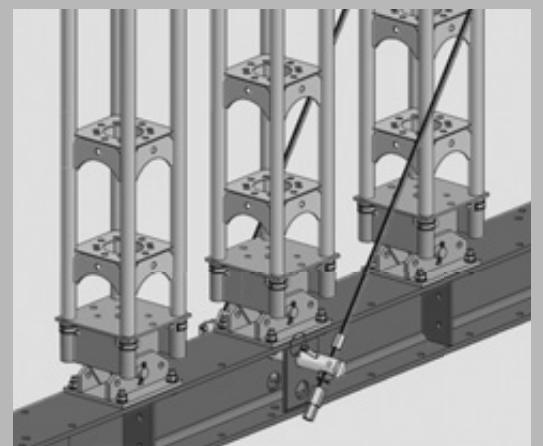
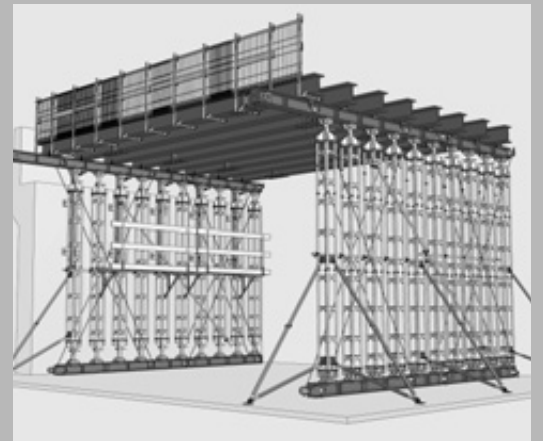
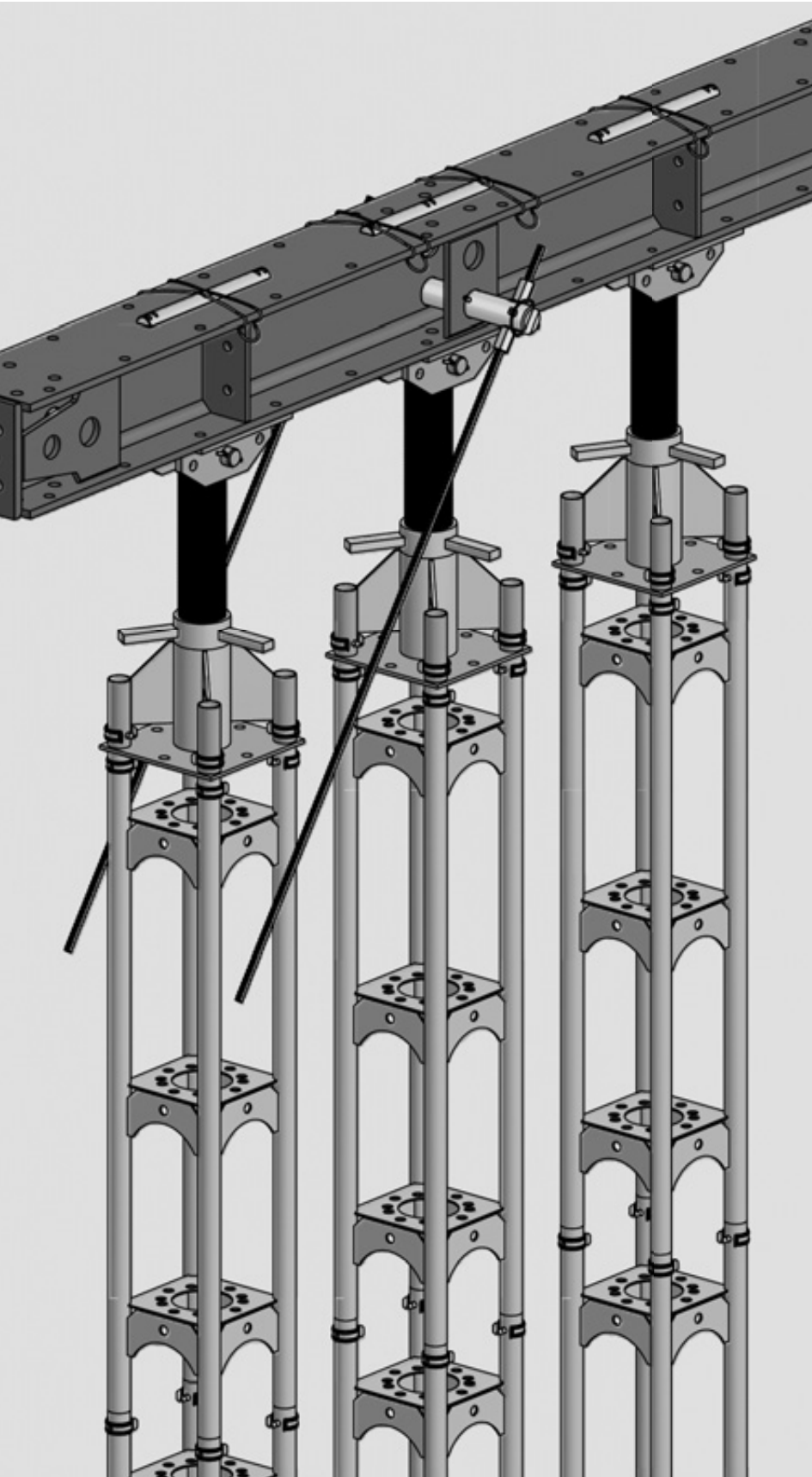


# INFRA-KIT

Modular construction and heavy-duty shoring system

## Instructions for assembly and use



April 2010, english  
Keep for later use!

**HÜNNEBECK**   
A BRAND COMPANY

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## 1.0 Product features

The **INFRA KIT** from **Hünnebeck** is a versatile multi-functional modular construction system engineered for all applications where particular high loads have to be transferred safely and economically. It suits especially well the needs of bridge and open tunnel construction.

The **INFRA-KIT** consists of standardized logical components and connections that make this system remarkable user friendly and cost efficient. The components of the **INFRA-KIT** are designed for simple, fast and safe use on site. They can be combined flexible according to the project requirements while the time and cost intensive production of special steel parts is reduced to a minimum. At the same time the composition of well adapted parts allow reliable planned and load optimised designs.

The system based on the **Hünnebeck Frame Props** with a load bearing capacity of up to 210 kN each and the **Main Beams** covering a wide variety of applications. Due to the high load bearing capacity of those components even tall support structures and wide-spanned traffic openings can be easily achieved of course in compliance with EU-wide applicable standards and regulations.

Many practical and innovational details simplify the use of the system. Many compatible components from the **Hünnebeck** product range extend the possibilities of use & preparation and execution.

All components are also available for rent at the European Rental Park of **Hünnebeck**.

### 1.1 General

In this instruction for erection and use you can find important information regarding the erection and use of the **INFRA-KIT** of **Hünnebeck** as well as safety instructions, important for a safe erection and use. This instruction is created to support effective working with **INFRA-KIT**. For this reason please read the present guidance before assembly and use of the **INFRA-KIT** carefully and, keep it always at hand and archive it as a reference book.

**Hünnebeck** products are exclusively designed for commercial use by technically suitable users.

## 1.2 Safety Instructions

**Important information regarding the intended use and safe application of formwork and falsework**

**The contractor is responsible for drawing up a comprehensive risk assessment and a set of installation instructions. The latter is not usually identical to the assembly instructions.**

- **Risk Assessment**

The contractor is responsible for the compilation, documentation, implementation and revision of a risk assessment for each construction site. His employees are obliged to implement the measures resulting from this in accordance with all legal requirements.

- **Installation Instructions**

The contractor is responsible for compiling a written set of installation instructions. The assembly instructions forms part of the basis for the compilation of a set of installation instructions.

- **Assembly Instructions**

Formwork is technical work equipment which is intended for commercial use only. The intended use must take place exclusively through properly trained personnel and appropriately qualified supervising personnel. The assembly instructions are an integral component of the formwork construction. They comprise at least safety guidelines, details on the standard configuration and intended use, as well as the system description.

