.

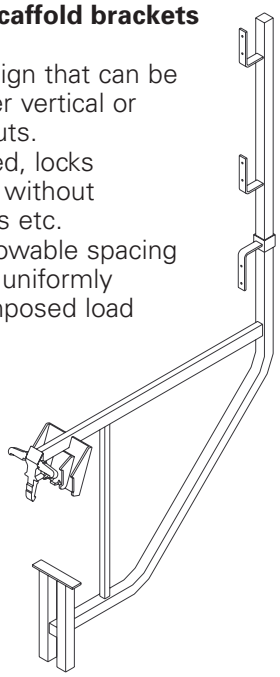
2. Lift mounting beams – they engage automatically.

3. Attach concreting platform to 4 chains of lifting gear at the yellow connection points.

TRIO scaffold brackets

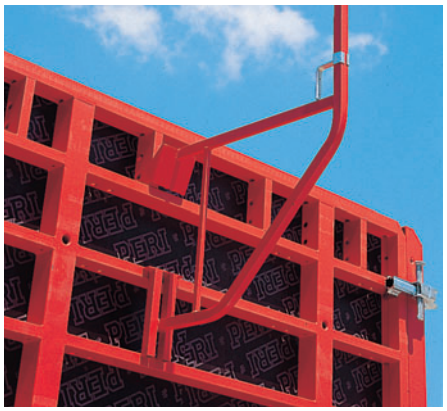
TRIO TRG 80 and 120 concreting scaffold brackets

- Universal design that can be used on either vertical or horizontal struts.
- Once mounted, locks automatically without additional pins etc.
- Maximum allowable spacing 1.35m with a uniformly distributed imposed load of 150kg/m²



Connection to horizontal strut

Connection to vertical strut



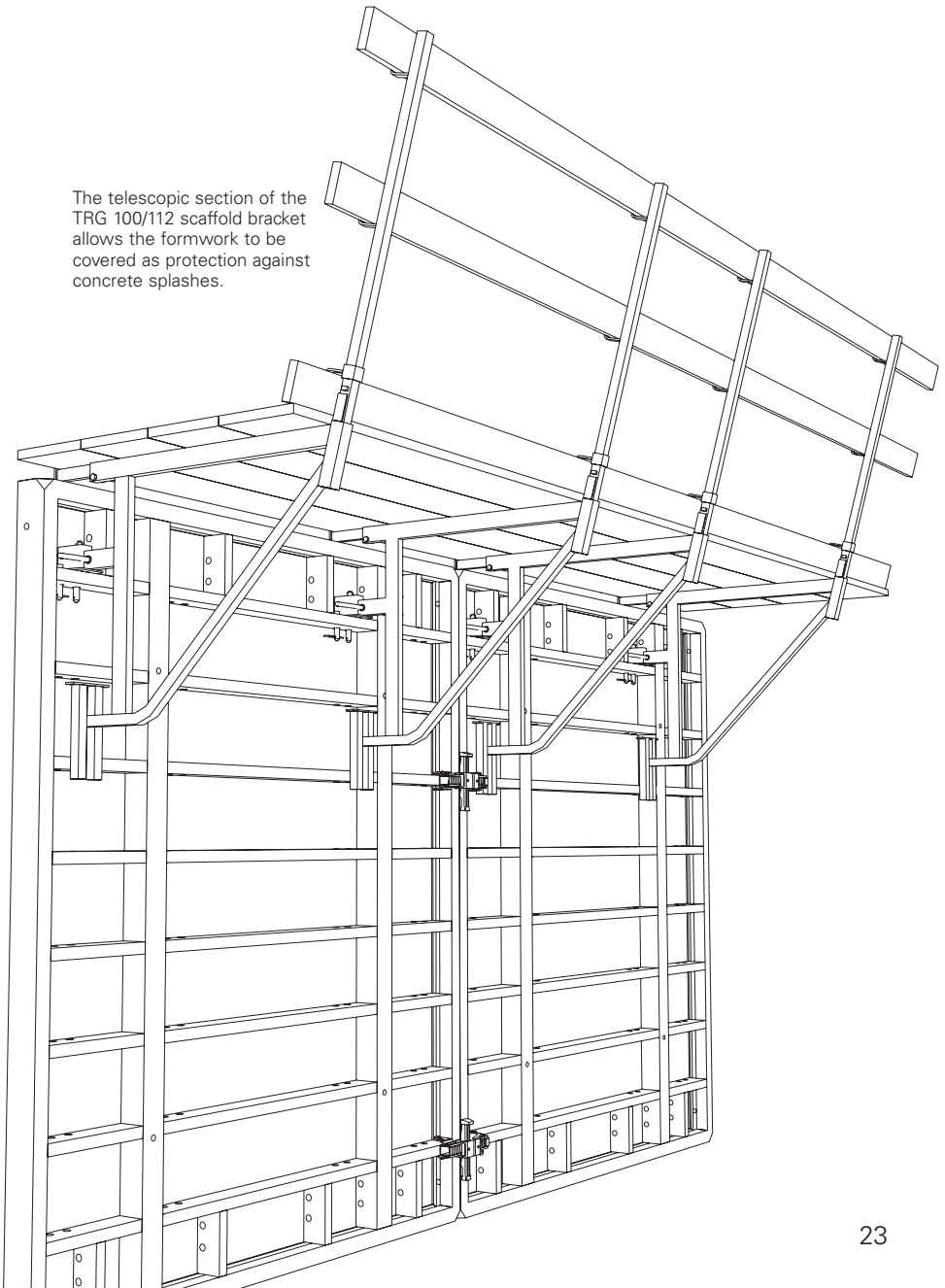
The TRIO TRG 80 and 120 concreting scaffold brackets can be mounted on any horizontal or vertical strut.

TRIO TRG 100/112 concreting scaffold bracket

- For mounting on horizontal and vertical struts.
- Mounting on the top strut allows the boards to project to the front edge of the formlining.
- The HANDSET HSGP handrail post is used to hold the handrails.
- Maximum permissible spacing 1.35m with a uniformly distributed imposed load of 150kg/m².

Connection to vertical strut

The telescopic section of the TRG 100/112 scaffold bracket allows the formwork to be covered as protection against concrete splashes.

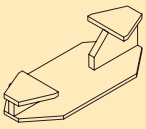


Foundations
Shuttered with standard TRIO system components

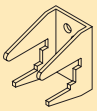
Column pad footings with TRIO foundation strap and AH-2 tie bracket.

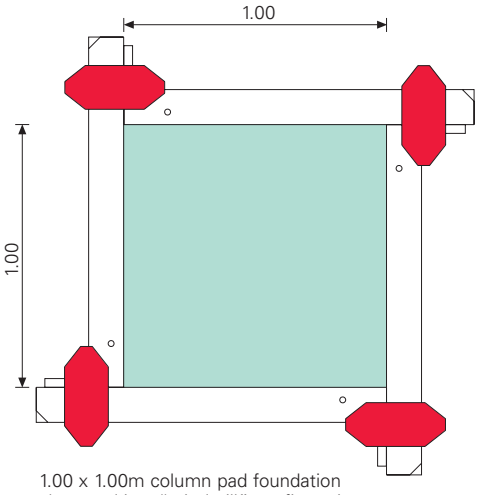
The TRIO foundation strap allows the panels to be fixed in a **"windmill"** configuration. This saves expensive custom filler panels, since the panels can be adjusted continuously to any dimension required.

TRIO foundation strap
Item no.: 023800



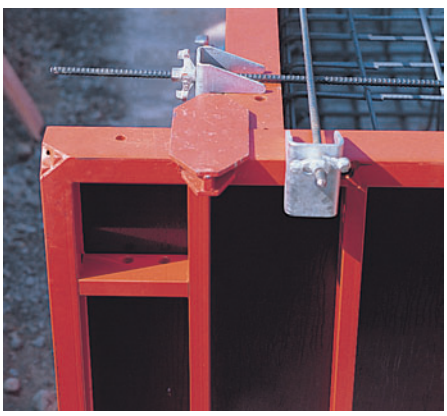
AH-2 tie bracket
Item no.: 023630





1.00 x 1.00m column pad foundation shuttered in a "windmill" configuration.

The foundation strap in combination with the tie bracket ensures accuracy on very large foundations.



TRIO foundation strap and tie bracket act in combination for large foundations.

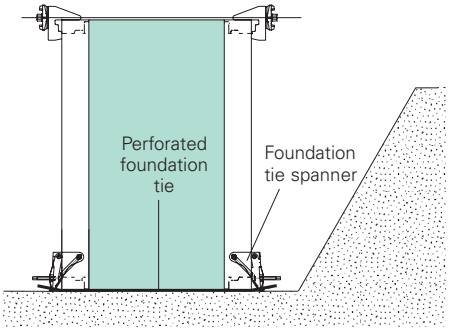
All sizes of foundation can be formed. The foundation strap and tie bracket allow continuous adjustment of the formwork.

TRIO foundation strap for connecting formwork quickly at external corners, with continuously adjustable panel overlap.

Wall footings and column pad footings with the TRIO foundation tie spanner and perforated foundation tie.

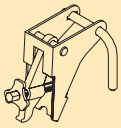
The TRIO foundation tie spanner for shuttering foundations quickly and easily. Replaces the bottom tie, saves working space and hence excavation.

Foundations up to 1.20m deep are possible with the foundation tie spanner. (Two ties provided in 2.70m length of panel).

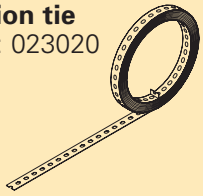


When the tie holder is used for the top tie, the TRIO panels do not have to be exactly aligned. The panel can be tied at any position.

