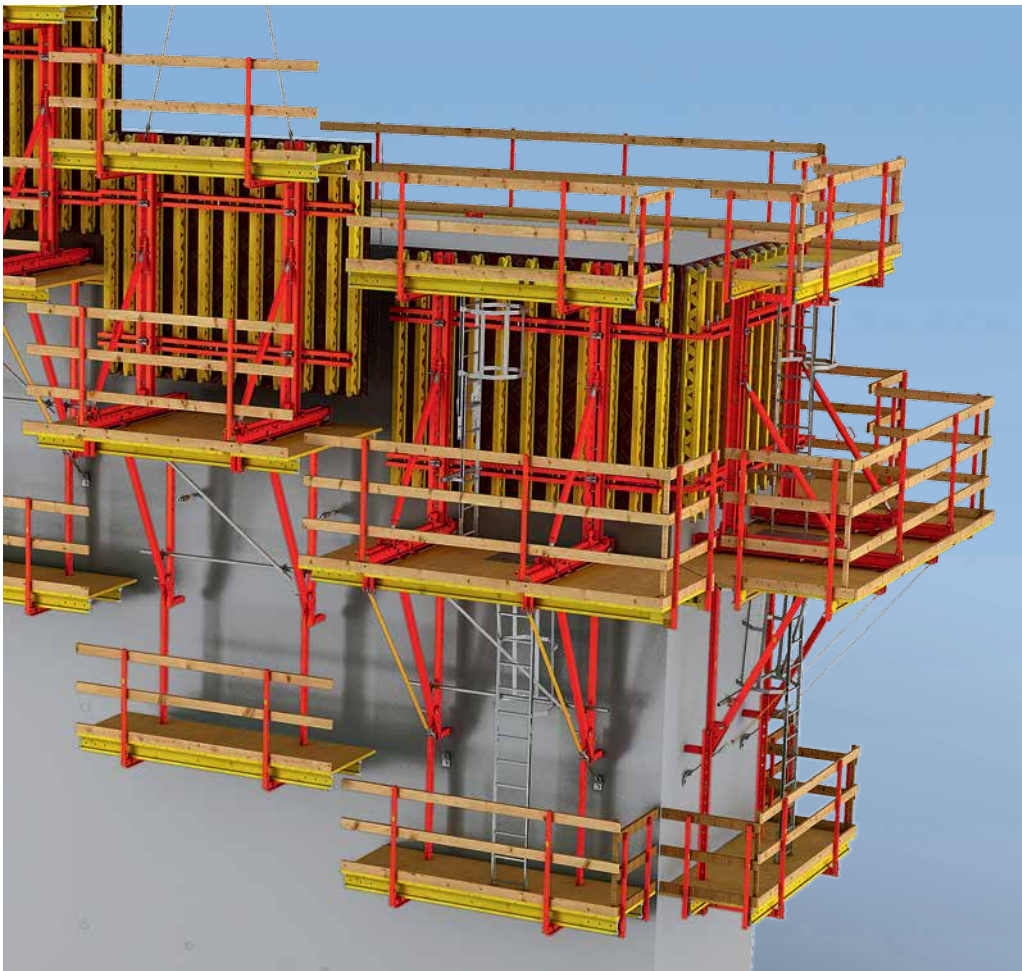


# SCS Climbing System

The solid bracket system for single-sided and two-sided climbing formwork operations

Product Brochure – Issue 06/2019



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## Project Examples

26 The SCS Climbing System  
in use

### Important information

All current safety regulations and guidelines applicable in those countries where our products are used must be observed.

The images shown in this brochure feature construction sites in progress. For this reason, safety and anchor details in particular cannot always be considered conclusive or final. These are subject to the risk assessment carried out by the contractor.

In addition, computer graphics are used which are to be understood as system representations. To ensure a better understanding, these and the detailed illustrations shown have been partially reduced to show certain aspects. The safety

installations which have possibly not been shown in these detailed descriptions must nevertheless still be available. The systems or items shown might not be available in every country.

Safety instructions and load specifications are to be strictly observed at all times. Separate structural calculations are required for any deviations from the standard design data.

The information contained herein is subject to technical changes in the interests of progress. Errors and typographical mistakes reserved.









### **SCS Climbing System**

For the construction of dams, locks, cooling towers, pier heads, tunnels and other similar structural components, formwork elements can very often only be positioned on one side while, at the same time, it would not be suitable to install any anchoring for the formwork due to the large spacing to the elements positioned on the opposite side. The Climbing System SCS is predominantly used for these one-sided applications - for the first time for the widening of the Panama Canal. From 2011 to 2014, the SCS proved itself on countless occasions during this project. In addition, the system can also be used for two-sided applications as well as on circular structural elements.







## SCS Climbing System

The solid bracket system for single-sided and two-sided climbing formwork operations

**The Climbing System SCS is predominantly used for single-sided applications, i.e. with non-tied wall formwork. The loads resulting from the fresh concrete pressure are thereby transferred via the Brackets into the previous concreting section by the Climbing Anchors. Typical areas of application for the Climbing System SCS are dams, locks, cooling towers, bunkers and strongroom vaults, pier heads and tunnels. With only a minimum of additional components, the system can also be used extremely cost-effectively for two-sided applications.**

With the System SCS, two bracket units together with one PERI Wall Formwork section form a crane-movable platform unit. Optionally, VARIO GT 24 Girder Wall Formwork as well as TRIO or MAXIMO Panel Formwork can be used.

The Climbing System SCS has been optimised for a concreting height of 3.00 m (vertical applications) or 2.50 m (forward-inclined applications). If required, a finishing platform can be added. With only a minimum of additional components, use with anchored formwork is also possible for walls up to 6.00 m high.

The Climbing System SCS is characterised by a high level of cost-effectiveness: on the one hand, the well-thought-out modular concept with multi-part Brackets facilitates easy and simple adaptation to suit project-specific requirements and geometries. On the other, the high load-bearing capacity of the Brackets allows wide climbing units which, in turn, reduces material requirements and workload respectively.

The wider SCS 250 version is equipped with a formwork carriage for retracting the formwork. This carriage can also be used on circular structures; thereby, an adapter ensures that the Brackets are always arranged in a parallel position.

Thanks to its modular design, the SCS can be delivered pre-assembled to the construction site with subsequent fast final assembly.

With the SCS, full consideration is also given to safety issues: if inclined components are formed, the inclination of the working platforms can be adjusted separately; in addition, the concreting and finishing platforms can be tilted by  $\pm 15^\circ$  and  $\pm 30^\circ$  respectively. Ladders with hatches ensure safe access to working levels; end-to-end side protection can be attached to all platforms.

### Optimised use of crane time

thanks to large, craneable climbing units – also with large formwork heights and circular structures

### Material-optimised solution

with the same formwork and components for the starter and subsequent standard cycles

### Safe, horizontal working areas

due to the horizontal alignment of the platforms also for inclined working operations

### Cost-effective also for two-sided applications

due to a minimum of additional components for a high level of material utilisation and reduced logistical requirements

# SCS Climbing System

## Description of the SCS versions

### SCS 190

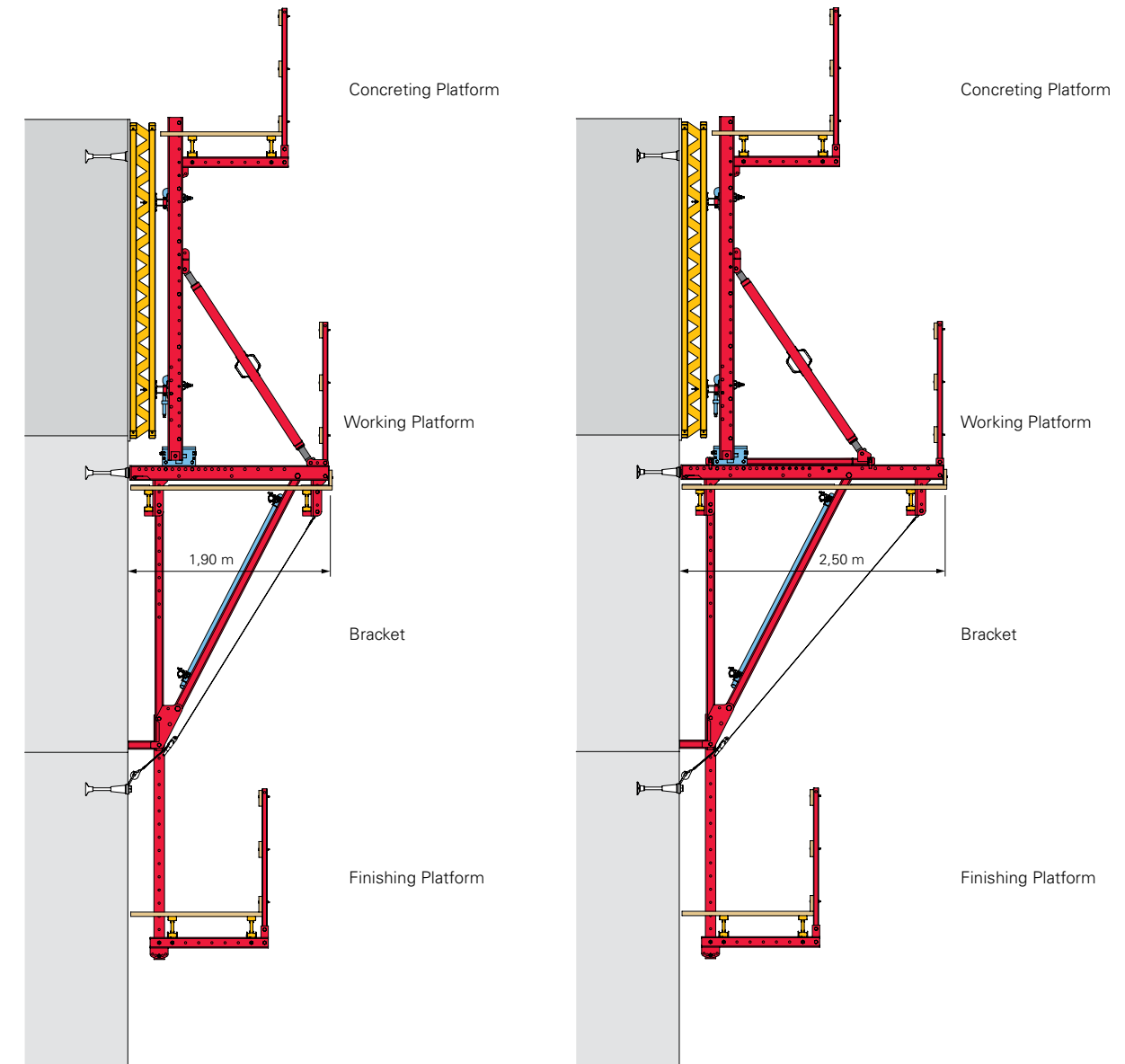
**Bracket width approx. 1.90 m**  
**With tilting device for striking operations**

The Bracket SCS 190 has a width of 1.90 m and requires only a minimum of space, as well as being a more cost-effective alternative. The formwork is simply tilted when striking.