The functional instructions (standard configuration) contained in the assembly instructions are to be complied with as stated. Enhancements, deviations or changes represent a potential risk and therefore require separate verification (with the help of a risk assessment) or a set of installation instructions which comply with the relevant laws, standards and safety regulations. The same applies in those cases where formwork and/or falsework components are provided by the contractor.

- **Availability of the Assembly Instructions**

The contractor has to ensure that the assembly instructions provided by the manufacturer or formwork supplier are available at the place of use. Site personnel are to be informed of this before assembly and use takes place, and that they are available at all times.

- **Representations**

The representations shown in the assembly instructions are, in part, situations of assembly and not always complete in terms of safety considerations. The safety installations which have possibly not been shown in these representations must nevertheless be available.

- **Storage and Transportation**

The special requirements of the respective formwork constructions regarding transportation procedures as well as storage must be complied with. By way of example, name the appropriate lifting gear to be used.

### Material Check

Formwork and falsework material deliveries are to be checked on arrival at the construction site/place of destination as well as before each use to ensure that they are in perfect condition and function correctly. Changes to the formwork materials are not permitted.

- **Spare Parts and Repairs**

Only original components may be used as spare parts. Repairs are to be carried out by the manufacturer or authorized repair facilities only.


- **Use of Other Products**

Combining formwork components from different manufacturers carries certain risks. They are to be individually verified and can result in the compilation of a separate set of assembly instructions required for the installation of the equipment.


- **Safety Symbols**

Individual safety symbols are to be complied with.


Examples:



**Safety information:**  
non-compliance can lead to damage to materials or risk to the health of site personnel (also life)



**Visual check:**  
the intended operation is to be carried out through a visual check.



**Note:**  
supplementary information for safe, correct and professional execution of work activities.

- **Miscellaneous**

Technical improvements and modifications are subject to change without notice.

For the safety-related application and use of the products, all current country-specific laws, standards as well as other safety regulations are to be complied with without exception. They form a part of the obligations of employers and employees regarding industrial safety. This results in, among other things, the responsibility of the contractor to ensure the stability of the formwork and falsework constructions as well as the structure during all stages of construction.

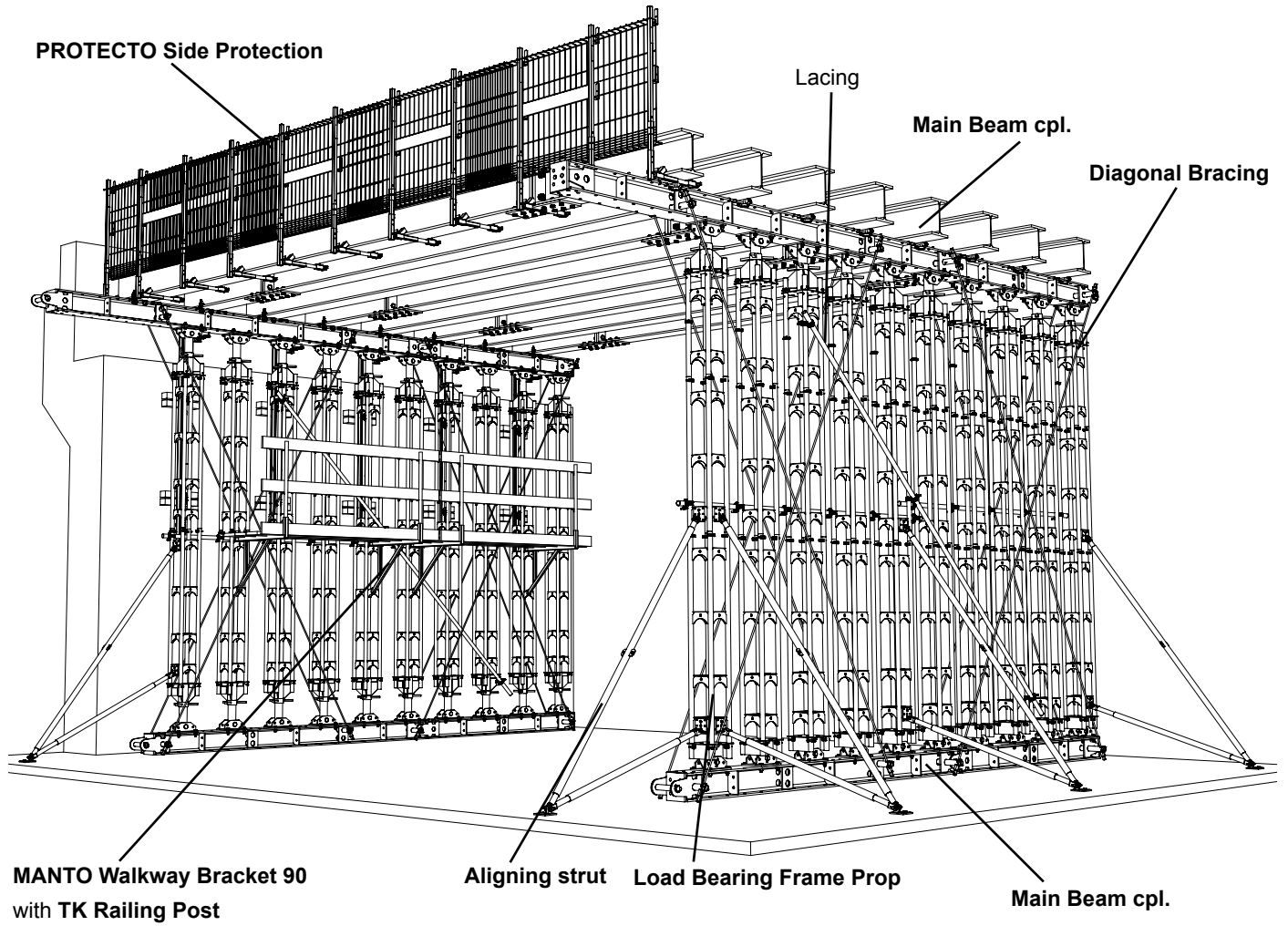
This also includes the basic assembly, dismantling and the transport of the formwork and falsework constructions or their components. The complete construction is to be checked during and after assembly.

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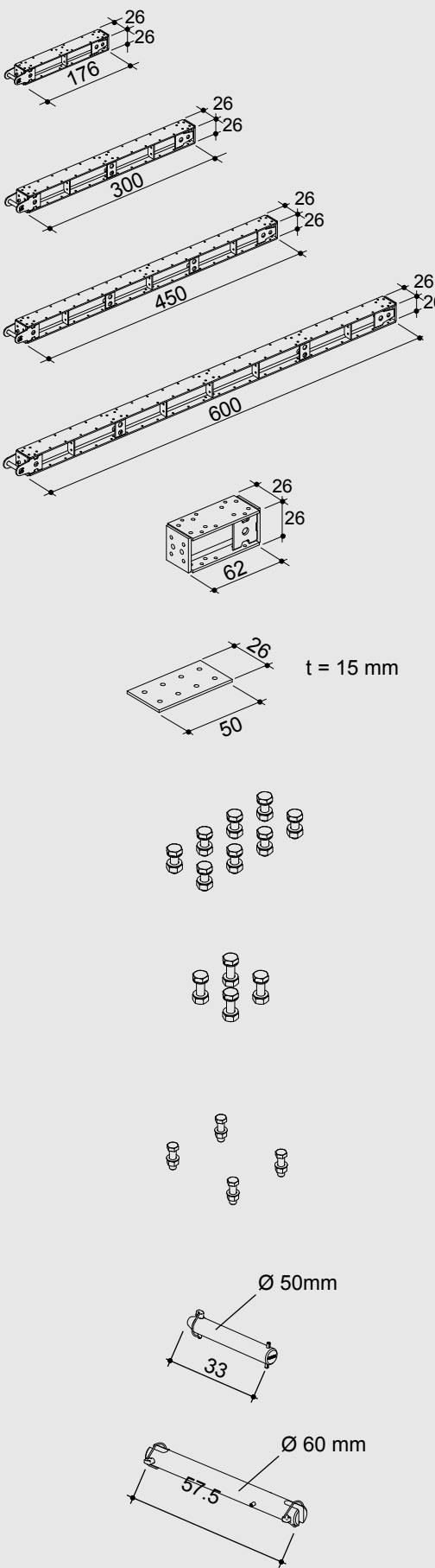
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## 2.0 Overview