TRIO foundation tie spanner
Item no.: 023010



Perforated foundation tie
Item no.: 023020



Wall footing of a factory building shuttered using foundation tie spanners.

The TRIO foundation tie spanner brings major advantages:

Dispenses with bottom tie position.

Accurate tensioning with a self-cleaning hexagonal spindle.

The small amount of working space required reduces earthworks to a minimum.

The TRIO foundation tie spanner is tensioned with a standard 14mm ratchet spanner.

Single face walls
With TRIO and PERI SB brace frames

TRIO extended to 3.90m with SB-B and SB-C brace frames.

TRIO panels with PERI brace frames are used when concreting against existing walls, rock faces or sheet piling.

PERI brace frames for varying pour heights up to 8.75m, with an allowable fresh concrete pressure of up to 60 kN/m².

PERI SB-A, B, C brace frames are designed to suit lorry and container loading dimensions.

PERI brace frames can be used with all PERI wall formwork systems (TRIO, VARIO, RUNDFLEX) using standard system connection components.

The PERI V anchor brackets For installing anchors quickly and accurately when using brace frames.

The PERI V anchor bracket is available for DW 15, 20 and 26 anchor rods. When the bracket is placed horizontally the anchor rods are inclined at the correct angle of 45°.

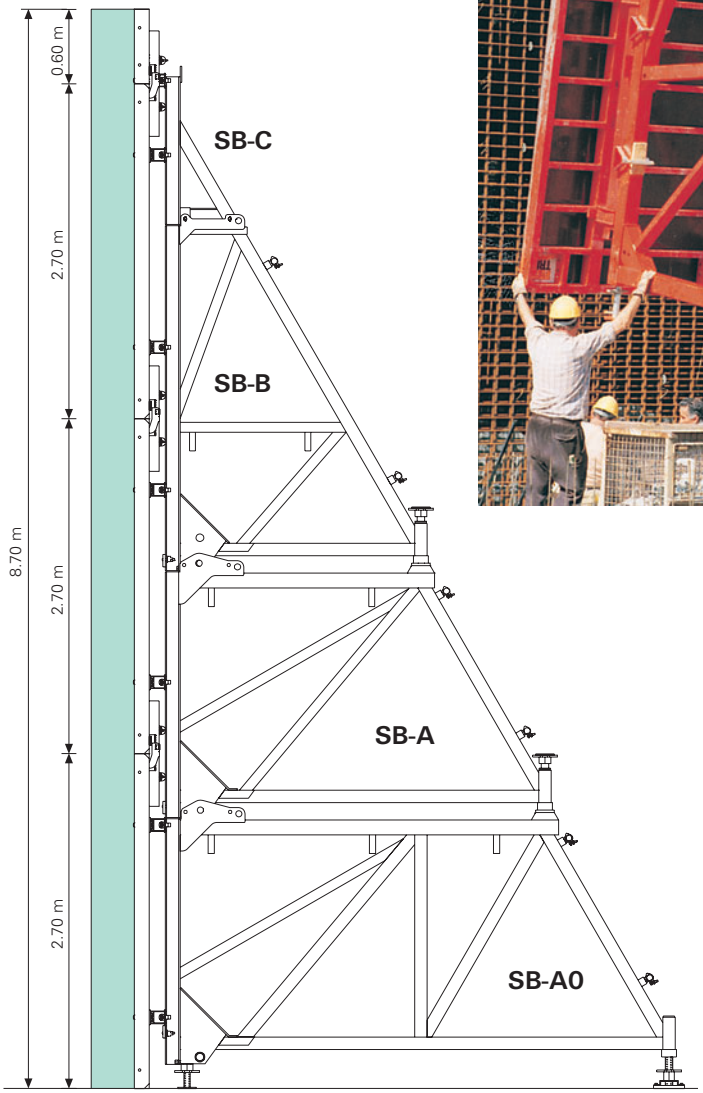
The choice of anchorage system is governed by the tension forces at the brace frame's anchor point.

Instructions and details are given in the PERI SB Brace Frame brochure.

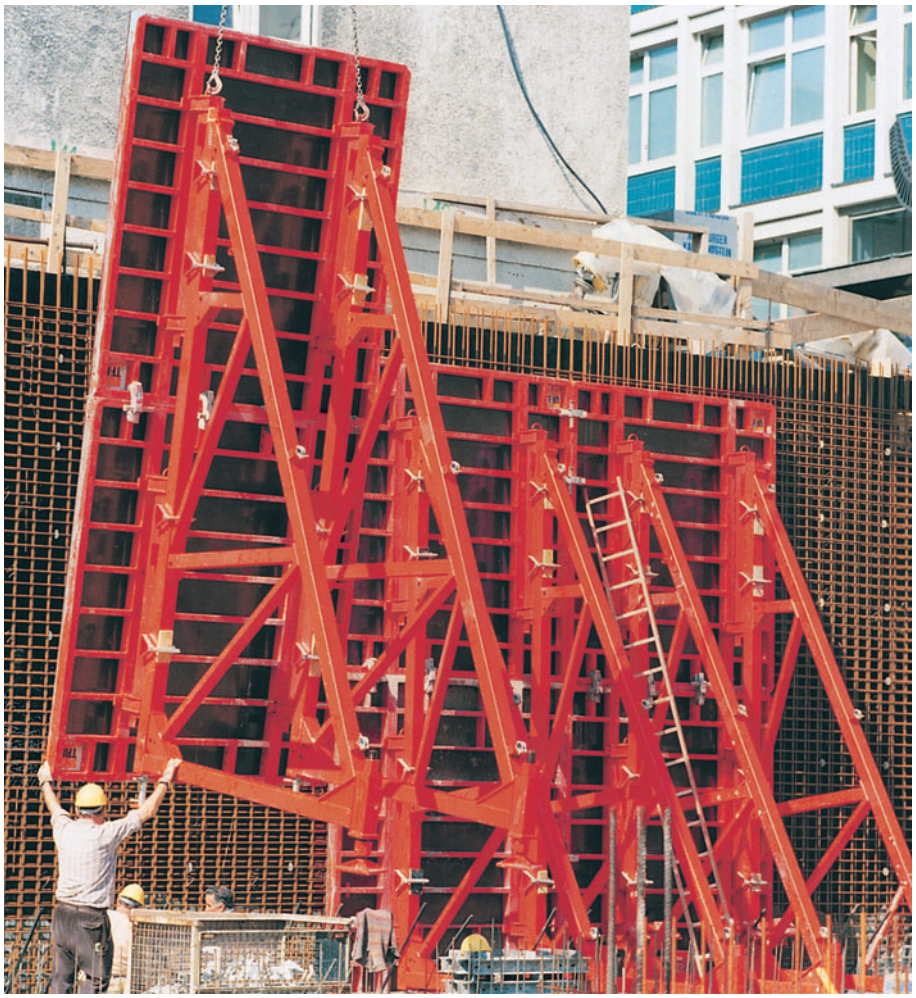
The following points must be carefully observed when using PERI brace frames.

1. The structural members (eg foundations or floor slabs) must be able to withstand the tension and compression forces arising. These members must be checked accordingly at the design stage, and the position of the anchors approved.
2. The "other side" of the single face formwork (existing walls, sheet piling, rock faces etc) also has to be able to withstand the fresh concrete pressure.
3. The DW anchor rods used must not be welded or bent. We recommend using PERI's anchor bracket for positioning the anchors.

The TRIO formwork is connected to the SB brace frame with the TRIO/SB-A,B,C connector

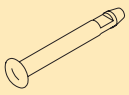


SB-2 brace frame with 5.40m high TRIO.

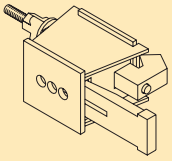


The following connection components are used to connect TRIO to PERI SB-A, B, C brace frames:

SB-TRIO/SE bolt
Item no.: 027690



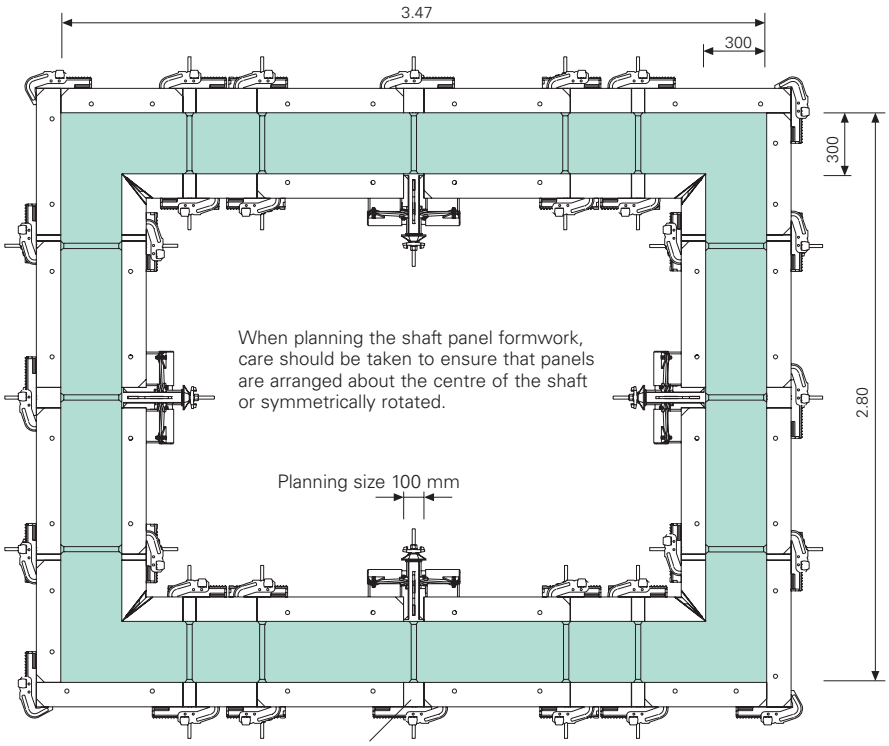
TRIO/SB-A,B,C connector
Item no.: 025740



Shafts
moved as a complete unit with TRIO shaft panels TSE

The TRIO shaft panels TSE enable the complete shaft formwork to be moved as a single unit.