### SCS 250

**Bracket width approx. 2.50 m**  
**With Formwork Carriage and a retraction distance up to 67 cm**

The SCS 250 has a width of 2.50 m and is equipped with a Formwork Carriage. The carriage allows the wall formwork to be retracted up to 79 cm (valid for MAXIMO and TRIO) or up to 63 cm (valid for VARIO GT 24) without requiring a crane. This provides sufficient space for the reinforcement work, assembly of the scaffold anchoring, as well as shuttering and striking of box outs.



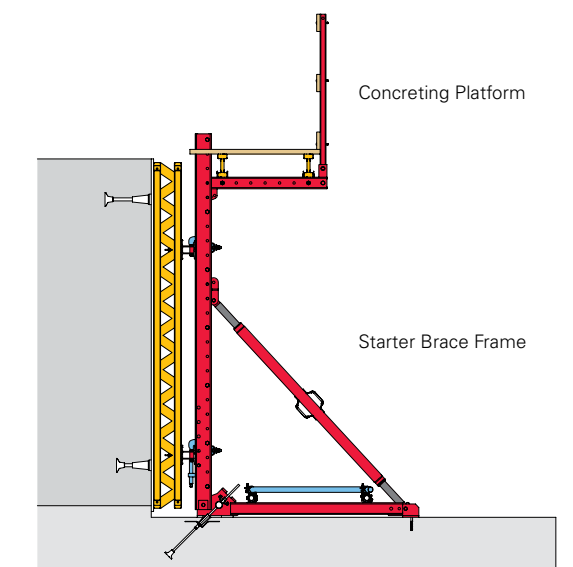


## SCS Starter Brace Frame

### Modular construction consisting of Strongbacks, Heavy-Duty Spindles and Starter Walers

For the first casting segment, a Starter Brace Frame is used while diagonal anchoring transfers the loads into the bottom slab.

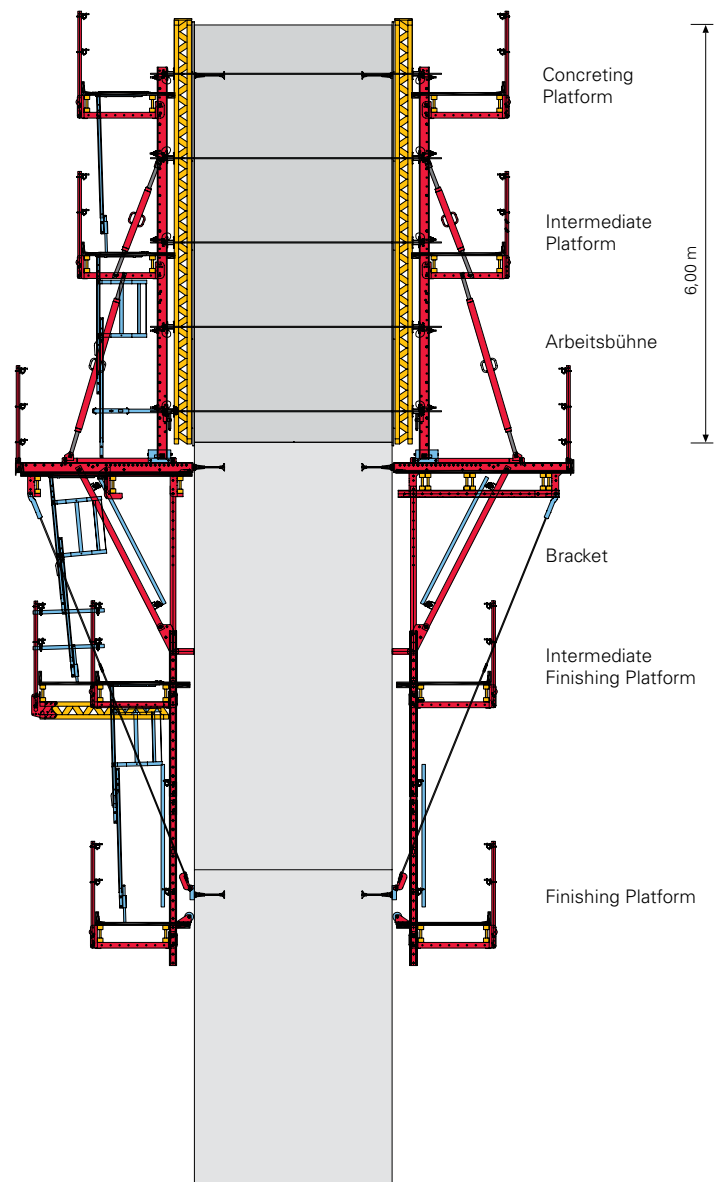
The SCS Starter Brace Frame is designed in such a way that the Strongback, Spindle and Formwork can also be used in the next casting segments with the Climbing Bracket.



## SCS two-sided application

### Use of the SCS Climbing Bracket for anchored wall formwork with only a minimum of additional components

With only a minimum of additional components, the SCS Climbing Bracket can also be used for anchored wall formwork up to 6.00 m high. This ensures increased material utilisation of the system components and thus enhanced cost-effectiveness of the investment.



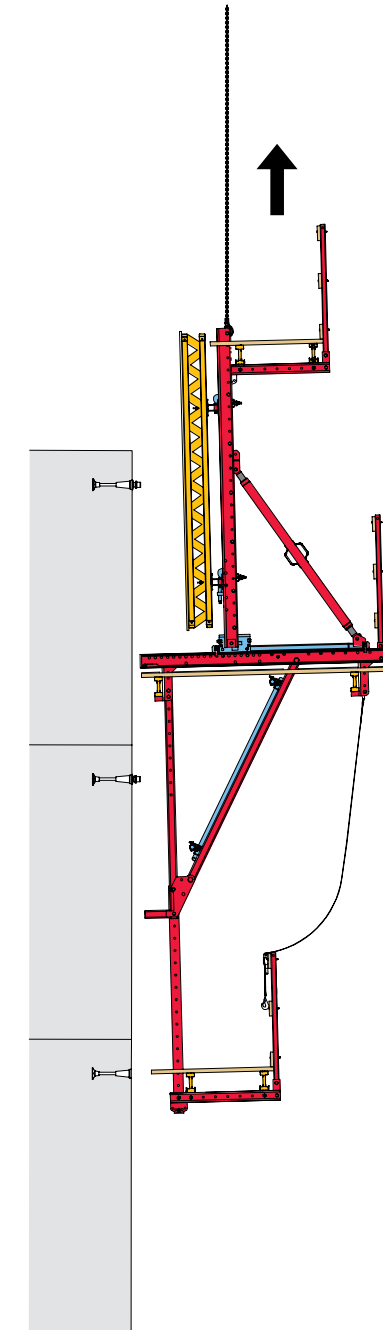
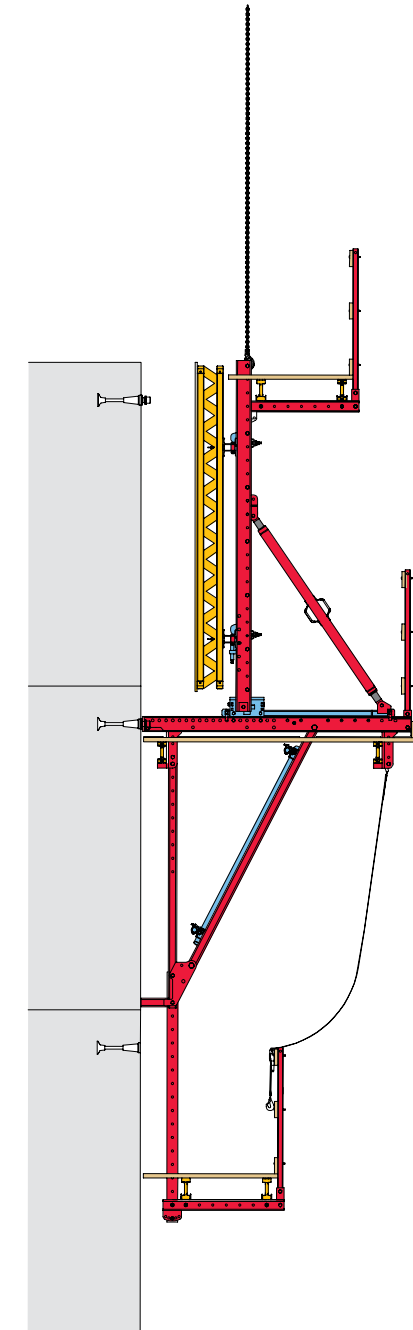


# SCS Climbing System

## The moving procedure

For moving the Climbing Units by crane, the formwork is tilted backwards slightly.

The Climbing Unit is then released and removed from the mounting rings or mounting bolts, and then lifted.