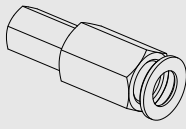
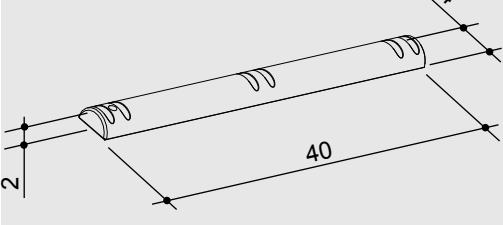
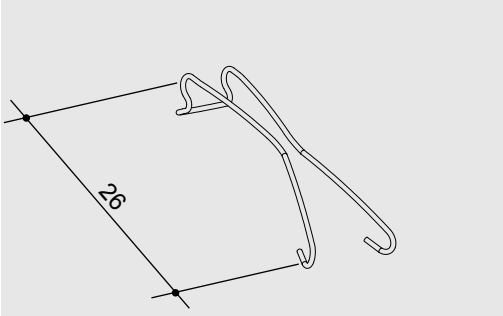
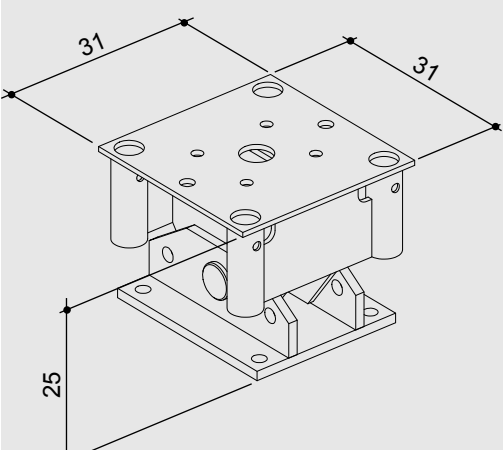
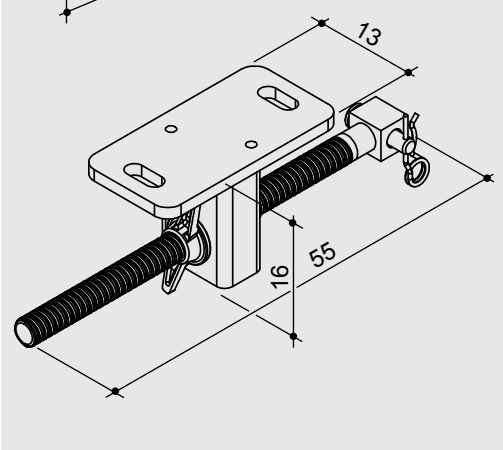
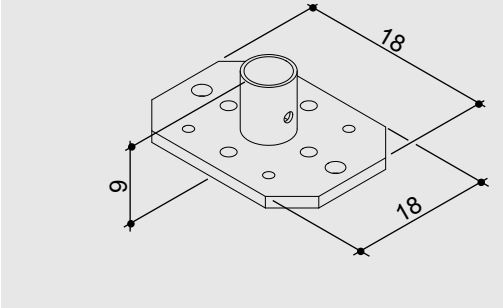
## 3.0 Components

	Description	Part - No.	Weight kg/pcs
<p><b>3.1 INFRA-KIT</b></p> 	<p><b>Main Beam 176 kpl.</b> including <b>Connecting pin cpl.</b></p> <p><b>Main Beam 300 kpl.</b> including <b>Connecting pin cpl.</b></p> <p><b>Main Beam 450 kpl.</b> including <b>Connecting pin cpl.</b></p> <p><b>Main Beam 600 kpl.</b> including <b>Connecting pin cpl.</b></p> <p><b>Main Beam 62</b></p> <p><b>Main beam joint plate</b> for connection of <b>Main Beams.</b></p> <p><b>Joint plate bolt set<sup>1)</sup></b> consisting of high tensile screws M24 with washer &amp; nut.</p> <p><b>Main beam joint bolt set<sup>1)</sup></b> for head plate joint, consisting of four high tensile screws M24 with washer &amp; nut.</p> <p><b>Load-bearing frame prop bolt set<sup>1)</sup></b> for connecting of <b>Load Bearing Frame Prop</b>, consisting of four high tensile screws M20 with washer &amp; nut.</p> <p><b>Connecting pin cpl.</b> included in <b>Main Beam.</b></p> <p><b>Tension bolt cpl.</b> for bracing with DW15 tie rods.</p>	<p>603 728</p> <p>603 709</p> <p>603 710</p> <p>603 711</p> <p>603 670</p> <p>603 673</p> <p>603 695</p> <p>603 696</p> <p>603 697</p> <p>603 664</p> <p>603 665</p>	<p>226.48</p> <p>349.10</p> <p>501.57</p> <p>654.10</p> <p>82.94</p> <p>15.03</p> <p>5.22</p> <p>2.82</p> <p>1.41</p> <p>6.15</p> <p>11.68</p>

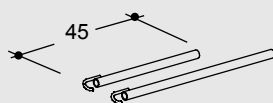
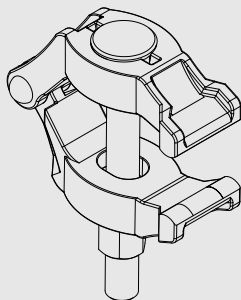
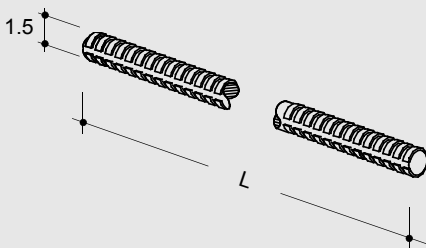
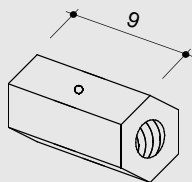
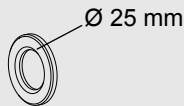
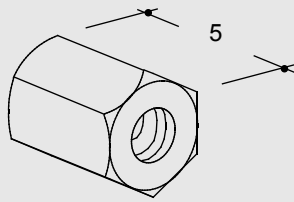
\*only rental

<sup>1)</sup>no rental

# 3.0 Components

	Description	Part - No.	Weight kg/pcs
	<p><b>Tension nut set DW15<sup>1)</sup></b> for prestressing of DW15 tie rods in diagonal bracing.</p>	603 712	0.70
	<p><b>Centering bar 40/20</b> for centered transfer of loads from deck into <b>Main beams</b>.</p>	603 706	1.97
	<p><b>C-Clip</b> for connection of Centering bar 40/20 on <b>Main Beams</b>. Minimum one clamp (standard use) up to three clamps per Centering bar.</p>	603 707	0.13
	<p><b>Pin-jointed Base Plate</b> For connection of the <b>Frame Prop</b> or <b>Mk II-Soldier</b> prop to <b>Main Beam</b>. The connection to the <b>Main Beam</b> is done with the <b>Load-Bearing frame prop bolt set</b> (603 697). The <b>Pin-jointed Base Plate</b> replaces a <b>Prop-jack 2</b> in a <b>Load-Bearing Frame Prop</b> layout. The <b>Pin-jointed Base Plate</b> allows a 7° inclination of <b>Load-Bearing Frame Prop / Mk II-Soldier</b>.</p>	603 713	35.82
	<p><b>Adjustable Abutment Bracket</b> For a load-bearing and adjustable connection of <b>INFRA-KIT</b> support structure to existing structures such as bridge abutments and piers. The bracket connects the <b>INFRA-KIT MAIN beam</b> to previously attached standard steel walers at the abutment or piers.  For every two abutment brackets one <b>Load-bearing frame prop bolt set</b> (603697) has to be ordered. <b>Permissible load: 15 kN</b></p>	603 878	8.60
	<p><b>Mk II Spindle adaptor</b> To connect <b>Mk II Soldier</b> beams as props to the <b>INFRA-KIT Main Beams</b>.  Per two <b>Mk II Spindle adaptors</b> one <b>Load-bearing frame prop bolt set</b> (603 697) has to be ordered.</p>	603 725	5.15

## 3.2 Accessories



### Hexagon nut 15/50<sup>1)</sup>

The **Hexagon nut 15/50** is used as counter nut for the **DW15 tie rods** in the **Tension bolts**.