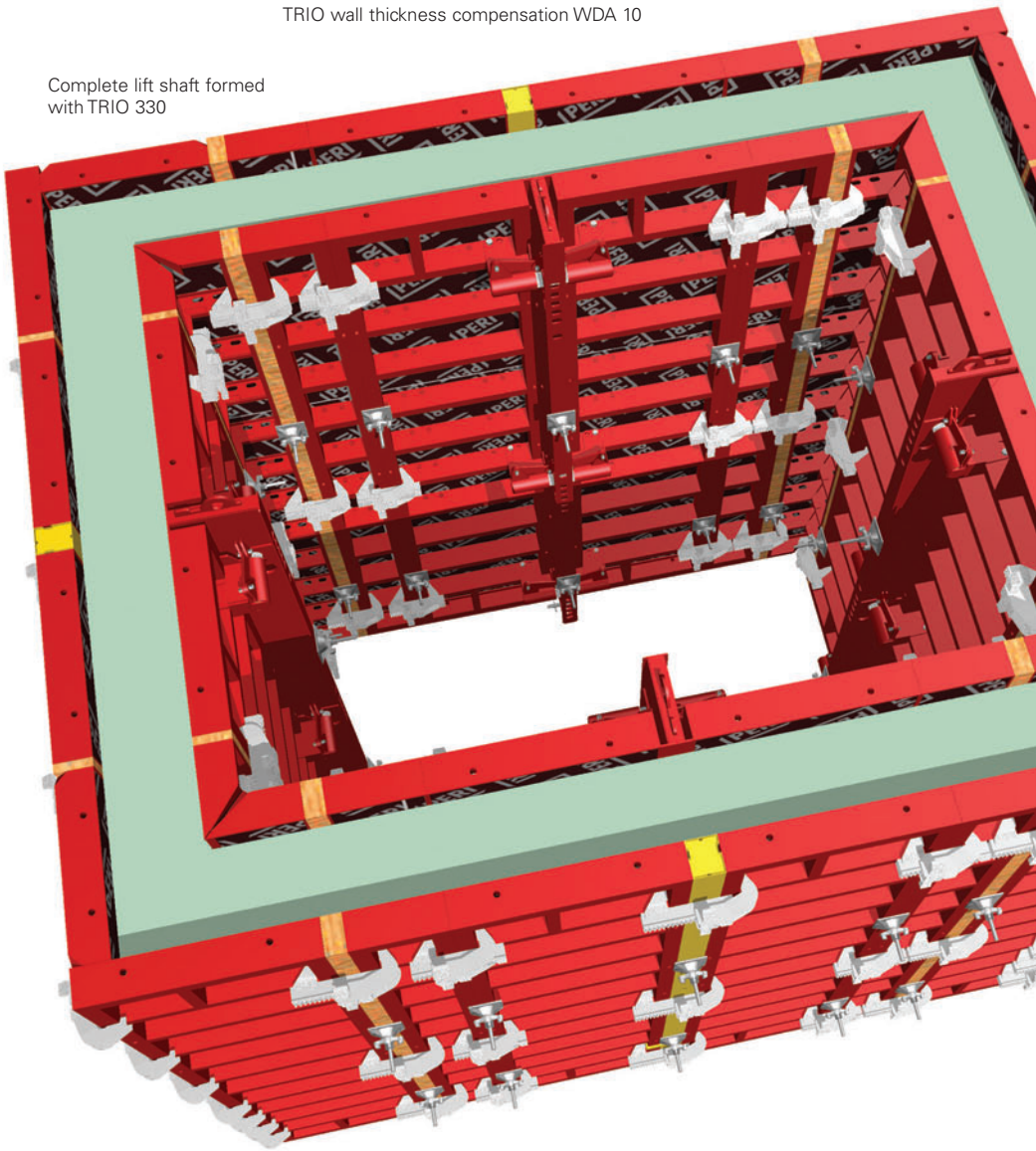
When lifting the TRIO shaft panels TSE the inner formwork reduces in width by 60 mm.
This provides a striking space of 30 mm on all sides. Enough clearance to remove a complete unit.



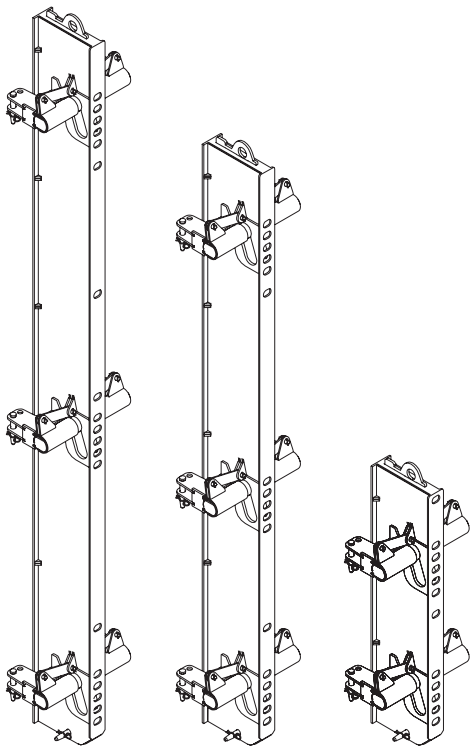
TRIO wall thickness compensation WDA 10

Remark:
The TRIO shaft panels TSE **must** be drawn out sequentially.
The formwork unit is then lifted with a 4-way crane sling.
Loading per shaft panel = 2000 kg

Complete lift shaft formed with TRIO 330



The TRIO shaft panel TSE is supplied in 3 heights, 1.20 m, 2.70 m and 3.30 m



The size of the shaft is principally of no importance for the use of the shaft panel TSE.

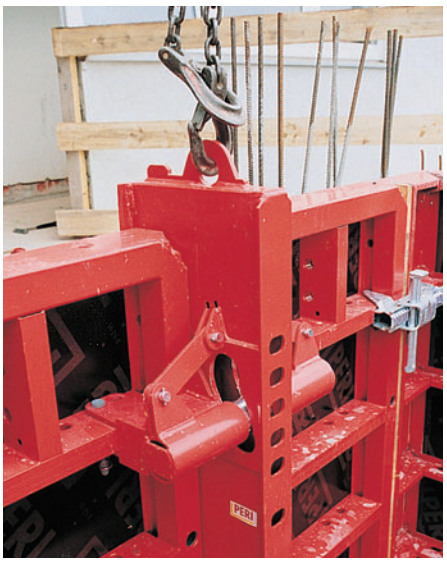
There is a minimum construction length of 1.30 m. The maximum size is dependent on the loading capacity of the crane hook of 2000 kg per shaft panel.

Complete shaft formwork hanging on the crane.

The striking space of about 30 mm in width is clearly seen. The shaft panel itself remains close to the concrete for better striking.

Striking with the TRIO shaft panel TSE

Clearly visible:
The withdrawn TRIO shaft panel TSE



For easy striking (loosening the formwork from the concrete) a formwork tool is pressed upwards, and to erect is pressed downwards.

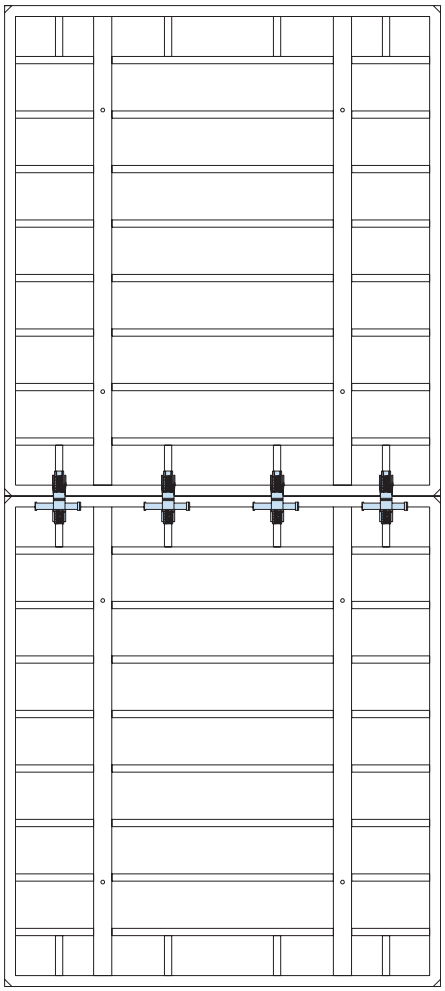
With rectangular cross-sections the chains on the long sides must be shortened. This ensures that when lifting with the crane, all 4 shaft panels are lifted equally.

High Walls
Using TRIO without additional stiffeners

All that is needed to extend the formwork to a height of 5.40m is the BFD alignment coupler.