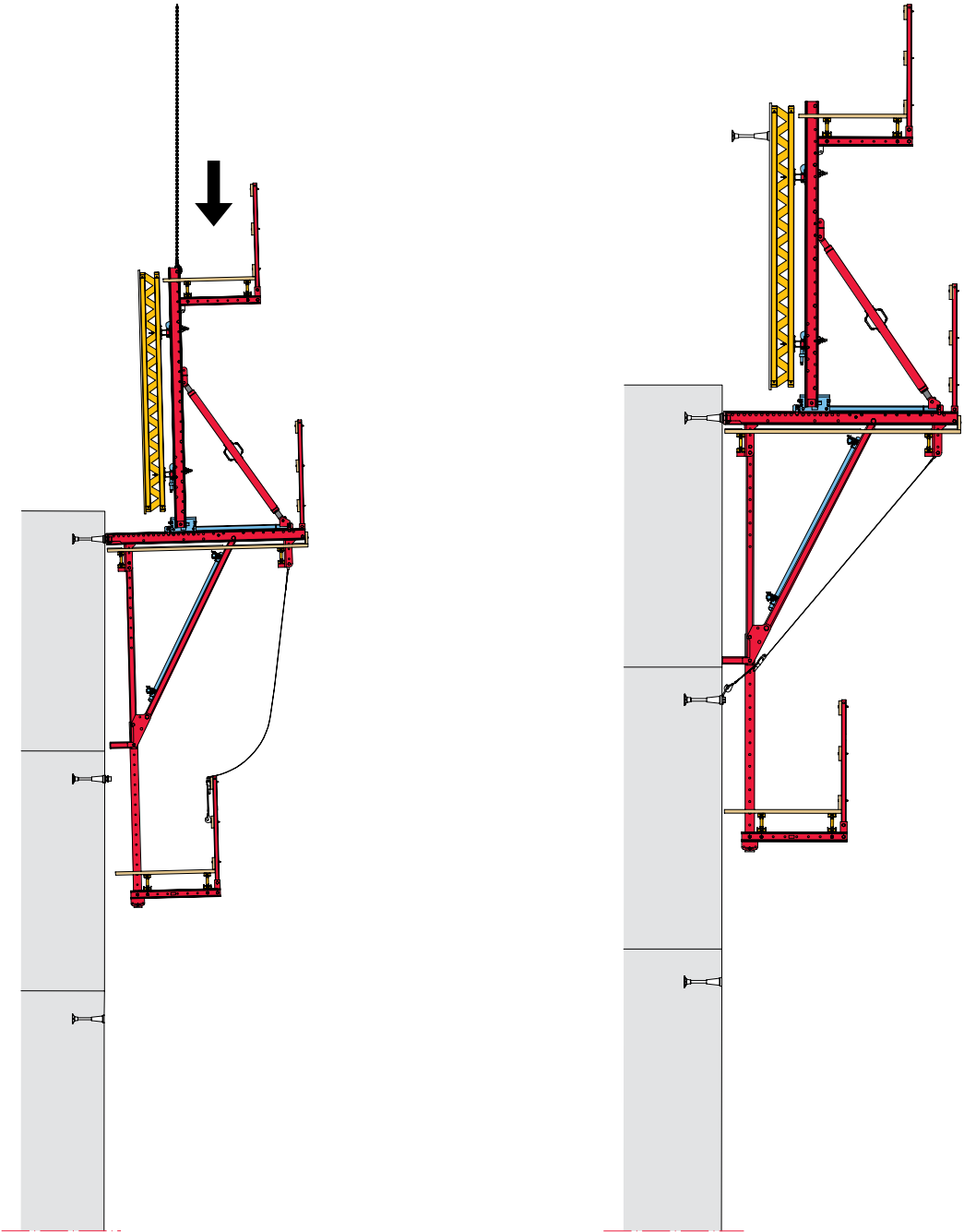






The Cross Beam is subsequently mounted on the next highest mounting rings or mounting bolts, and then secured.

After this, the crane lifting gear can be released. Following this, the Leading Anchor for the next casting segment is fixed to the formwork.





## Optimised use of crane time

Large, craneable climbing units – also for large formwork heights and circular structures

**The SCS Climbing System stands out in particular due to its high load-bearing capacity; at the same time, it is one of the lightest systems in its class. Due to the possibility of forming large climbing units - optimised for a formwork height of 3.00 m - the system is very cost-effective.**

With the SCS system, the load-bearing capacity of the brackets and anchorage is perfectly matched. The number of brackets required is reduced due to maximum utilisation of the anchoring. This means only a few anchor points are needed. As a result, the workload and execution costs are reduced overall - also through the reduction in the number of lost parts.

Through the use of the Angle Adapter, the Climbing Brackets can always be arranged in a parallel position even on circular structures and the climbing units can be moved by crane. This also saves on crane lifts for circular structures - and thereby costs and time.

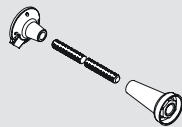


## Proven tie system with the certified PERI Climbing Cone

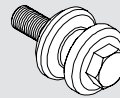
The anchoring is approved by the building inspection authority. The suspension systems have been optimally adapted for this application and, as a result, are very cost-effective. The PERI portfolio includes:

- Mounting Bolt SCS for high tensile forces
- Mounting Ring SCS for high vertical loads
- Climbing Cone M30 / DW 20
- Climbing Cone M36 / DW 26

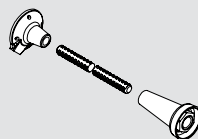
**Climbing Cone M24 / DW 15**



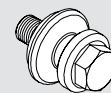
**Mounting Ring SCS M24**



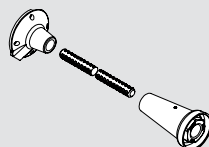
**Climbing Cone M30 / DW 20**



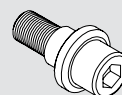
**Mounting Ring SCS M30**



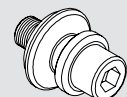
**Climbing Cone M36 / DW 26**



**Mounting Bolt SCS M36**



**Mounting Ring SCS M36**

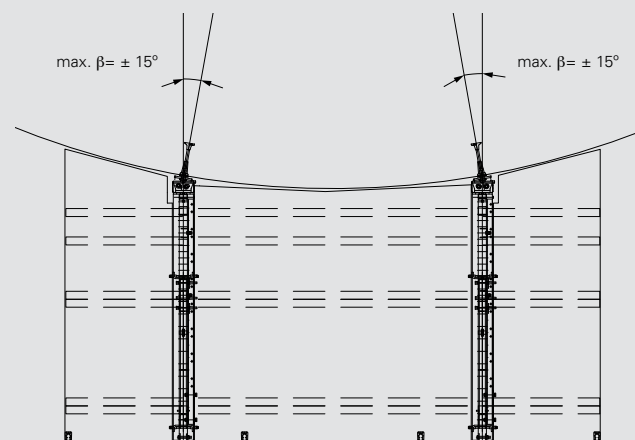




## Advantages of the Angle Adapter SCS on circular structures

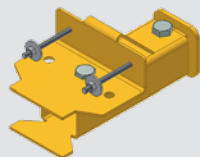
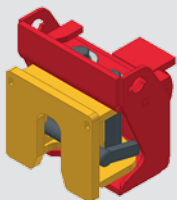
The Angle Adapter is attached to the Head Plate of the Cross Beam Unit. The Adapter can be pivoted by  $15^\circ$  so that there is a parallel arrangement of the brackets. The Swivel-Mounted Pressure Point is used on the vertical strut.

Thereby, the formwork can also be quickly retracted on circular structures using the formwork carriage; separate crane lifts for moving the formwork are not required.



Angle Adapter SCS

Swivel-Mounted Pressure Point SCS





## Material-optimised solution

Same formwork and components for the starter and subsequent standard cycles



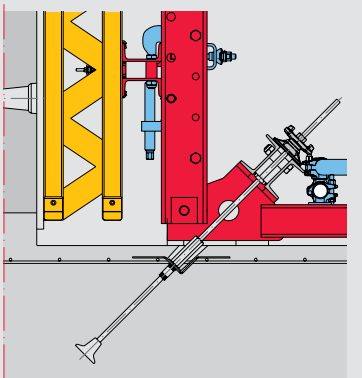
**With the so-called starter cycle, the loads are transferred into the bottom slab. This cycle frequently has to be carried out with varying heights, e.g. on uneven terrain. Only one additional component is required for the SCS: the Starter Bar SCS.**

The Starter Bar transfers the loads from the first concreting section into the bottom slab. For subsequent cycles, Strongbacks, Spindles and the formwork are simply mounted on the brackets and reused without requiring any modifications. In general, the SCS Climbing System follows a modular concept; in addition, all system components are consistently designed to accommodate a system grid of 125 mm – as with the VARIOKIT Engineering Construction Kit. This ensures maximum utilisation of the components and therefore a high level of cost-effectiveness.

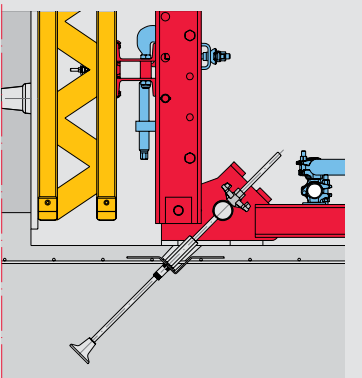
Thus, for example, the Climbing Bracket consists of multiple parts so that most of the same components are used for both the SCS 190 and SCS 250. The Adjusting Unit as well as the separate vertical and diagonal struts are used in both system versions. Last but not least, the SCS 190 and SCS 250 utilise identical system components for the formwork support and for the finishing and concreting platforms.



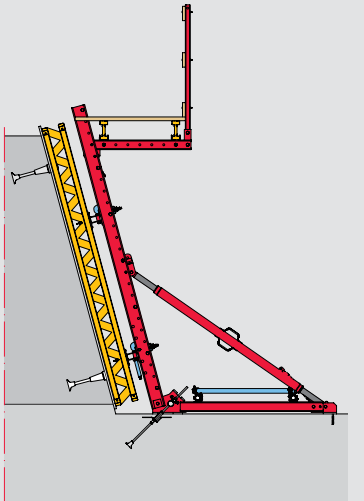
SCS system components are used for the vertical Starter with Brace Frames: Starter Bar SCS, Strongback SCS and the Heavy-Duty Spindle SCS.



For anchoring the Starter Brace Frames, an SRU Waler together with Tie Rods and Wingnut Pivot Plates can be used.



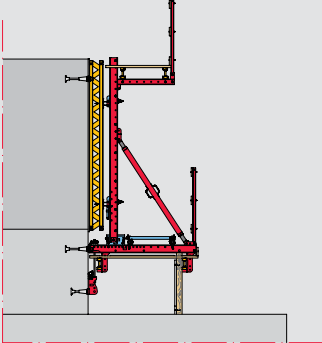
The alternative anchoring solution consists of Tie Yokes and Wingnuts.