The nut is operated with a spanner size 30 mm.

**Permissible load: 90 kN**

164 535

0.21

### Washer 25

Is used as bearing for **Hexagon nut 15/50** on the **Tension bolt** if bracing with DW15 tie rods.

603 699

0.03

### Hexagon nut 15/90 with pin <sup>1)</sup>

The **Hexagon nut 15/90** is used to connect two **Tie rods DW15**. The pin guarantees that both ties are fully inserted.

The nut is operated with a spanner size 30 mm.

**Permissible load: 90 kN**

164 546

0.38

**Tie rod DW15 300 cm<sup>1)</sup>** (DW 15)

024 413

4.32

**Tie rod DW15 350 cm<sup>1)</sup>** (DW 15)

024 424

5.04

**Tie rod DW15 400 cm<sup>1)</sup>** (DW 15)

024 435

5.76

**Tie rod DW15 600 cm<sup>1)</sup>** (DW 15)

136 260

8.64

**Tie rod DW 15 1 m<sup>1) 2)</sup>** (DW 15)

164 811

1.44

**Permissible load: 90 kN**



#### Safety information:

Do not weld or heat Tie rods, otherwise risk of unheralded failure!

### Beam clamp 16/70

For a flexible and force-fit connection of **Main- and cross beams** or **Main beams** and base plate of load prop. The clamping range is 16 to 70 mm.

With a maximum torque of 150 Nm the usable resistance is:

One friction surface: **3.0 kN**

Two friction surfaces: **4.5 kN.**

603 750

1.73

### Scaffold retainer 75

078 940

2.90

### Scaffold retainer 45

078 939

1.90

Steel tube dia. 48.3 mm with hook dia. 20 mm.

For tying of **Load-bearing frame prop**.

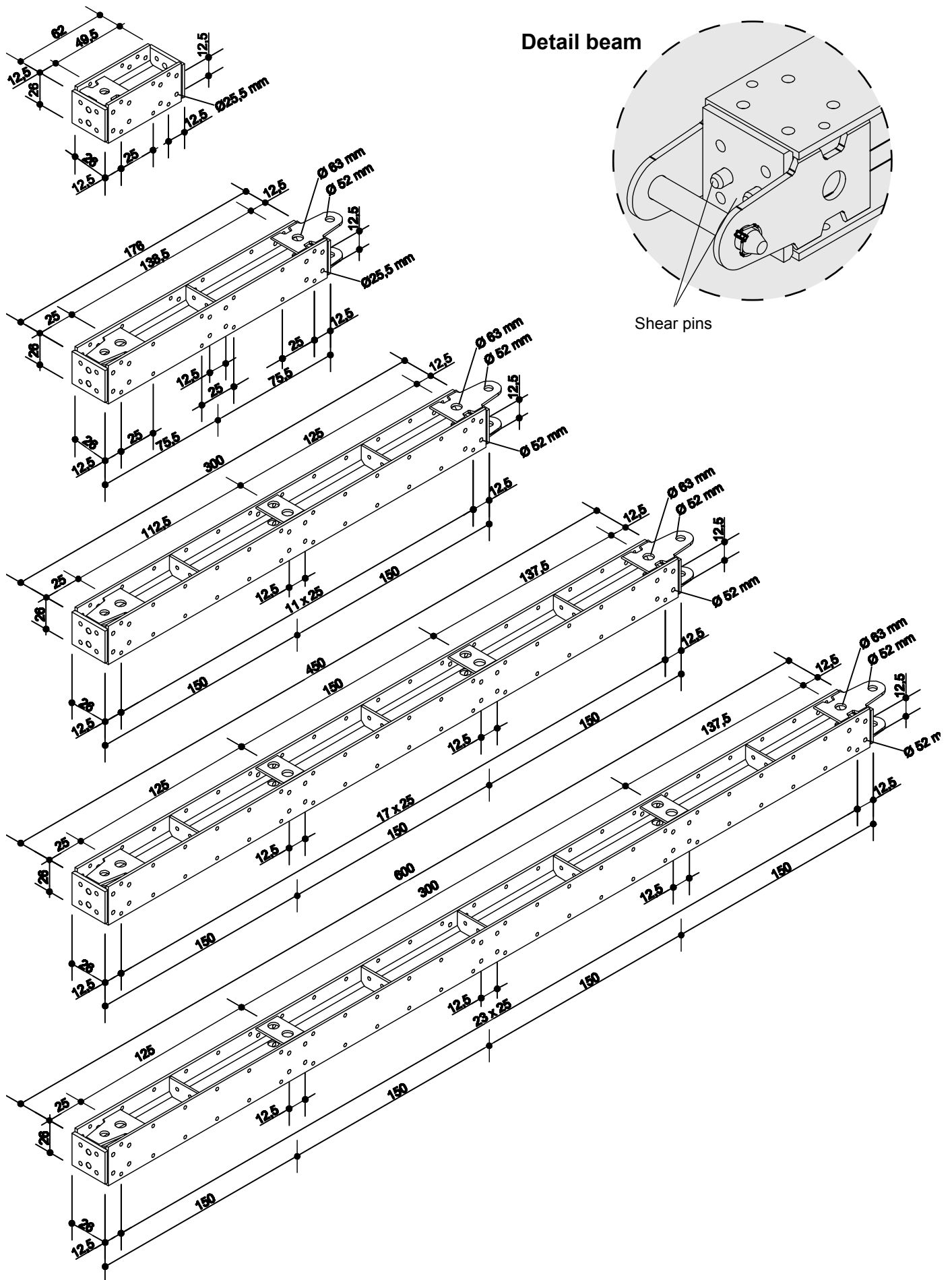
Is connected with a scaffold coupler to the prop

\*only rental

<sup>1)</sup>no rental

<sup>2)</sup>Customer option

## 4.0 Component dimensions and joint combinations



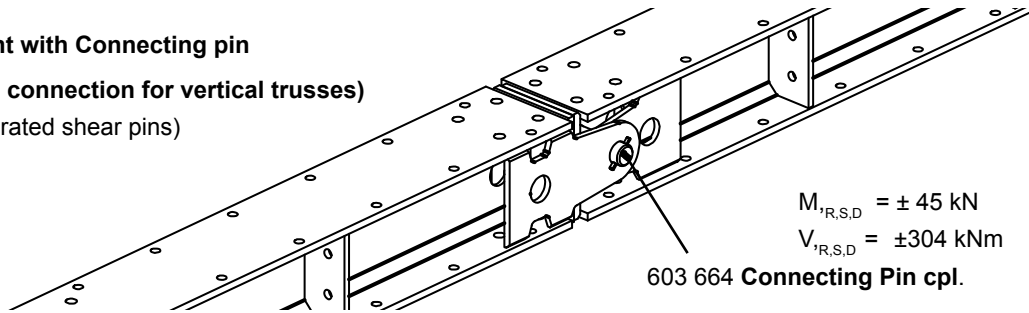


The mentioned charges are for normal forces < 100 kN only.