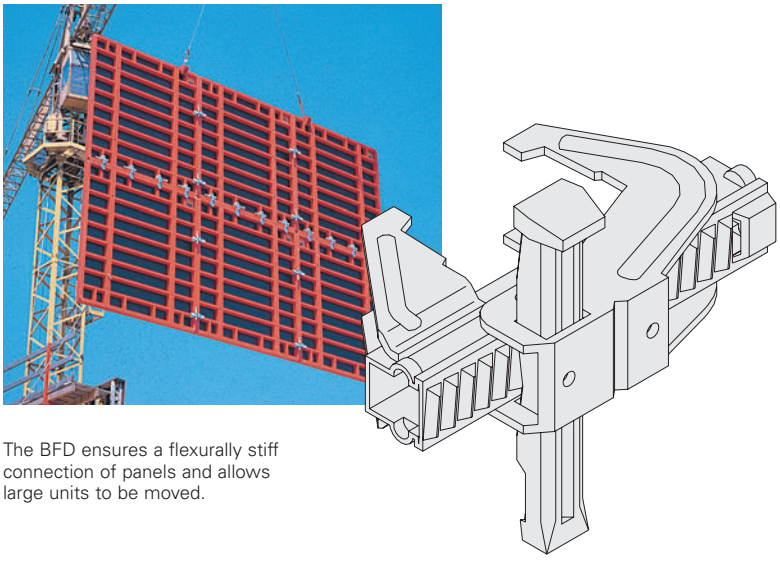
With PERI's TRIO you can shutter any height of wall, from 600mm wall footings to 12.0m high factory walls.

Alignment coupler and struts all round make extension with TRIO simpler.



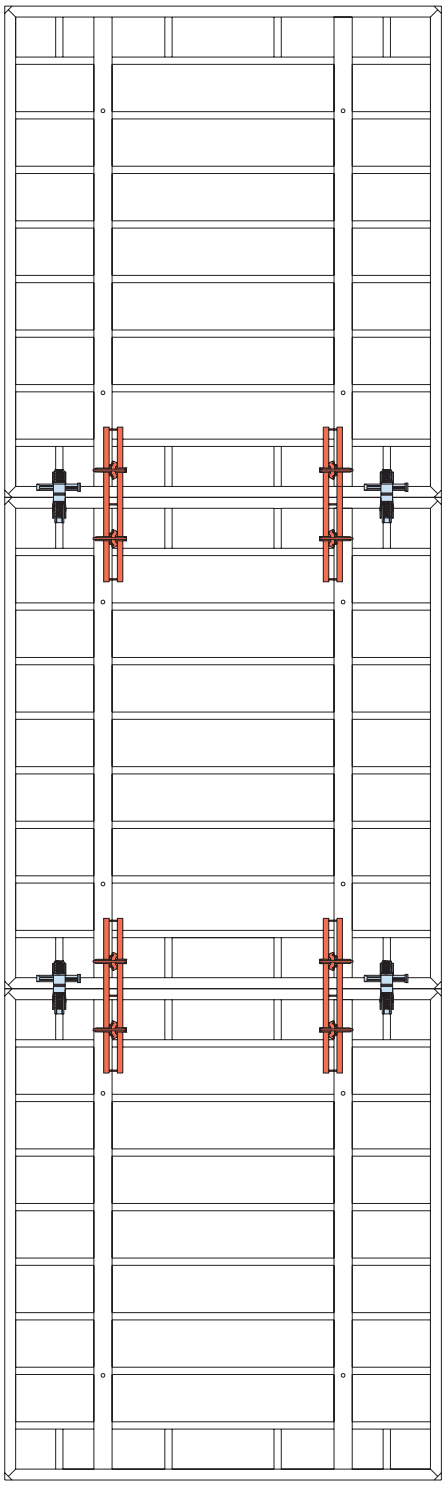
Four BFDs are required for extension of 2.40 or 2.70m wide panels to a height of up to 5.40 m.

CAUTION!
Do not exceed the safe working load of the TRIO lifting hook when shifting large panel units.



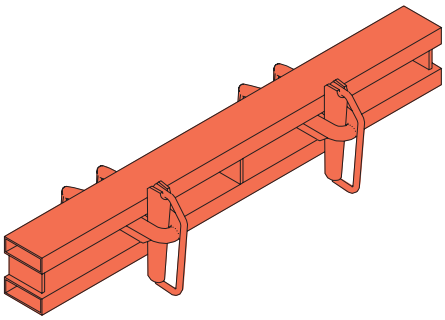
The BFD ensures a flexurally stiff connection of panels and allows large units to be moved.

Extended units up to 8.10m in height (three 2.70m panels) can be erected in one piece.



Two TAR 85s and two BFDs are needed to extend to a height of 8.10m.

TRIO extended to 12.00m
Five TRIO 270 x 240 panels on their side.



Just one component:
the TAR 85 compensation waler.

The TAR 85 compensation waler is easily fixed, without the need for loose clamps that can be lost.

Circular Structures
Polygonal shuttering with TRIO

Circular structures with small or large radii can be shuttered as polygons by choosing panels of the correct width.

The continuously adjustable BFD alignment coupler always allows the correct infill between the panels. This ensures that the circle can be closed, and the inside and outside panels are aligned to fix the through ties.

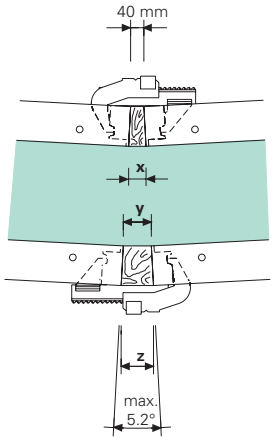
The diameter to be formed dictates the size of panel required.

Stormwater tank with a diameter of about 18m, shuttered with TRIO TR 270 x 90 panels.

Table of minimum radii for TRIO panels.

Panel width	**R** Min radius	**S** Deviation from curve
TR 30	3.55 m	4 mm
TR 60	6.90 m	7 mm
TR 72	8.25 m	8 mm
TR 90	10.25 m	11 mm
TR 120	13.60 m	14 mm
TR 240	26.95 m	28 mm
TR 270	30.30 m	31 mm

Detail



Notes on using TRIO as polygonal circular formwork:

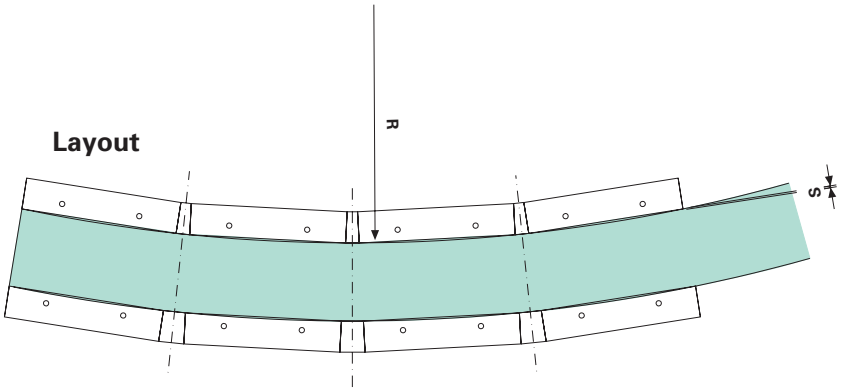
1. To ensure the BFD coupler can be attached properly, the maximum angular deviation of the panels must not exceed 5.2°.

2. To enable the ties to be fitted radially (passing through the filler timber), the smallest dimension of the inside filler timber must not be less than 40mm.

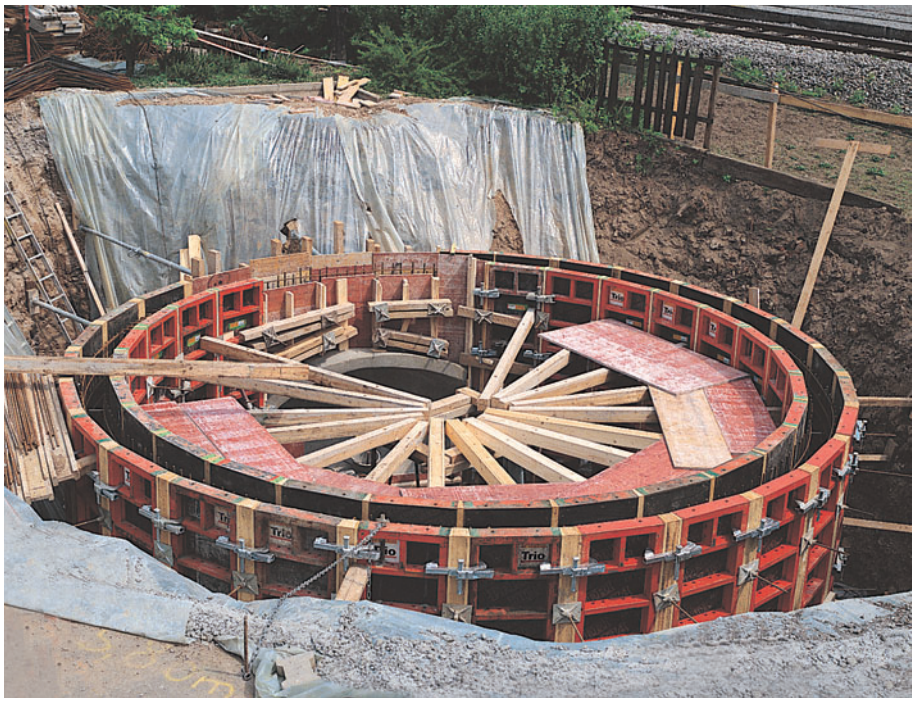
3. The maximum width of the filler timber:
BFD alignment coupler → 100mm
38 alignment coupler → 260mm

When using the formwork in this way the BFD alignment coupler must **not** be positioned on the struts.

Layout



Note:
The BFD alignment coupler is not positioned on the struts as normal.



Sewage tank shuttered with TRIO TR 270 x 60 panels.