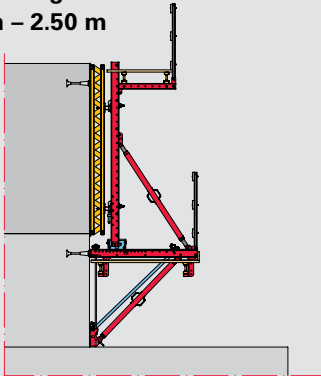
With SCS, inclined Starters can also be realised as the inclination of the wall is adapted to suit using the Heavy-Duty Spindle.

The SCS Climbing System includes easy and simple solutions for different starter heights facilitating use on difficult terrain.

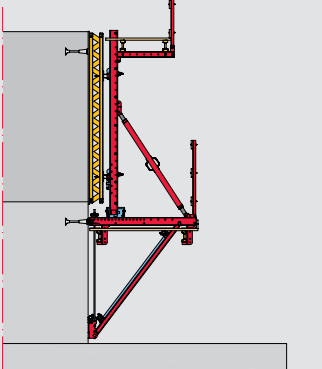
**Starter height  
1.20 m – 2.00 m**



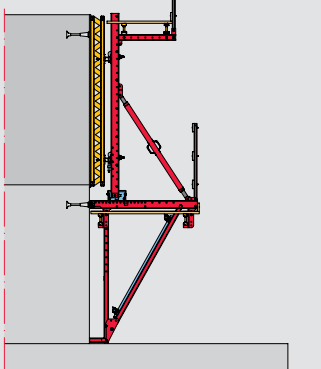
**Starter height  
2.00 m – 2.50 m**



**Starter height  
2.50 m – 2.80 m**



**Starter height  
2.80 m – 3.00 m**





## Safe, horizontal working areas

Enhanced safety due to inclinable platforms



**SCS is very flexible and safe to use. The platforms themselves can be aligned horizontally even during inclined working operations. In addition, 1.50-m-high Guardrails installed on the working platforms provide a high level of work safety.**

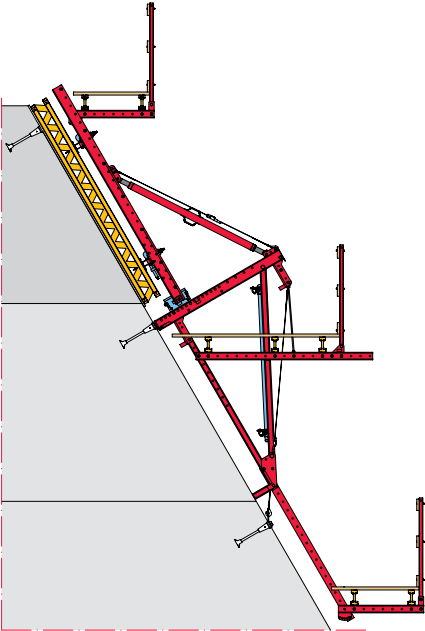
For dams and other similar structures which are realised using single-sided forming operations, inclined areas very frequently need to be constructed. The SCS Climbing System also provides the flexibility needed to form these surfaces efficiently and safely.

Thus, the length of the platform suspension for the working platform can be adapted according to the respective component inclination; the working platform is therefore always aligned horizontally. Furthermore, concreting and finishing platforms can be tilted by  $\pm 15^\circ$  as well as  $\pm 30^\circ$  so that these working areas are also horizontally positioned in all situations. In addition, the generously-sized 1.50-m-high Guardrail Posts guarantee a high level of safety on all platforms.

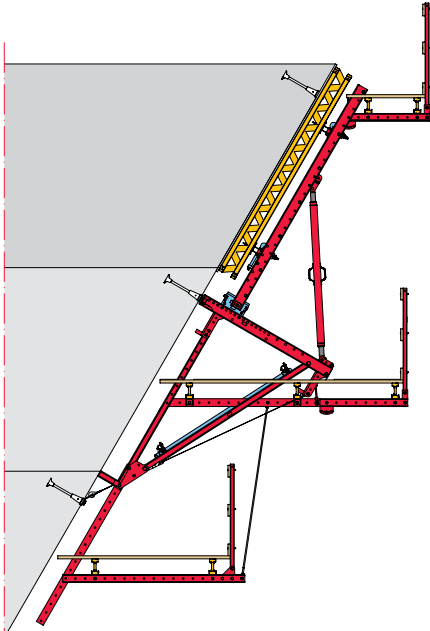




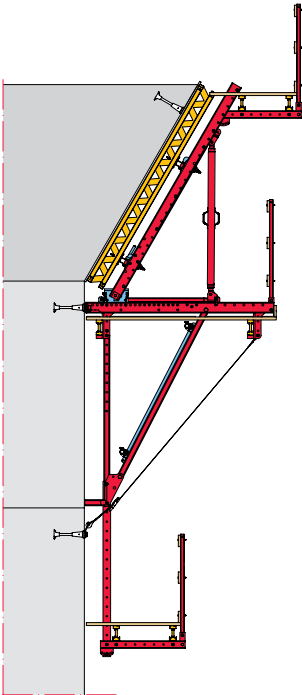
For inclined applications, working, concreting and finishing platforms are adapted to accommodate different inclinations; changing the angle of inclination is easily realised. With these inclined components, concreting loads are also reliably transferred via the anchoring into the respective preceding casting segment.



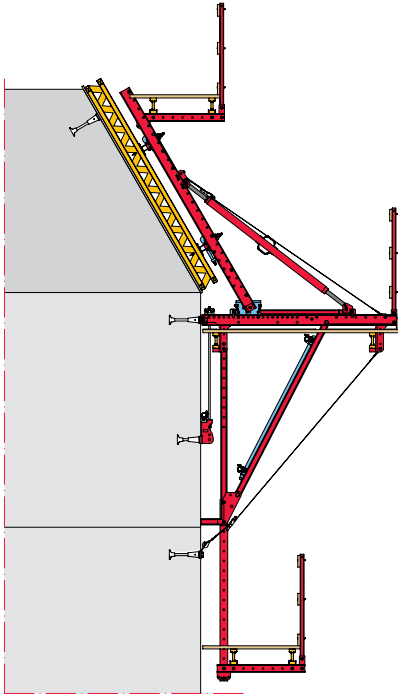
Execution featuring a component with a forward inclination of up to 30°.



Execution featuring a component with a rear inclination of up to 30°.



Execution featuring changes in inclination to the rear of up to 30°.



Execution featuring changes in forward inclination of up to 30°.



## Also used for two-sided applications

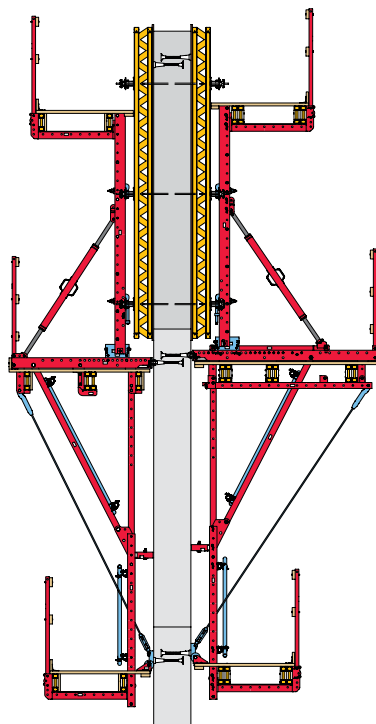
A minimum of additional components ensure cost-effective climbing operations with anchored wall formwork

**With only a minimum of additional components, the proven SCS Climbing Brackets can be also used for economical two-sided applications.**

With anchored wall formwork, the SCS Brackets can be used up to heights of 4.00 m (with SCS 190); heights of up to 6.00 m are possible with an additional 5.50-m-long Strongback. If required, an intermediate platform and an intermediate finishing platform can be mounted on the formwork.

Compared to single-sided applications, larger platform widths and therefore wider climbing units can be realised with anchored wall formwork. As a result, centre beams can be arranged under the platform lining, while reinforced platform beams are used for the concreting, intermediate and finishing platforms. Double use of Platform Posts from the single-sided application facilitate the suspension of the finishing platform. In addition, scaffold tubes are to be installed to brace the finishing platform suspension.

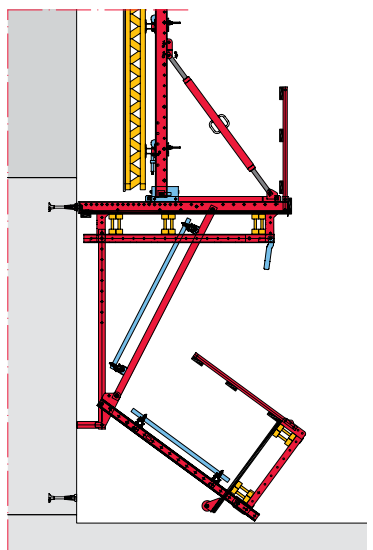
Thanks to its compatibility with the VARIOKIT Engineering Construction Kit, project-specific solutions using system components from the PERI rental park can also be realised – without requiring any investment in customised special components.



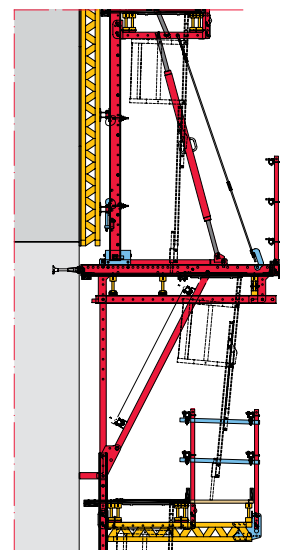
The SCS 190 serves as a primary formwork for two-sided operations. The SCS 250 with the Formwork Carriage serves as closing formwork. With the formwork in a retracted position, reinforcement work can be carried out from here.

The high load-bearing capacity of the brackets also allows wide climbing units for two-sided applications to accommodate large formwork heights and high wind loads. The advantages are reduced material, crane and labour requirements, as well as fewer lost components.

SCS Platforms can be delivered pre-assembled; the final assembly steps are carried out on the construction site.