### Beam joint with Connecting pin

(standard connection for vertical trusses)

(with integrated shear pins)



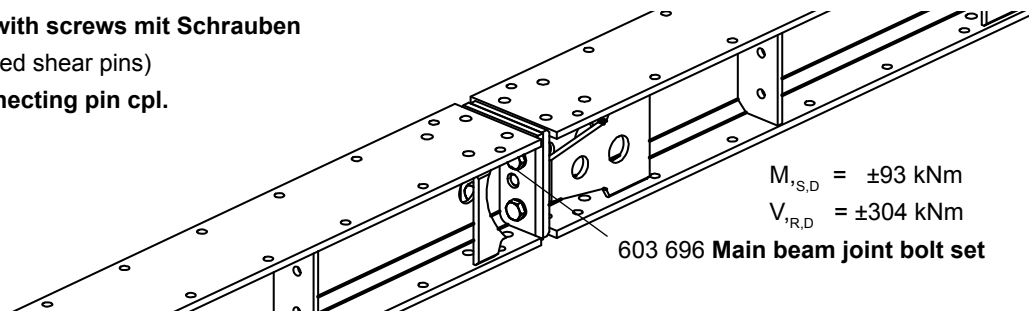
$$M_{1,R,S,D} = \pm 45 \text{ kNm}$$

$$V_{1,R,S,D} = \pm 304 \text{ kNm}$$

### Beam joint with screws mit Schrauben

(with integrated shear pins)

Without connecting pin cpl.



$$M_{1,S,D} = \pm 93 \text{ kNm}$$

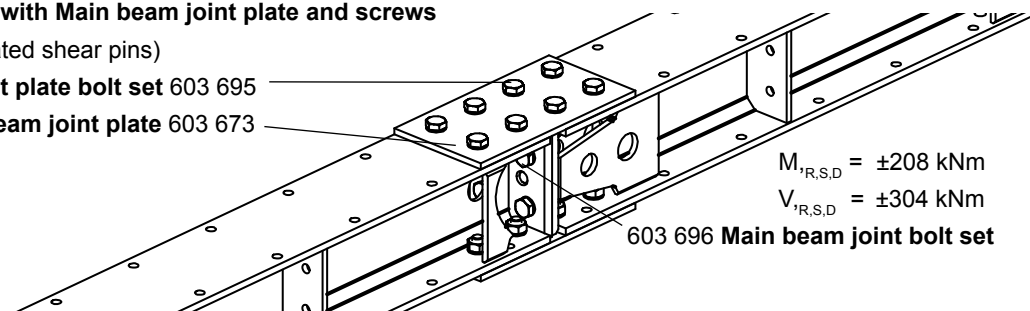
$$V_{1,R,D} = \pm 304 \text{ kNm}$$

### Beam joint with Main beam joint plate and screws

(with integrated shear pins)

Joint plate bolt set 603 695

Main beam joint plate 603 673

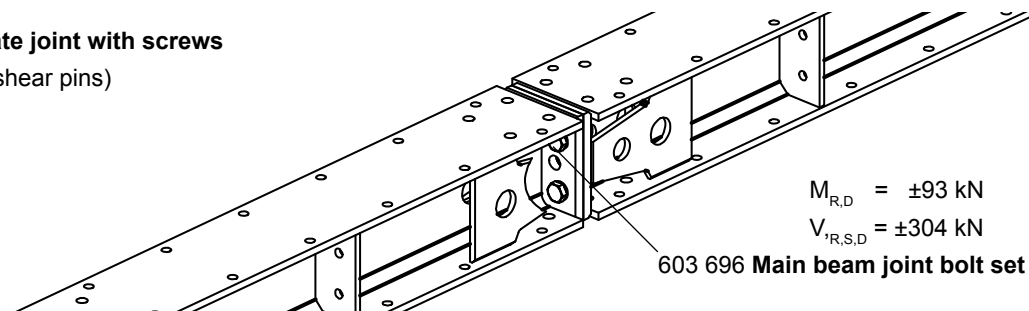


$$M_{1,R,S,D} = \pm 208 \text{ kNm}$$

$$V_{1,R,S,D} = \pm 304 \text{ kNm}$$

### Head plate joint with screws

(without shear pins)



$$M_{R,D} = \pm 93 \text{ kN}$$

$$V_{1,R,S,D} = \pm 304 \text{ kN}$$

## 5.0 Assembly

### 5.1 Recommended working sequence with horizontal assembly and transport

#### Step 1: Preparations

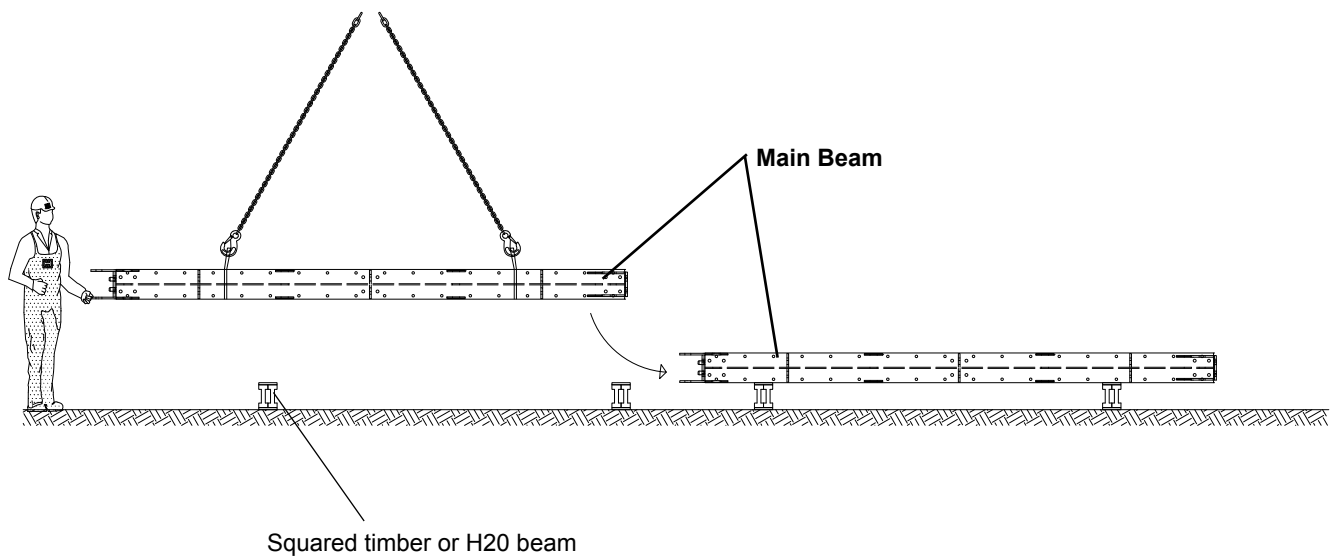
- Prepare proper assembly area.
- The assembly area need to be leveled, well compacted, capable to carry the loads and accessible by forklift or crane.
- Place squared timbers or H20 beams on assembly area as distance keepers.