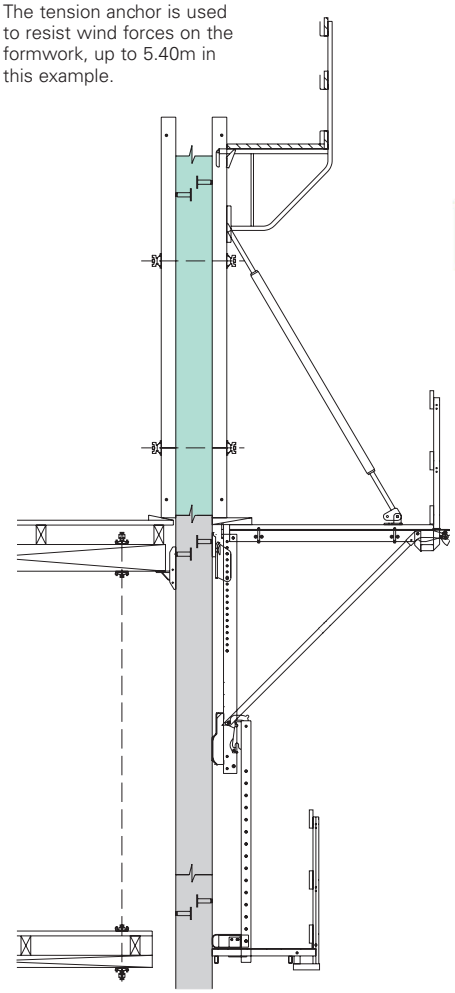
Climbing Formwork
TRIO on work platforms and climbing scaffolding

On FB 180 folding platform

TRIO formwork up to 5.40m high can be erected and supported on the FB 180 folding platform.

TRIO 330 on FB 180 folding platforms fitted with suspended finishing platforms.

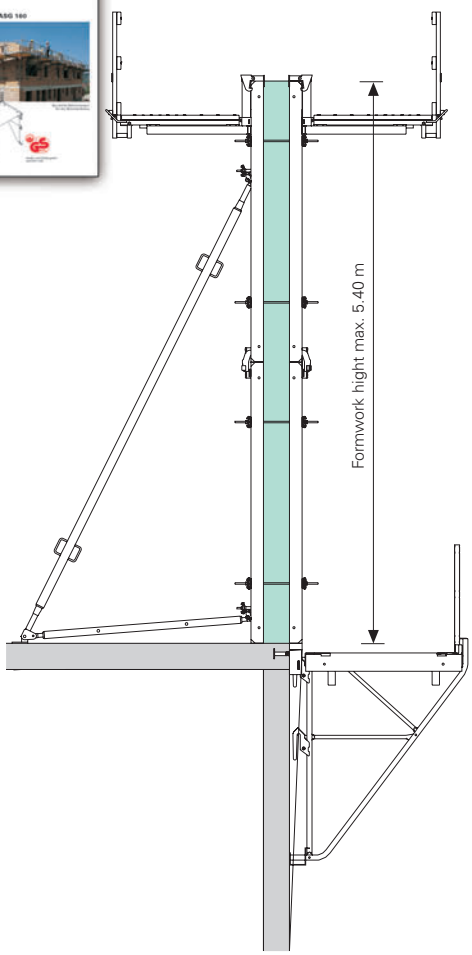
The tension anchor is used to resist wind forces on the formwork, up to 5.40m in this example.



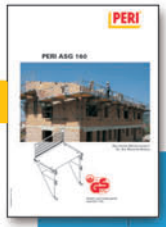
On ASG 160 work and access platform system

TRIO formwork up to 5.40m high can be propped using the ASG wall scaffold hinge.
The weight of the formwork must be supported on the floor slab at this height extension.

Detail: ASG 160 mounted on ASG wall scaffold hinge.



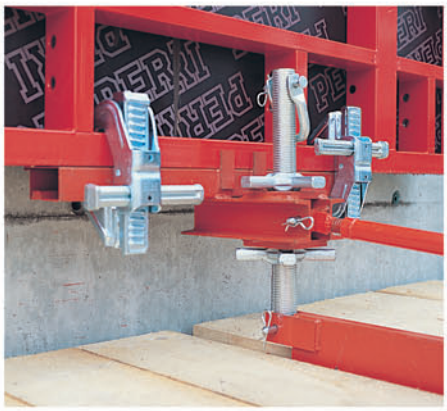
On KGF 240 climbing bracket



For high structures TRIO is combined with climbing brackets.

The formwork is then connected to the scaffold, and can be moved as a unit.

The TRIO articulated joint connects the TRIO to the KGF climbing brackets.



Climbing formwork units comprising TRIO panels and climbing platforms are raised one storey at a time. This ensures each step of the operation is safe, and speeds up the process by minimising crane lifts.

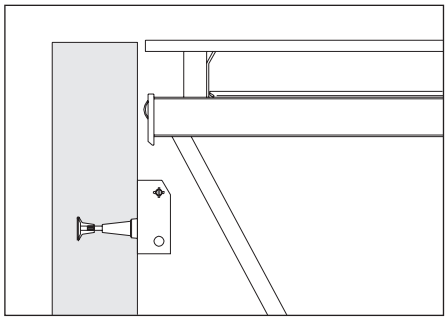
On CB 240 climbing bracket

TRIO 270 on CB 240 climbing brackets

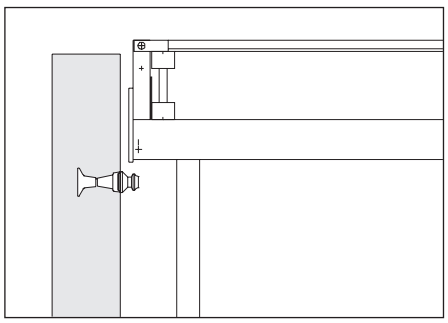
The height of the TRIO formwork is adjusted with spindles.

Varying the height of the panel using the adjusting unit (connection between TRIO and CB)

Mounting of KGF 240/KG 180 with WGS wall scaffold hinge



Mounting of CB 240 and CB 160 with 15 scaffold mounting ring

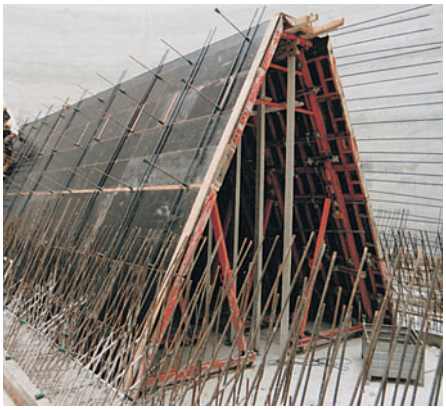


Special Applications
TRIO for beams, tunnels, custom solutions

Small beams with TRIO.
Supported with MULTIPROPs.

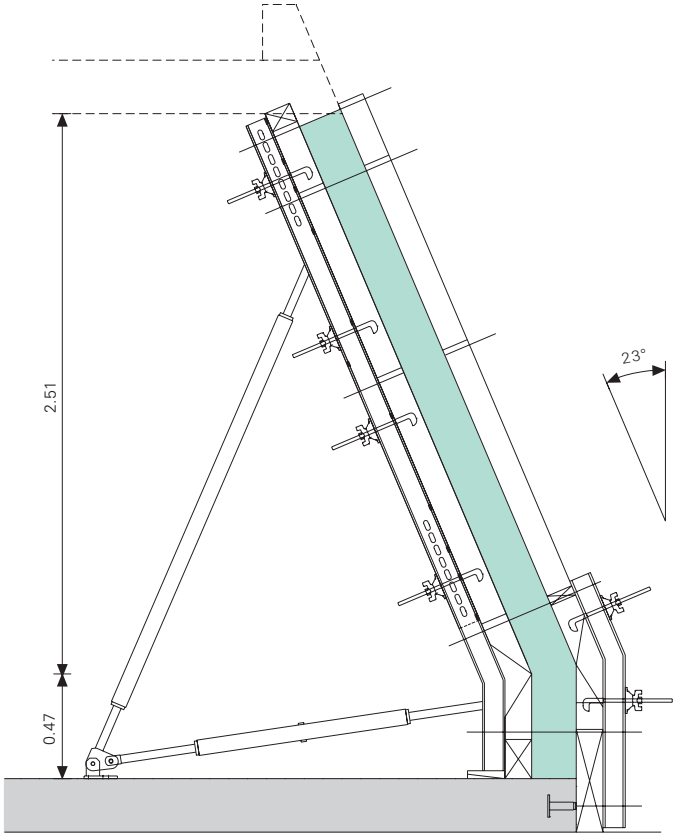
Heavy beams with TRIO.

Trapezoidal tunnel with
TRIO and SKS brace frame.



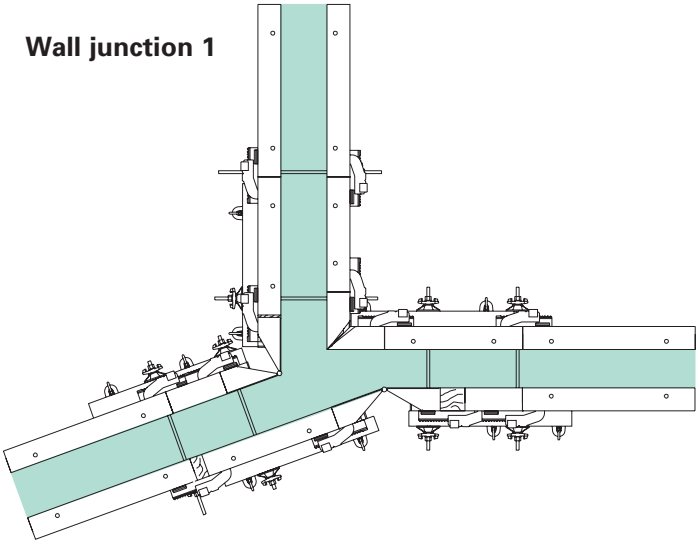
Complete TRIO unit 8.40m high.
Inside and outside formwork hung
from a portal frame traveller.