While the Climbing Bracket is being fixed to the wall, the finishing platform is mounted on it. When moving the unit, the finishing platform then swings into a vertical position. This means that remaining under suspended loads is not necessary at any time.

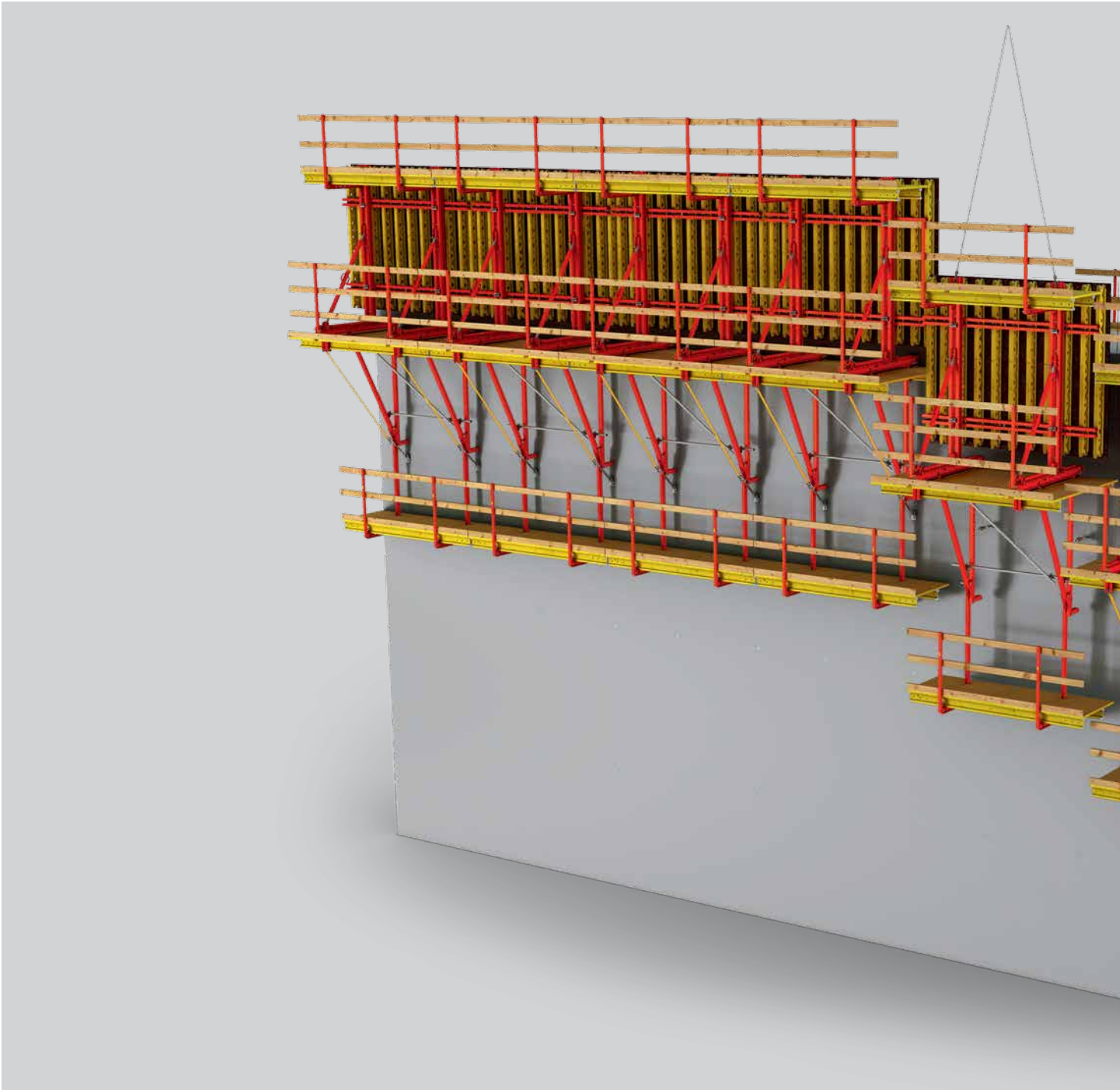


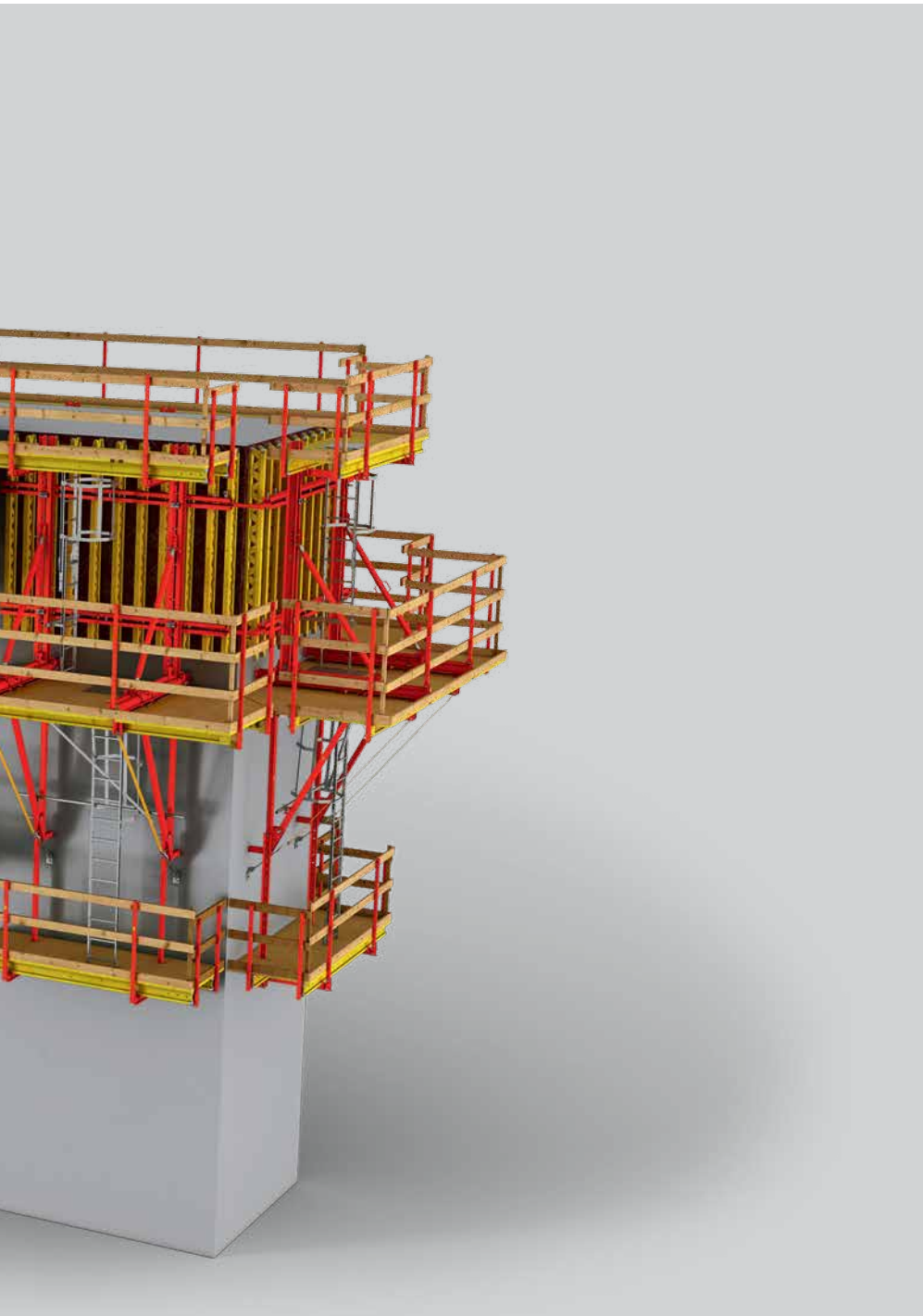
Accessing the finishing platform via the ladder is safe at all times – even with retracted formwork. For descending from the working platform to the finishing platform, a cantilevered ladder platform can be integrated.



## The SCS Climbing System at a glance

Regular operating sequence, standard applications and execution details





**The assembly of the SCS Climbing System shows the three platforms: concreting, working and finishing platform.**

The top platform – the concreting platform – is used for placing the concrete, attaching the crane slings and for mounting the Leading Anchor.

The formwork is adjusted and operated, e.g. retracted, from the middle working platform.

The finishing platform suspended at the bottom is used to recover the anchorage from the preceding casting segment and, if necessary, to mount the wind safety device. If required, the finishing platform can also form the necessary working area for post-processing the concrete.