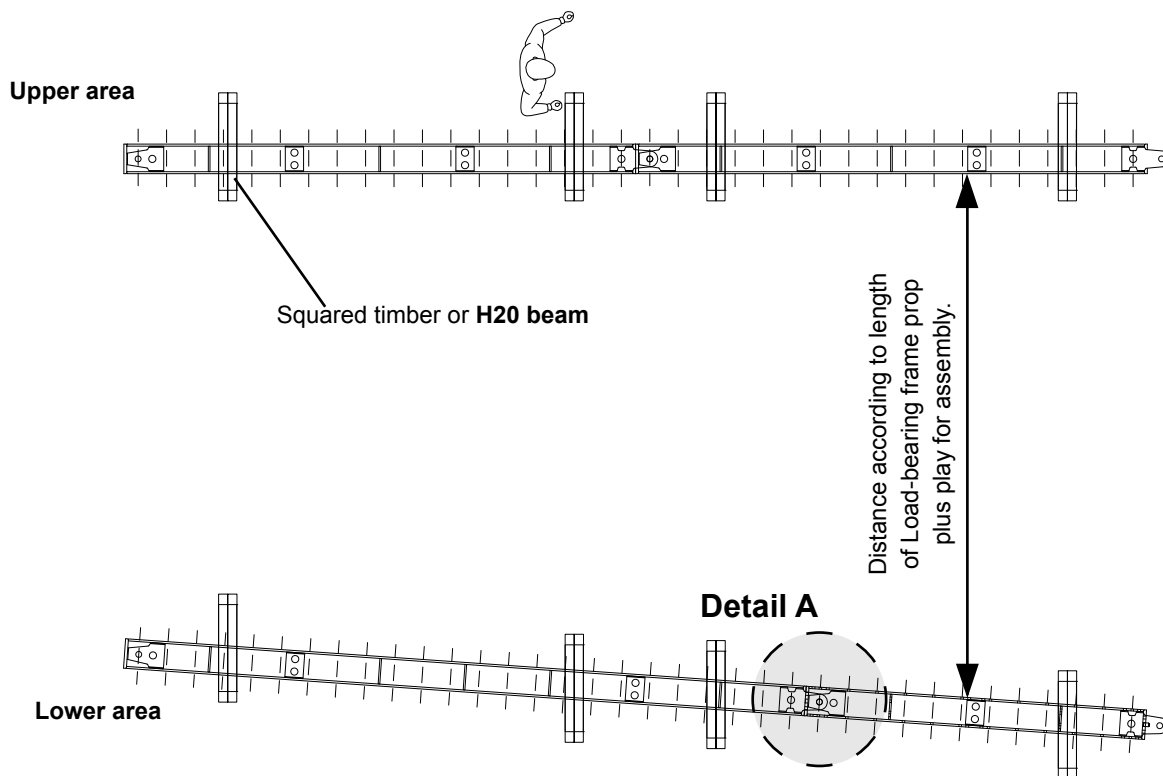
#### Note:

To simplify the later assembly place the distance keepers (squared timber or H20) in accordance to **Main beams** and connection parts.

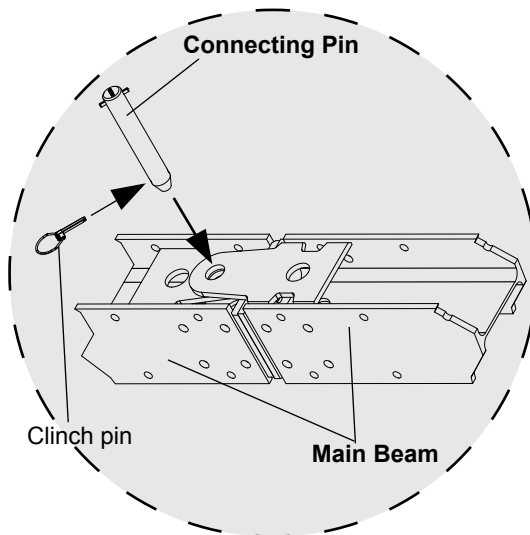
#### Step 2: Main beams

- Remove **Connecting pins** of **Main beams** and place **Main beams** into assembly position on squared timber or **H20 beams**.
- Align **Main beams** and insert **Connecting pins**. Secure **Connecting pins** with **Clinch pins**.





## Detail A



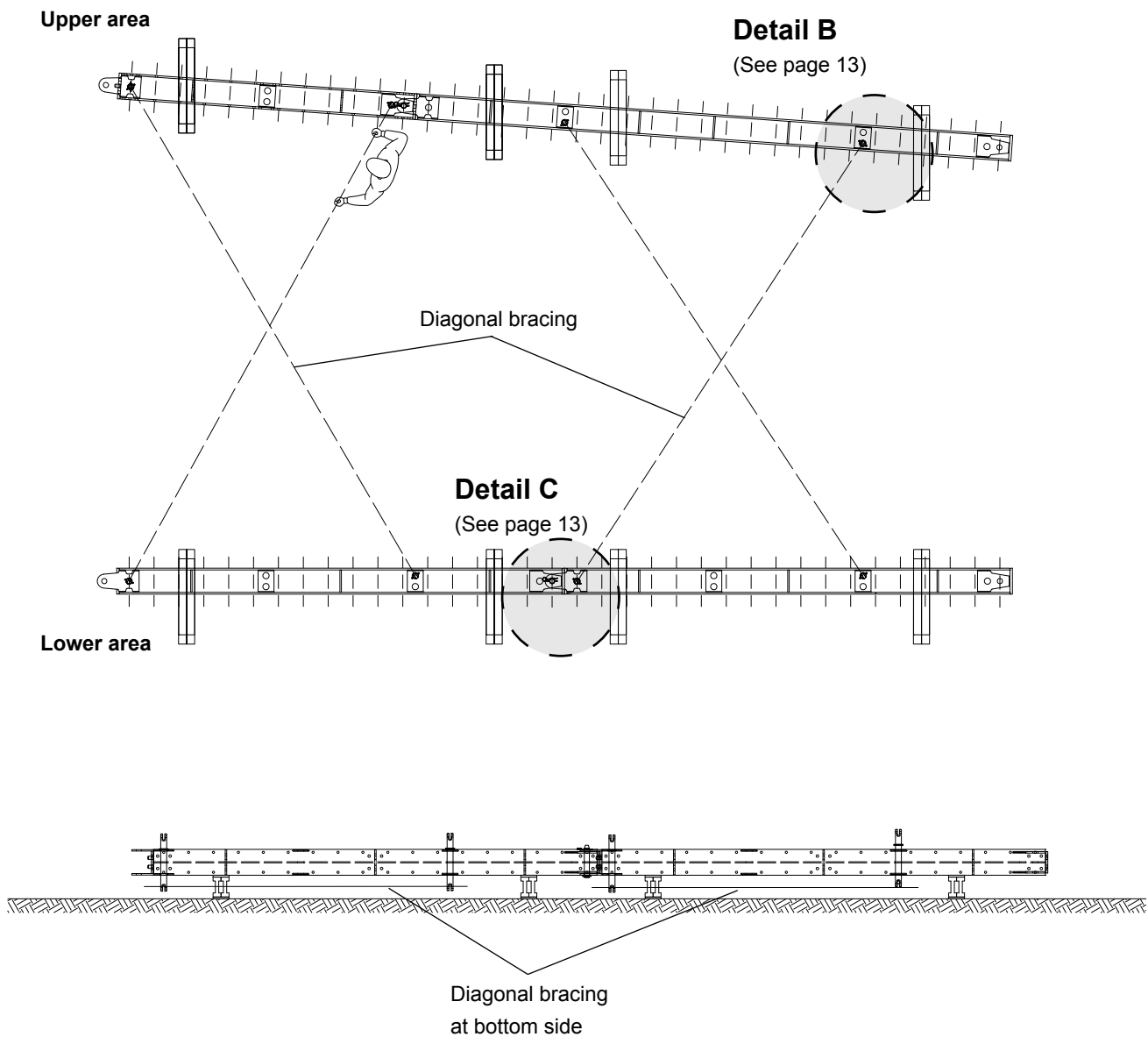
Typical connection:

slide front of the additional **Main Beam** over the back of the other **Main Beam** until the shear pins are inserted into its holes and the holes of the **Connecting Pin** are aligned. Insert the **Connecting Pin** and secure with **Clinch Pin**.

## 5.0 Assembly

### Step 3: Brace lower side

- Insert **Tension bolts**.
- Insert tie rods of the diagonal bracing into **Tension bolt** at lower area and secure them with clinch pins. Screw the **Tension nut set DW15** at Lower beam to the tie rod (do not tighten!). At the Upper beam the tie rod is countered with **Hexagon nuts 15/50** to the Tension bolt to secure them from unintended turning.