Rectangular tunnel with
standard TRIO components.

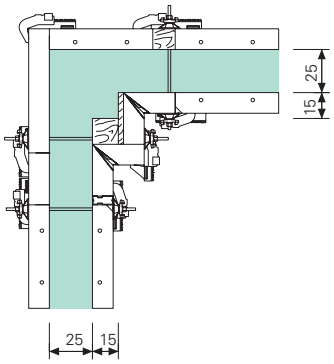


TRIO for pitched roofs
The slope angle was formed using articulated corners and special walers. The vertical forces were transferred by means of walers and push-pull props.

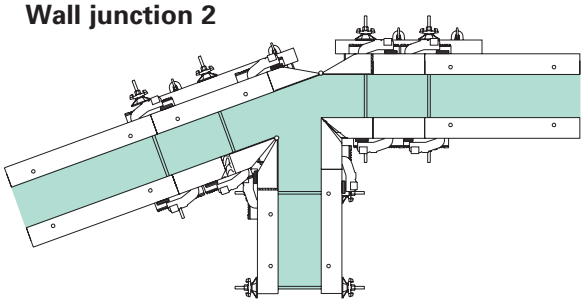
Wall junction 1



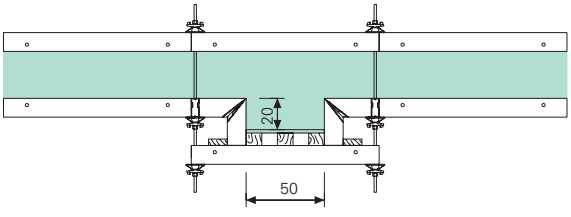
Internal corner with pier projection



Wall junction 2



Column projection



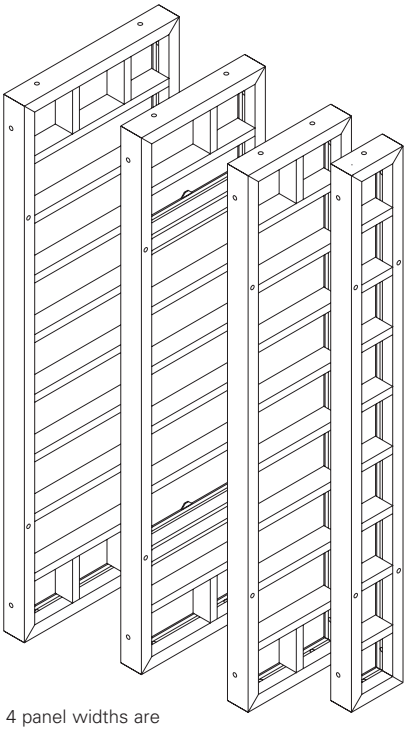
TRIO-L (aluminium)
The aluminium system to complement TRIO (steel)

TRIO-L is a complete system for all sites without a crane, as well as an appropriate way of supplementing red steel TRIO on any site.

TRIO-L is fully compatible with steel TRIO.

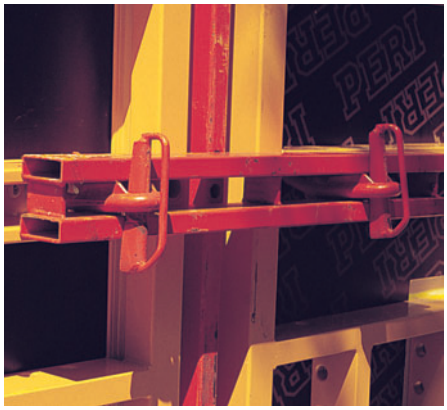
TRIO-L panels are available in the following sizes: height 2.7m, widths 900, 600 and 720mm; height 900mm and widths 1200, 600, 300 and 720mm.

TRIO-L is a lightweight aluminium system colour-coded yellow for ease of identification. It can be identified quickly and erected by hand whenever the crane is tied up on other work.



4 panel widths are available in heights of 270 and 900mm as TRIO-L.

Filler with Compensation Waler TAR 85 and Filler Plate LA.



No extra accessories
TRIO-L uses the same accessories as the red steel TRIO.

TRIO L allows shuttering to be erected without the use of a crane.
Particularly advantageous on housing projects.

TRIO-L is a complete system for shuttering without a crane.

Complete cellar for a detached house shuttered with TRIO-L without the use of a crane.

TRIO-L elements are the same size as TRIO steel panels to enable the two systems to be combined.

TRIO-L being used to shutter foundations.

TRIO-L panels are designed for the same fresh concrete pressure as steel TRIO.

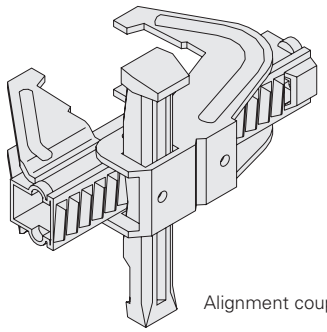
A site with TRIO-L (aluminium) and TRIO steel. The corners and infills are shuttered with TRIO-L by hand and the crane is only needed for the large steel elements (270 x 240).

TRIO 330
The panel formwork for storey heights of up to 3.30m

TRIO 330 is a complete formwork system with only 6 panel sizes.

TRIO 330 can be positioned both symmetrically and asymmetrically enabling the ties to be installed with the formwork upright or on its side. This prevents incorrect tie positioning for the asymmetrical configuration.

TRIO 330 also needs only one coupler: The BFD alignment coupler fastens aligns and tightens.



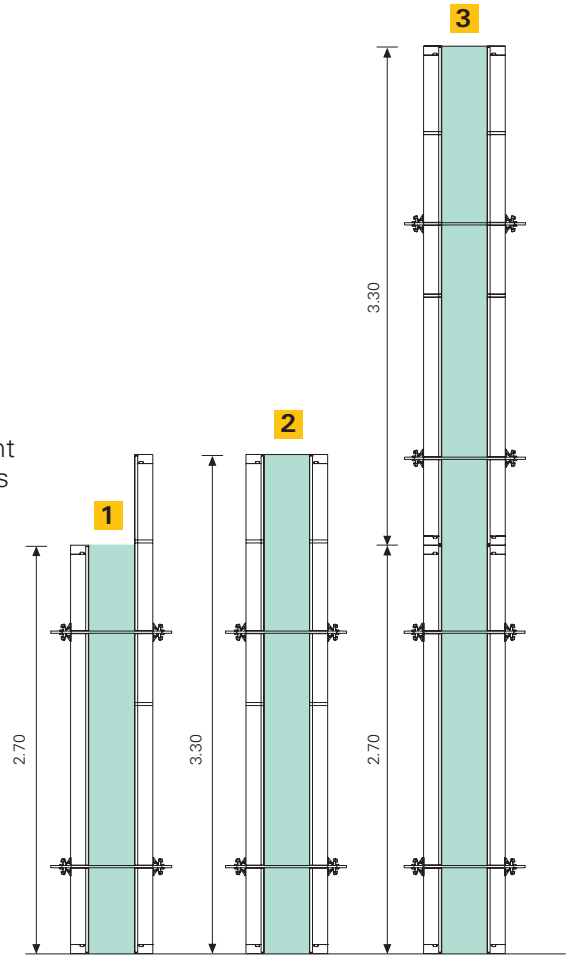
Alignment coupler BFD

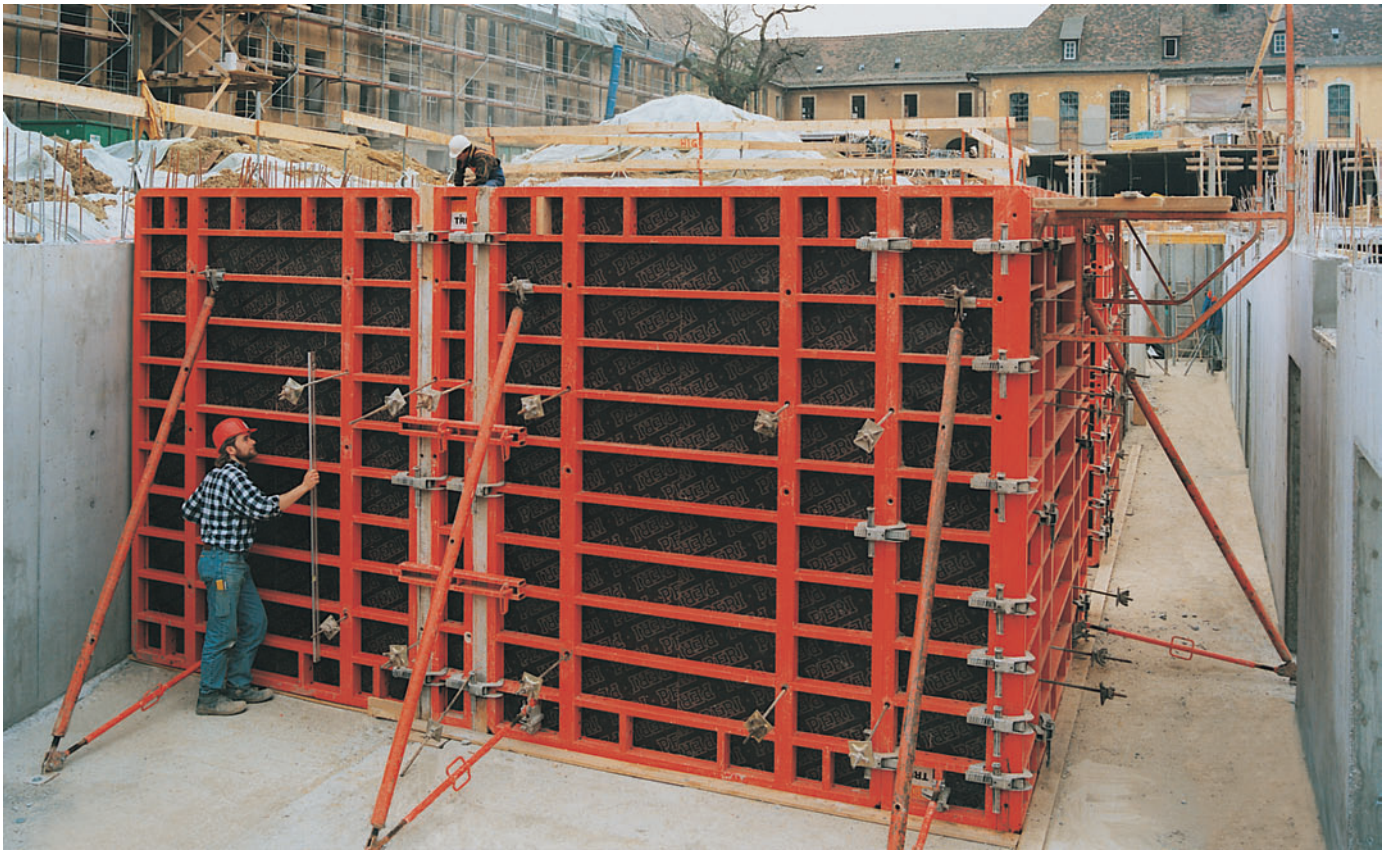
1 **TRIO 330** and TRIO 270 can be used opposite one another.