# The regular operating sequence with SCS

Simple cycle sequence for fast construction progress

## The starter cycle

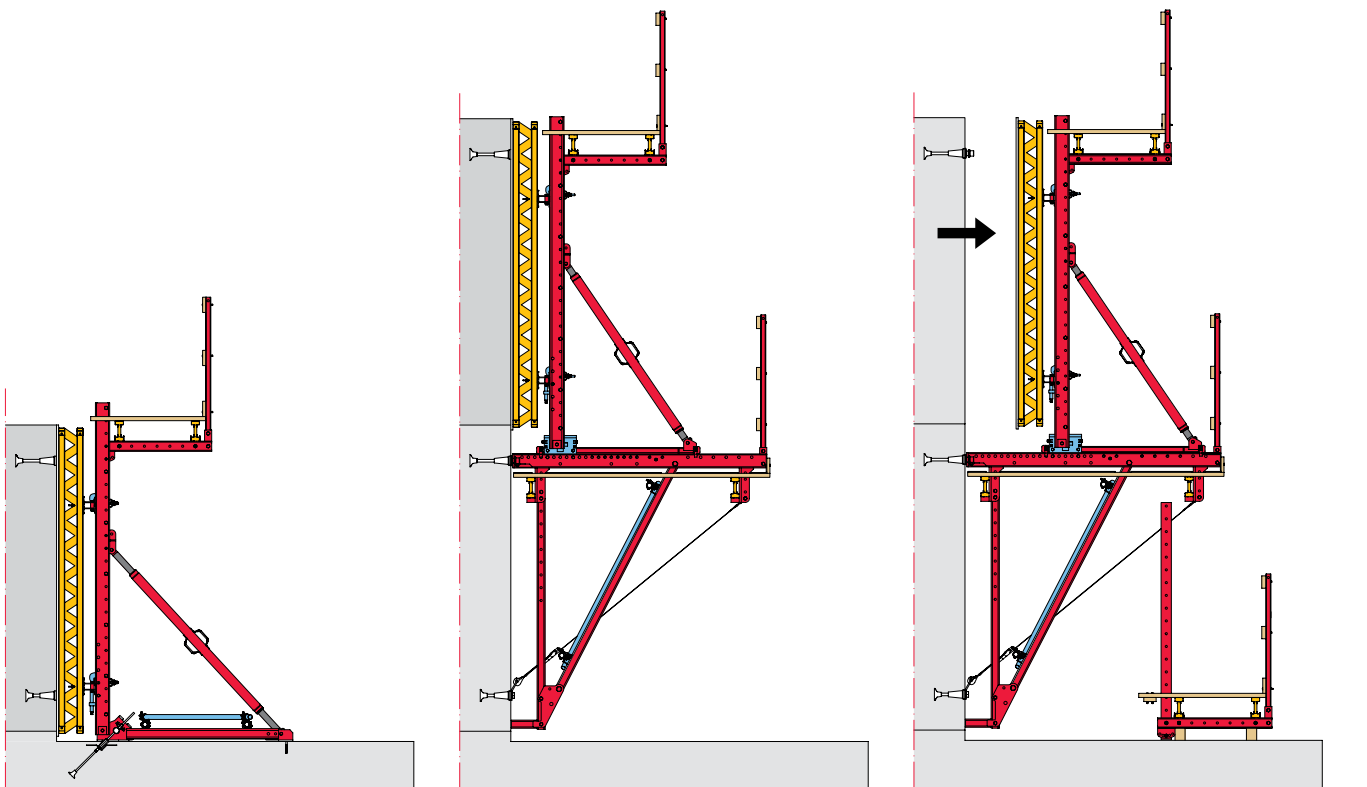
The first casting segment is constructed using the Starter Brace Frame. In the process, the horizontal Starter Bar is anchored in the bottom slab and, together with the formwork, complements the Strongback and the Heavy-Duty Spindle. The latter components can be re-used during subsequent use with the Climbing Bracket.

## The first climbing step

For the second casting segment, the Climbing Bracket is used without a finishing platform. Formwork, Strongback and spindle of the Starter are mounted on the Bracket.

## Striking

Striking is carried out with the help of the Heavy-Duty Spindle, Adjusting Unit and Formwork Carriage. To do so, first release the mounting for the leading anchor after the concrete has hardened. The Mounting Ring must subsequently be fixed to the embedded Leading Anchor to which the climbing unit is later attached. Any wind safety devices are to be detached, while anchors which are no longer required must be removed and anchor holes must be sealed with plugs.



### Moving procedure

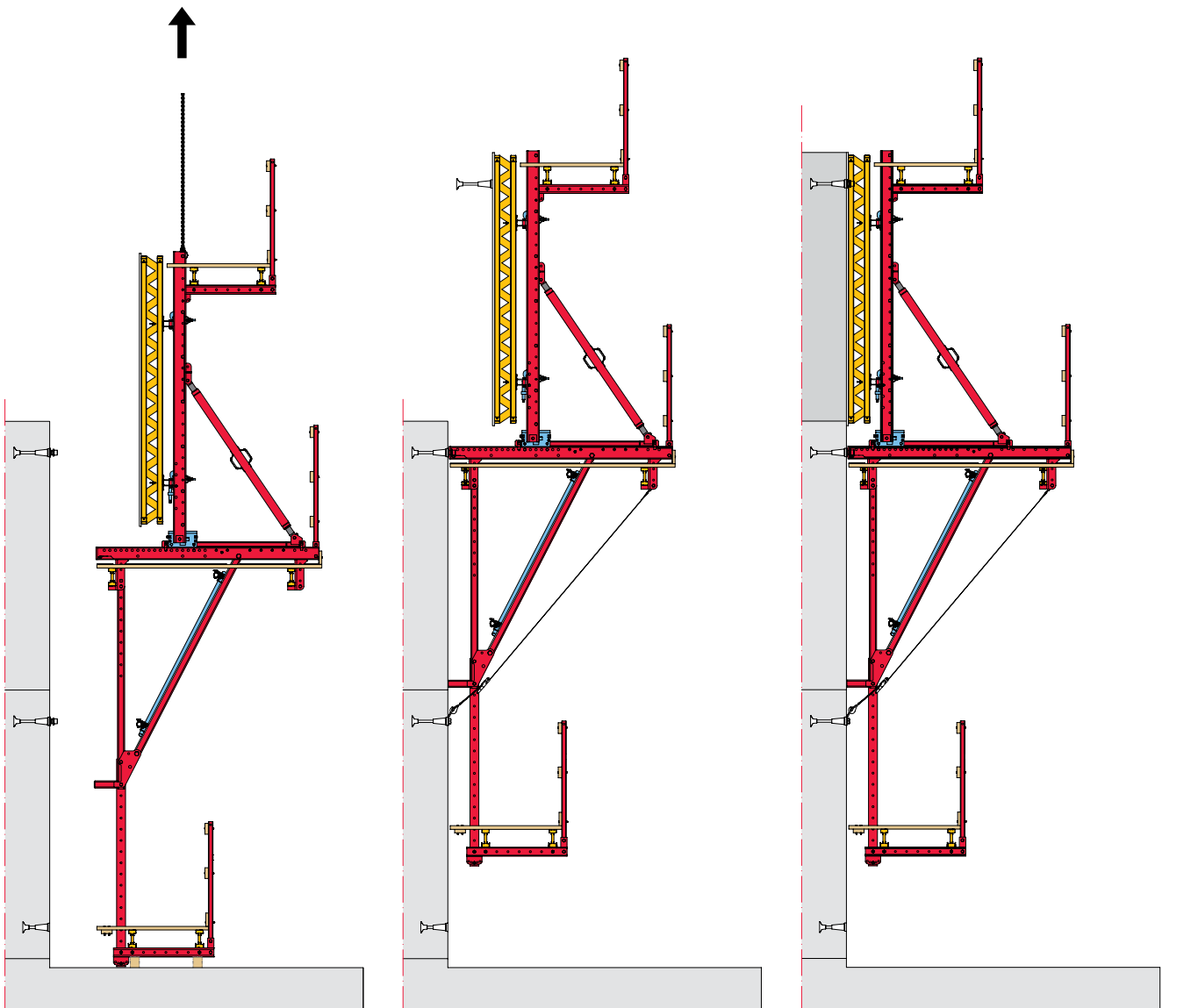
After striking, the climbing unit is prepared for the moving procedure. Crane hooks are to be attached to the Strongbacks of the climbing unit, and the Locking Pins of the Bracket are released. The finishing platform is subsequently mounted.

### Climbing in standard cycles

The climbing unit is lifted using the crane and attached to the next highest anchoring. The Locking Pins secure the Brackets against lift-off; if necessary, a wind safety device can be installed.

### Shuttering

The formwork must be cleaned before each subsequent concreting cycle while the Leading Anchors are attached to the formwork. The formwork is set up in the concreting position by means of the Formwork Carriage and Adjusting Unit, and then adjusted using the Height Adjustment Unit and Spindle. The first standard cycle is then concreted.

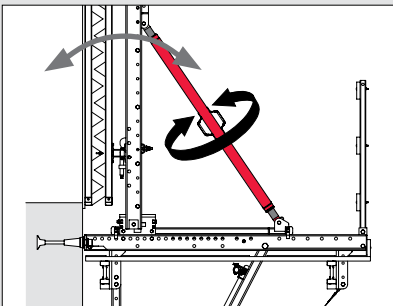




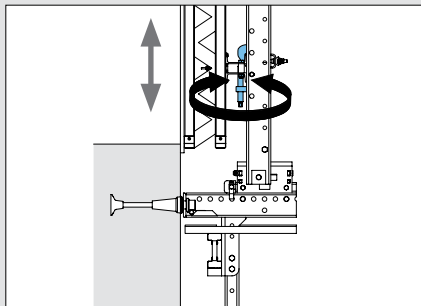
## Execution details

### Simple and exact formwork adjustment

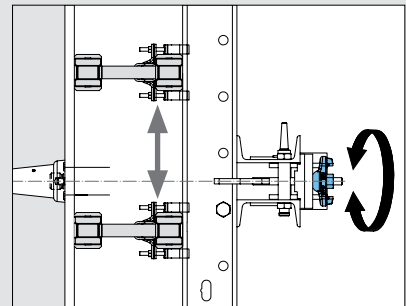
For exact adjustment of the formwork, the SCS offers a high level of flexibility; it can be easily and quickly adapted both vertically and horizontally as well as in inclined positions.



By turning the Heavy-Duty Spindle, the required formwork inclination can be adjusted in each case.



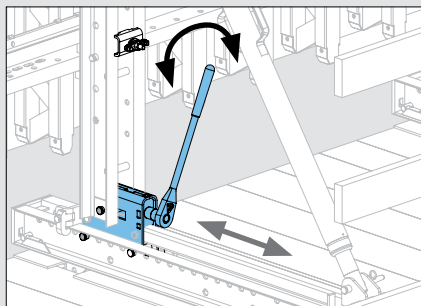
The formwork is vertically aligned by means of the Adjusting Bolt on the Height Adjusting Unit.



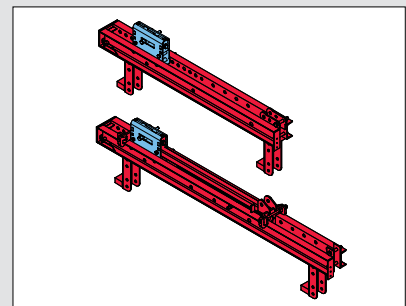
After opening the Waler Fixation, the formwork can be horizontally aligned.

### Closing the formwork with the Adjusting Unit

The Adjusting Unit SCS allows controlled pressing of the formwork against the previous casting segment. It is used for the Cross Beam Unit of the SCS 190 as well as the SCS 250 with Formwork Carriage. The adjustment range is  $\pm 45$  mm.