## Mounting of tie rods

### At upper area with counter nuts

#### Upper connection of bracing

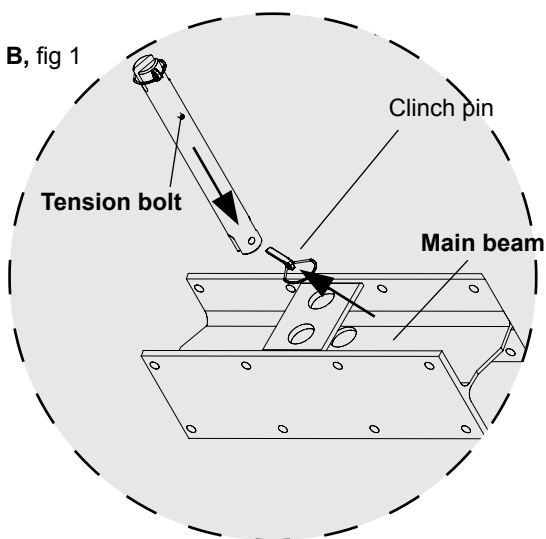
Remove one clinch pin and insert the **Tension bolt** into the **Main beam** (Detail B, fig. 1). Screw one **Hexagon nut 15/50** onto the tie rod. place **Washer 25** and screw a second **Hexagon nut 15/50** in a way that they will be on both sides of the **Tension bolt**.

Now the tie rod is placed sideways into the **Tension bolt** and secured with the clinch pin (Detail B, fig. 2).

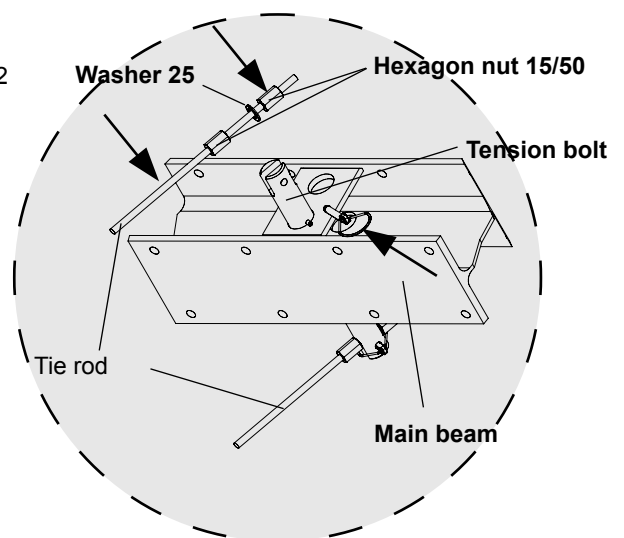
The **Washer 25** must be placed into the bearing at the **Tension bolt** slot.

Tighten the **Hexagon nuts 15/50** on both sides against the **Tension bolt** to avoid unintended turning.

Detail B, fig 1



Detail B, fig. 2



### At lower area with Tension nut set

Remove one clinch pin and insert the **Tension bolt** into the **Main beam** (Detail C, fig. 1).

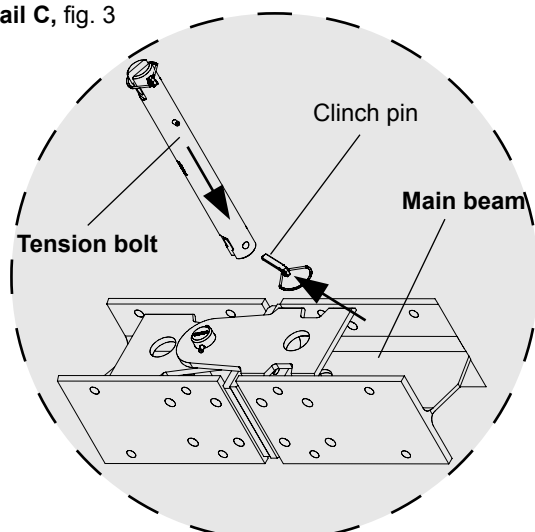
Screw one **Hexagon nut 15/50** onto the tie rod. place **Washer 25** and screw the **Tension nut** onto the tie rod.

Now the tie rod is placed sideways into the **Tension bolt** and secured with the clinch pin (Detail C, fig. 2).

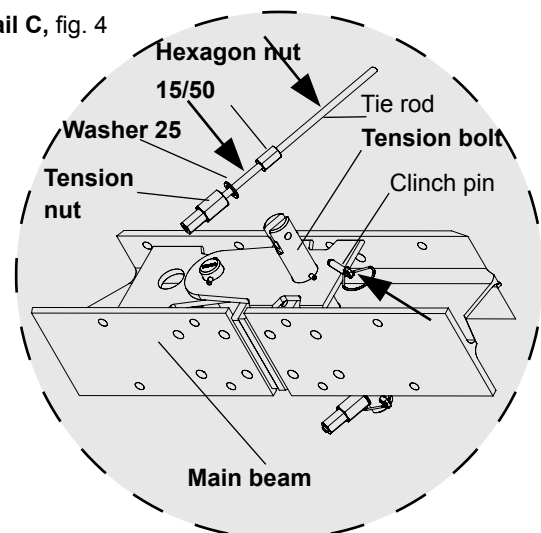
The **Washer 25** must be placed on the **Tension bolt** bearing.

The **Tension nut** now is tightened against the **Tension bolt** (hand-tight only).

Detail C, fig. 3



Detail C, fig. 4



# 5.0 Assembly

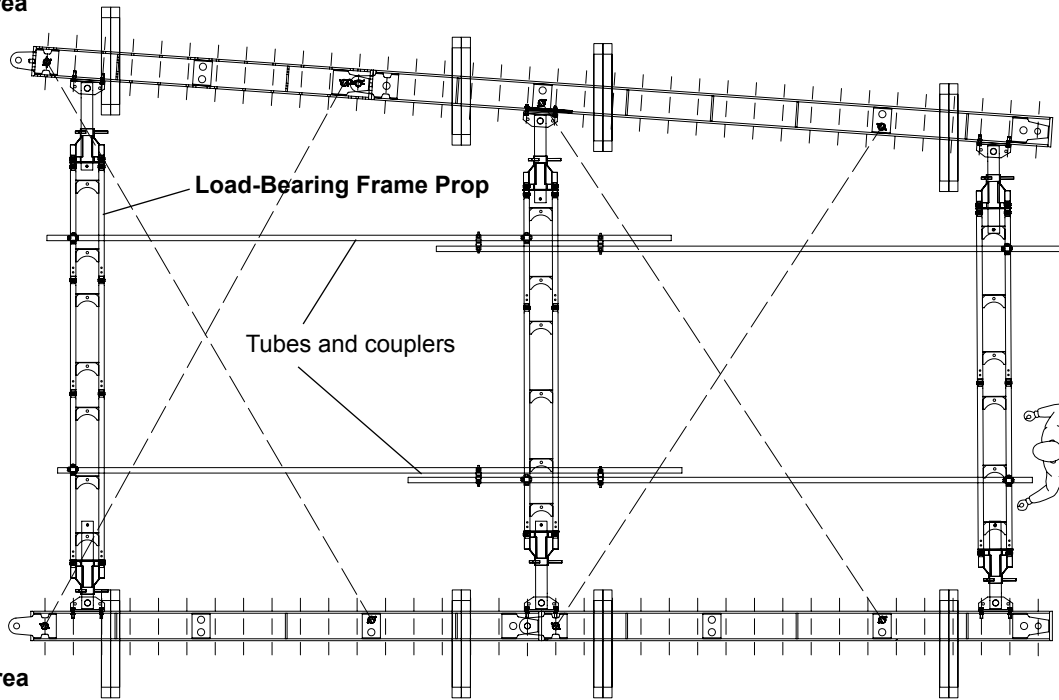
## Step 4: Place first and last Load-bearing frame prop

- Check actual foundation height on site.
- Pre-assemble **Load-bearing frame props** to correct length, pre-adjust spindles.  
Alternative: Assemble **Load-bearing frame props** step by step.
- Connect first and last **Load-bearing frame prop** with bolt set on **Main beam** (see details page 15).
- Check distance between upper and lower **Main beams**.
- Mount, as temporary stiffening device, tubes and couplers as lacing at the bottom of the Load-bearing frame props.