2 **TRIO 330** minimises deflection under high fresh concrete pressures. *With only 2 ties in a height of up to 3.30m TRIO 330 complies with DIN 18202, Table 3, line 7 under a fresh concrete pressure of 82.5kN/m².

3 **TRIO 330** can also be extended, the symmetrical tie arrangement ensuring correct tie alignment.

*These values have been worked out in accordance with the guidelines for obtaining the seal of approval for panel formwork from the German Association for Concrete Formwork Quality Assurance (GSV).

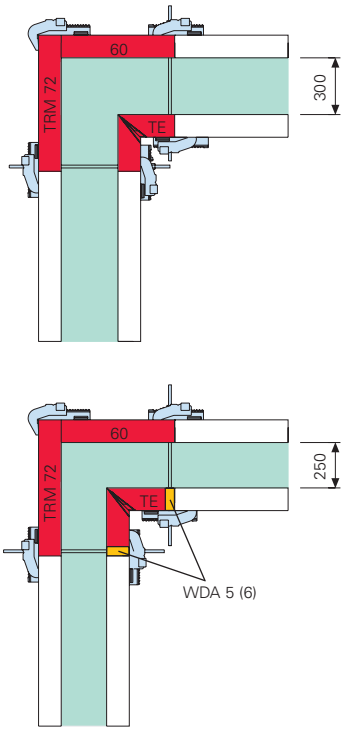




TRIO 330
Showing clearly that only 2 ties are needed in a height of 3.30m.

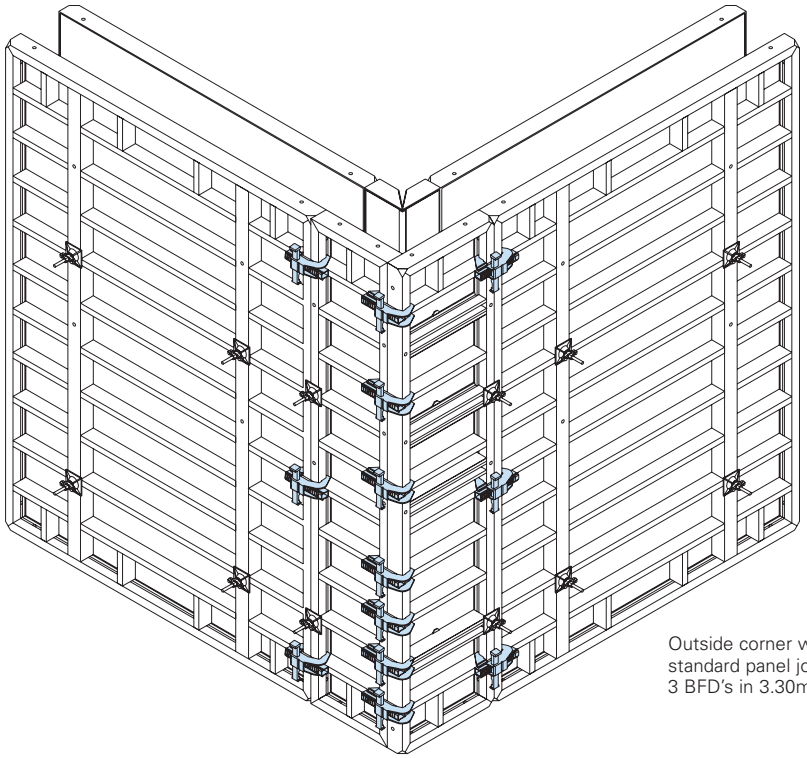
13.20m high wall with
4 x 3.30 TRIO panels.

Details solved in the same way as with TRIO 270
eg the external corner



Accessories such as the BFD alignment coupler, compensation waler, and scaffold brackets as the same as for TRIO 270.

TRIO 330 has all the advantages of the TRIO formwork system, such as powder coating, complete edge struts, and closed sections.



Outside corner with 7 BFDs, standard panel joint with 3 BFD's in 3.30m.

TRIO Structure
The panel formwork for special fairfaced concrete finishes

TRIO Structure with board finish formlining being used to construct a bridge abutment.

TRIO Structure, the formwork for special concrete surfaces. Any formlining required can be mounted on the fixing board.

TRIO Structure is available in heights of 3.30, 2.70 and 1.20m and is supplied with a factory fitted 21mm fixing board.

Ready-for-use Service
PERI can supply TRIO Structure with the formlining required ready fixed. If fixing is to be carried out on site we can supply the formlining required, cut accurately to size.

TRIO Structure - special panels
TRIO Structure panels can also be supplied in special sizes.

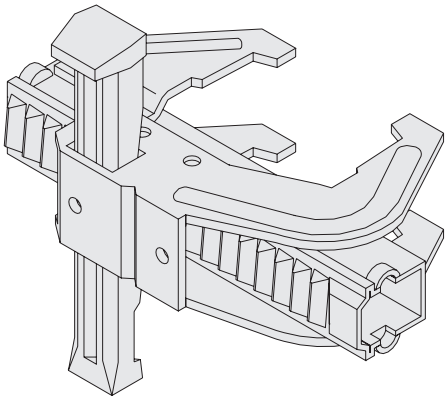
Panel units up to 9m wide and 2.70m high fitted with large formlining sheets.

Another important advantage:

TRIO's modest overall thickness is an important advantage, particularly when building narrow lift shafts or stairwells. It leaves enough space for personnel to work in.

TRIO Structure on the inside wall face is also often combined with TRIO on the outer face or vice versa, where a special concrete finish is only required on one side of a wall.

135° corner panel, fitted with large formlining sheets, being used in the construction of a Hotel.



All of the advantages of TRIO framed formwork are combined in TRIO Structure

A high permissible fresh concrete pressure of up to 80kN/m² allows faster concreting.

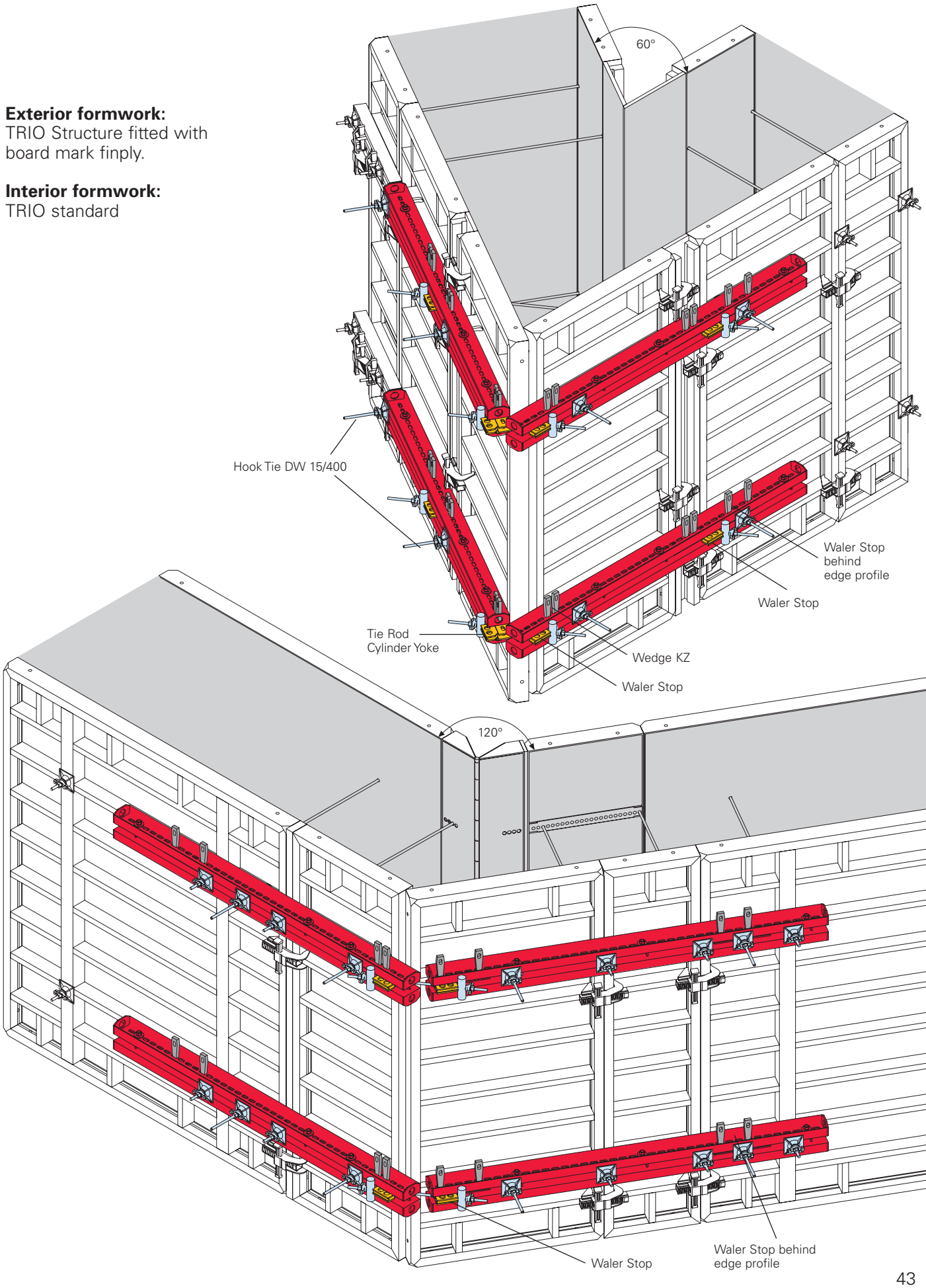
Compact for transportation
TRIO Structure's overall thickness of 140mm is 60% less than girder formwork. This cuts your transportation and storage costs, speeds up loading and unloading in your yard and on site.