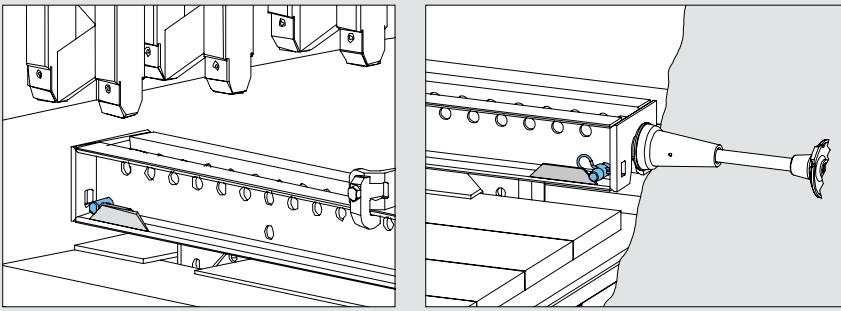
The Adjusting Unit is operated quickly and easily with the ratchet wrench.



The Adjusting Unit is used for the SCS 190 version as well as for the SCS 250 with Formwork Carriage. This helps to minimise the number of different system components.

### Protection against lifting

A locking pin fixes the bracket in order to prevent lifting; the Formwork Carriage of the SCS 250 is also secured against lifting during the moving procedure.



### Simplified logistics and space-saving transport

Due to the modular design of the bracket consisting of Cross Beam, Vertical and Diagonal Struts, this results in only small space requirements for transport and storage. The platforms can be transported pre-assembled, and then quickly and efficiently mounted on the construction site.





## The Climbing System SCS in use



**The Panama Canal has connected the Atlantic and Pacific Oceans since 1914 and is one of the most important waterways in the world: a total of 6 % of the cargo shipped worldwide is transported through the Panama Canal. From 2011 to 2014, the waterway was expanded to accommodate larger container ships. Key measures were the construction of two new locks on the Atlantic and Pacific sides.**

From 2011 onwards, PERI delivered more than 1,100 containers filled with formwork and scaffolding materials to the construction sites. The Climbing System SCS played a major role in the overall solution.

Due to its size and complexity, the project entailed major challenges in terms of know-how, logistics and construction site support. The transnational and intercontinental cooperation involving the international team of PERI engineers, logistics experts and other specialist engineers was an essential key to the success of the project.





In numerous projects worldwide, the climbing system has proved its flexibility and cost-effectiveness time and time again. The selected application examples on the following pages feature power stations and dams as well as bridge pylons.



## The Climbing System SCS in use



For the largest-ever individual contract in the company's history, PERI supplied a comprehensive overall concept and innovative climbing technology as well as delivering a very impressive performance.



PERI supported the construction of the impressive dam near the Portuguese town of Alijó, among other things, with an extensive range of engineering services.

### Panama Canal Lock Facilities, Panama

PERI Spain and PERI Panama were responsible for the formwork planning, logistics and on-site assistance for the expansion of the Panama Canal – competently supported by PERI headquarters in Weissenhorn. PERI delivered more than 1,100 containers to the construction site.

To ensure that the tight schedule could be maintained, a total of 4,200 personnel on both jobsites processed around 6,300 m<sup>3</sup> of concrete on a daily basis in two shifts. Within the construction period of three years, the construction site team formed an area of about 2.2 million square metres; the material used amounted to approx. 6.6 million cubic metres of concrete and 337,500 tonnes of steel. The construction site facilities included 70 cranes and 30 concrete pumping stations. These boundary conditions required an immense outlay of formwork and scaffolding materials along with a comprehensive overall concept.

An essential element of the PERI solution was the SCS Climbing System for single-sided applications, which was used for the first time on this construction site. Depending on the project requirements in the respective areas of the site, PERI engineers combined the brackets with either VARIO Girder Wall Formwork or TRIO Panel Formwork. Different shoring systems taken from the PERI product portfolio ensured efficient transfer of loads under the slab formwork, which was carried out in part with pre-assembled slab tables. In particular, PERI UP Flex Modular Scaffolding was extremely versatile in its application as it was used for the shoring as well as realisation of safe access means.

### Foz Tua Dam, Alijó / Vila Real, Portugal

For the construction of the Foz Tua Dam and the nearby pumped-storage power plant, PERI developed and supplied an optimised and safe formwork and scaffolding solution. With a comprehensive concept as well as logistical and technical services, PERI specialists supported the contractors – Barragem de Foz Tua, ACE – in ensuring dimensionally-accurate construction work along with on-schedule completion. The close cooperation between the PERI engineers and all project participants, as well as continuous coordination provided by PERI project managers on the jobsite, ensured the success of the project.

The dam wall in northern Portugal reaches a total height of 108 m while the length of the dam's crest measures 275 m. Regarding formwork considerations, the complex form of the double-curved reinforced concrete construction with a 5-m-wide dam crest was especially challenging.

PERI engineers developed a formwork concept using the Climbing System SCS and VARIO GT 24 Girder Wall Formwork. This combination was the ideal solution for the massive dam wall as it allowed single-sided transfer of loads and met the high surface requirements.



Important dam upgrade project: as part of a hydroelectric power plant expansion in Alaska, the height of the dam wall was to be increased.

### **Blue Lake Dam, Sitka / Alaska, United States of America**

The Blue Lake Dam Project in Alaska centred on expanding the existing dam. The dam supplies electricity to the city of Sitka in the north-west of the United States. Among other things, new intake structures and penstocks along with lock gates were realised. In addition, the height of the existing arch dam wall was to be increased by around 27 m. After completion of the project, the hydroelectric power plant now generates 27 % more electricity, boosting the city's energy independence.

Different PERI systems were used to construct the various structures of this large-scale project – for example, the Climbing System SCS was used to realise the massive arch of the new dam crest. The project-specific planning solution combined the brackets with VARIO GT 24 Girder Wall Formwork.



The massive power plant walls were formed in a single-sided process and concreted using the Climbing System SCS.

### **Smithland Hydroelectric Power Plant, Smithland / Kentucky, United States of America**

For the Smithland hydroelectric power plant, PERI supplied a customised formwork and shoring solution. The extremely tight construction time, massive structural elements and in part multi-curved shapes required not only large quantities of system equipment but also countless, specially designed 3D formwork units. With a comprehensive concept, the PERI specialists supported the construction company in ensuring that the efficient and dimensionally accurate execution was carried out on schedule. These included close, transnational cooperation between PERI engineers, prefabrication of the formwork elements, as well as on-going coordination by a PERI project manager on the construction site.

A large part of the massive walls were realised with the Climbing System SCS – as a result, no anchors were required. As this formwork solution avoided any costly sealing work, large savings could be made regarding the time and costs required for the construction work. Thanks to the particularly high load-bearing brackets and best utilisation of the anchoring, large climbing units were also possible, further accelerating construction progress.



## The Climbing System SCS in use



The high flexibility of the Climbing System SCS allowed an easy adaptation to suit all geometries in this dam project.



Comprehensive formwork solutions and a high degree of prefabrication also helped to deal with complex building geometries at a depth of 15 m - easily, accurately and on schedule.

### **Kayaburi Hydroelectric Power Station, Laos**

Around 30 km to the east of the provincial capital, Xayaburi, a dam complete with a hydroelectric power station was built on the Mekong river in northern Laos. It is the first structure of a total of 11 dams which have been planned for the lower Mekong Basin. With a nominal output of 1,260 megawatts, the Xayaburi hydroelectric power station is, in this respect, the third largest project in the overall planning. A shipping lock and two fishways were also planned.

The dam wall is 820 m long and has a total height of 49 m, whereby the water level has been raised by 32 m. For realising the reinforced concrete work, PERI designed and supplied a formwork solution based on the SCS Climbing System. In particular, the flexibility of the system was very important to ensure the smooth execution of the construction work so as to form the variable geometry. In addition to the straight dividing walls, there were also many areas of the dam to be constructed with rounded shapes. Along with the planning solution, providing training to the construction team also formed a large part of the PERI support to ensure successful execution.

### **Moselle Lock, Trier, Germany**

A new 216-m-long, 12.60-m-wide and 12.70-m-high lock chamber was constructed parallel to the existing Moselle Lock located south of Trier. As the 15-m-deep structure required a very high degree of reinforcement, PERI delivered prefabricated formwork units on the basis of VARIO GT 24 Girder Wall Formwork just-in-time to this major construction site, which were specifically adapted to match project requirements, and ensured that material quantities and scheduling exactly suited the technology of the jobsite.

Clearly marked elements were manufactured with very small tolerances and could be immediately allocated to the respective place of installation. The design of the formwork carriage for constructing the longitudinal channels was also well thought-out down to the smallest detail and likewise pre-assembled at the company's assembly hall using PERI system components.

Moreover, it proved to be advantageous that the PERI prefabrication operations were used to realise - in addition to the formwork elements - all recess units and timber formers used, e.g. for intake funnels, gate recesses and floating bollards- which were designed with a focus on providing efficient striking operations as well as ensuring reusability. The SCS Climbing System, used as scaffolding for the 7.80-m-high VARIO GT 24 Girder Wall Formwork, guaranteed optimal workflows. A PERI project coordinator supported the site management team with the coordination and control of the planning and assembly processes. In addition, PERI supervisors briefed the construction team on the correct handling and assembly of the various formwork and scaffolding solutions.



Free-form formwork on SCS Climbing Brackets for a large concrete funnel.

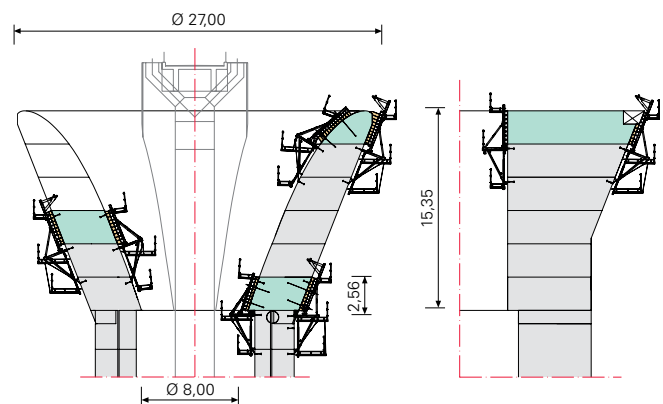


Special suspension points ensured that the formwork elements could easily be lifted into the respective final position with the crane.