Assembling TRIO Structure
The formlining required can be fixed from the front (using screwnails) or from behind (with Torx screws). Other types of fixing are available on request.

Example
Bridge abutment

Exterior formwork:
TRIO Structure fitted with board mark finply.

Interior formwork:
TRIO standard



TRIO column formwork
With panels for walls and columns

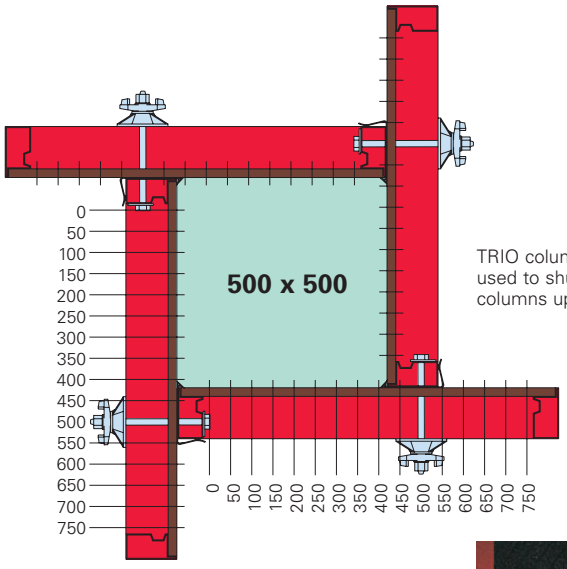
TRIO TRS column panels are designed to supplement TRIO.

They can be used as a column panel for cross sections up to 750 x 750mm or as a "standard" 90 panel in wall formwork.

The TRIO column panels have tie holes in the frame and can be used as 90cm wide TRIO standard wall panels.

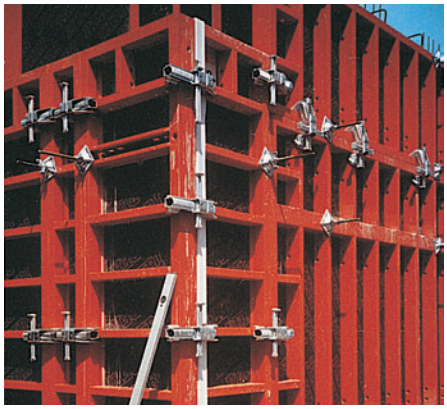
The permissible fresh concrete pressure to DIN 18218 is 100kN/m².

Accessories such as push-pull props connect in the same way as for TRIO formwork.



TRIO column formwork can be used to shutter square or rectangular columns up to 750 x 750mm.

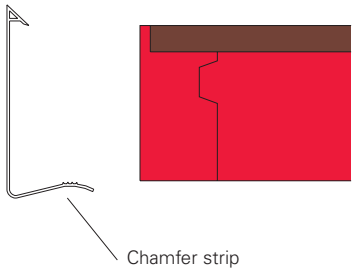
The chamfer strip can also be used on the external corner of TRIO formwork.

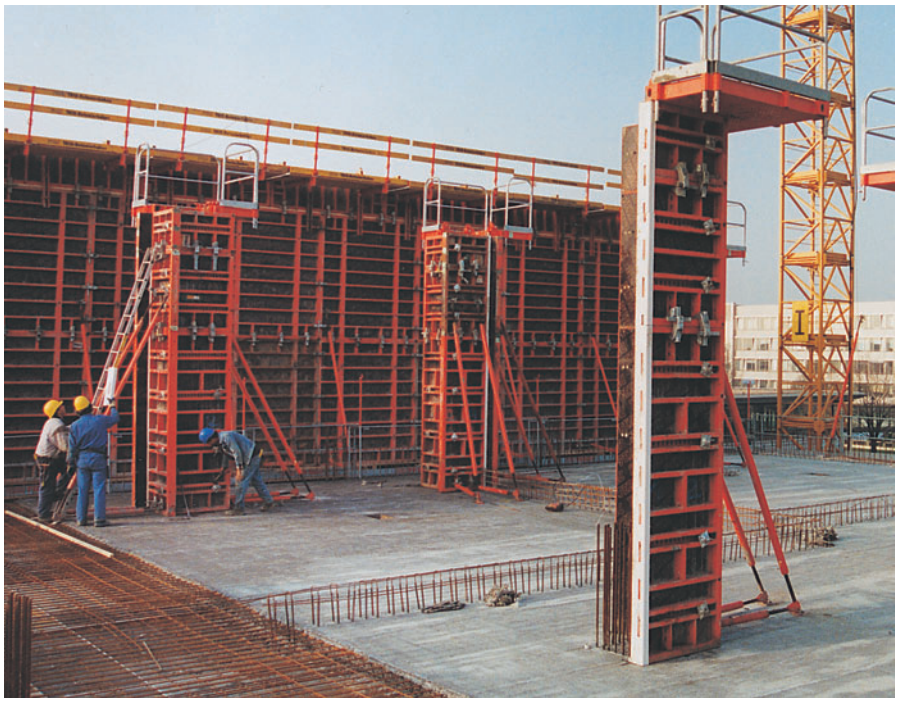


Chamfer strip for TRIO column formwork with clamping mechanism.

Difficult, laborious nailing of chamfer strips is now a thing of the past. **Just push them on!**

Detail

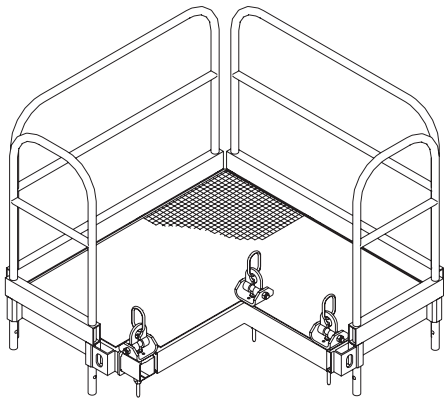




TRIO column formwork to a height of 4.5m with concreting platform.

The PERI concreting platform for TRIO column formwork.

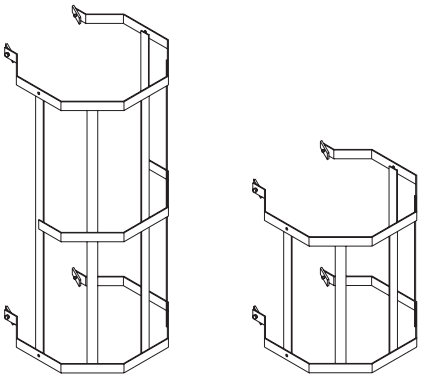
Continuously adjustable for any cross section from 200 x 200 to 750 x 750mm.



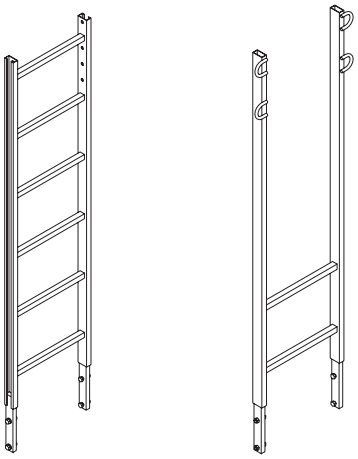
PERI's concreting platform also fits RAPID and QUATTRO column formwork. The telescopic support allows continuous adjustment to any column cross section up to 750 x 750mm.

Ladder access for PERI TRIO column formwork.

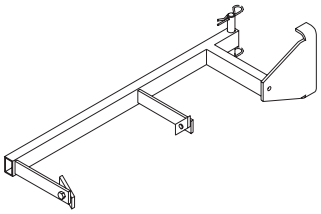
Ladder safety cage 150 Item no.: 051450
Ladder safety cage 75 Item no.: 104132



Ladder 180/6 Item no.: 051410
Access ladder 180/2 Item no.: 103724



Ladder connector TRIO Item no.: 103362



Ladder hook Item no.: 103718
Ladder base Item no.: 051460

Complete 5.40m high TRIO column formwork.
With concreting platform, ladder access and push-pull props.

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