### Bagatelle Dam, Port Louis, Mauritius

The Bagatelle dam project has improved the water supply on the small island state by increasing the storage capacity by approx. 14 million cubic metres. After the project was completed, a 2.5-km-long and up to 48-m-high dam transformed a tributary of the Grand River North West into a reservoir 400 m above sea level. Construction of the overflow funnel for the flood spillway was realised using a 3D formwork solution. The diameter of the circular shaft construction featured in the ground plan widens in the upper area from 8 m to 27 m in the form of a chalice – externally with uniform and internally with variable inclinations respectively.

For the construction of this complex geometry, the three-dimensional formwork units on the basis of VARIO GT 24 Girder Wall Formwork elements together with SCS Climbing Brackets were combined to form craneable climbing units. With the SCS Climbing System, the forward and reverse-inclined sections could be concreted without ties. The adaptation to suit the complex geometry was no problem; in addition, the bracket platforms always ensured horizontal working areas and access points even when having to deal with differently inclined walls. The formwork for the funnel walls with curved surfaces on all sides was individually manufactured and realised in the PERI formwork assembly facility.



The SCS Climbing System could be flexibly adapted to suit the variable inclinations and reliably transferred the high loads from the fresh concrete pressure into the previous casting segment.



## The Climbing System SCS in use

### Ruhrtal Bridge Bermecke, Nuttlar, Germany

In the Hochsauerland region, a steel composite bridge with a length of 626 m and span of 64 m has been constructed, with the superstructure realised using the incremental launching method. The structure crosses the Ruhr Valley at a height of up to 50 m and forms part of the feeder route to the Nuttlar junction on the A 46 motorway.

The superstructure - featuring 10 sections with individual spans ranging from just under 50 m to 65 m - has a circular ground plan. The composite cross-section consists of an upwardly open, trapezoidal hollow-box girder made of steel as well as an unstressed concrete carriageway.

The Climbing System SCS was used for constructing the massive pier heads.

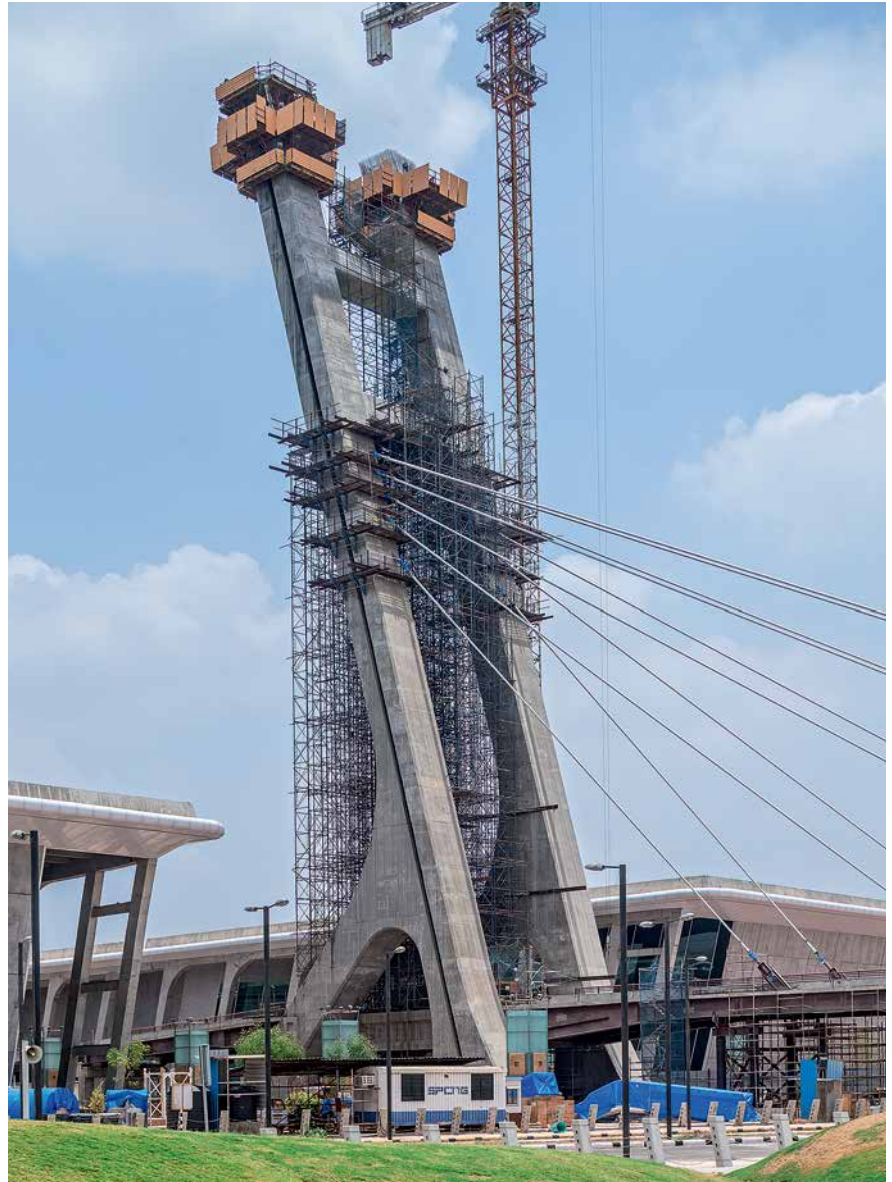


The SCS provided the optimum solution for the heads of these reinforced concrete piers for the composite bridge.

### **Mahatma Gandhi Mandir, Gandhinagar, India**

The Mahatma Gandhi Mandir is not only a convention centre but also a memorial site in Gandhinagar, Gujarat. The architecture of the complex was inspired by the life and philosophy of Mahatma Gandhi. With a surface area approaching 1.4 hectares, the complex has a total size of more than 19 football pitches.

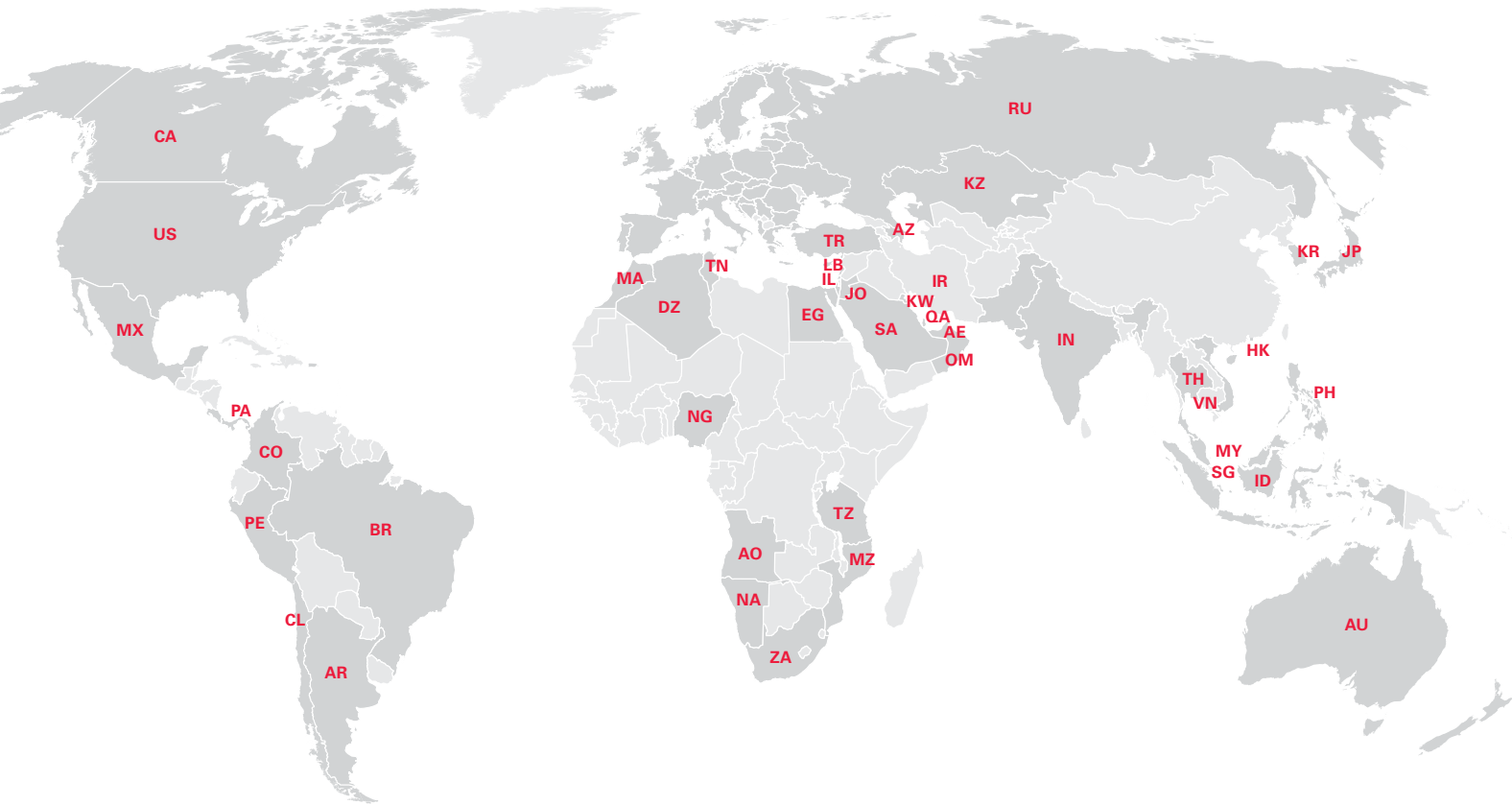
The facility also features a cable-stayed bridge for pedestrians which connects the museum to the congress centre. The pylon of the bridge has a 15° inclination and could not be realised with anchored formwork due to its massive dimensions. For this reason, PERI India planned and supplied a formwork solution based on the Climbing System SCS. The SCS 250 version with Formwork Carriage was used, whereby the formwork could be retracted by 62 cm to execute the reinforcement work and anchor installation.



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