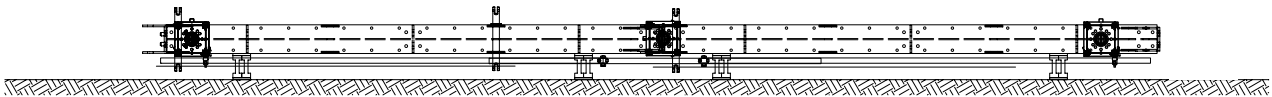
**Note:**  
If the **Main beams** are not parallel we recommend a horizontal assembly!

**Note:**  
Tubes and couplers are used as temporary bracing during assembly and transport. They do not carry horizontal loads!

Upper area

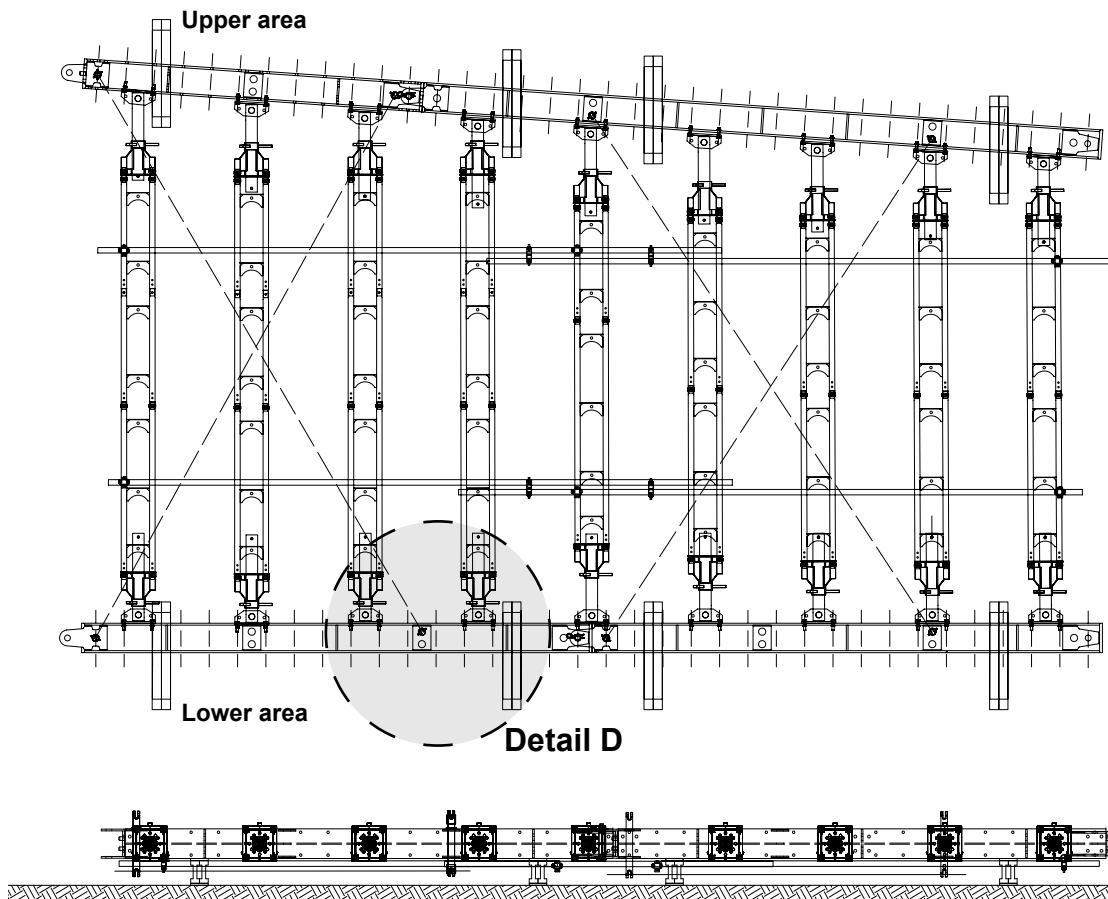


Lower area



## Step 5: Place middle Load-bearing frame props

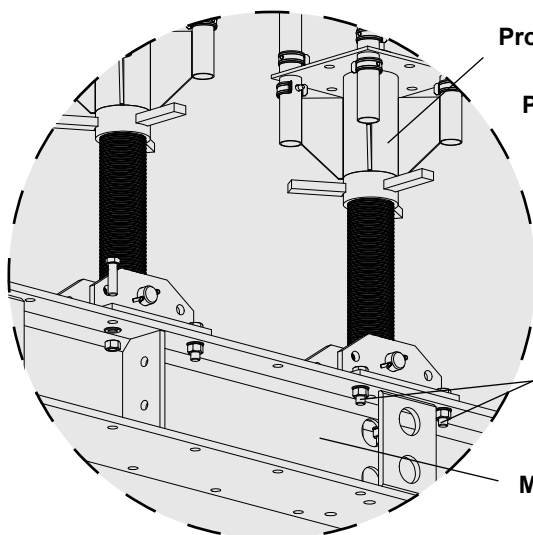
- To pre-assemble **Load-bearing frame props** adjust spindles at lower area to correct length, adjust spindles in upper area 5 cm short than the required length.
- Connect lower spindle to the lower **Main beam** by using the **Load bearing frame prop bolt set**. Tighten screws proper. Connect upper spindle to the upper Main beam with the bolt set. The 5 cm play remains.



**Note:**  
To allow an easy adjustment of the vertical truss on the final height we recommend to fix the middle props temporary with a 5 cm play at the top.

## Detail D

### Option A Prop Jack 2



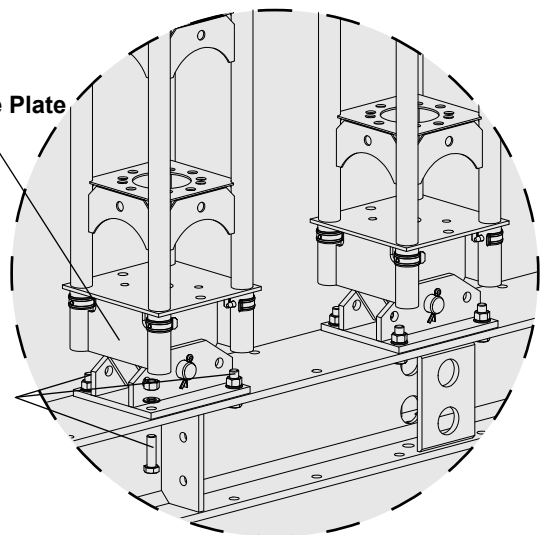
### Option B Pin-jointed Base Plate

Prop Jack 2

Pin-jointed Base Plate

Load bearing frame prop bolt set

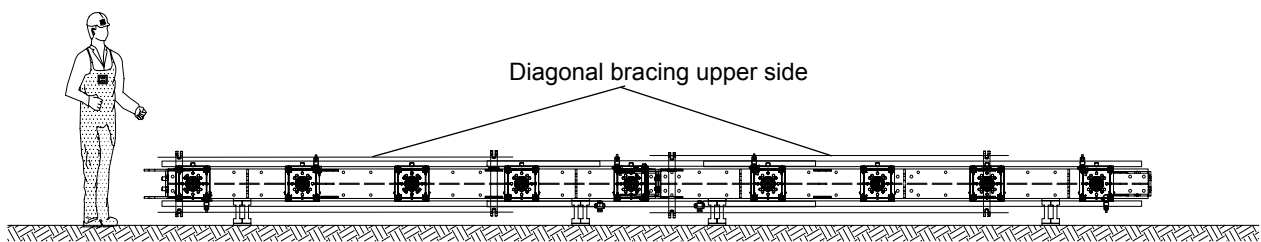
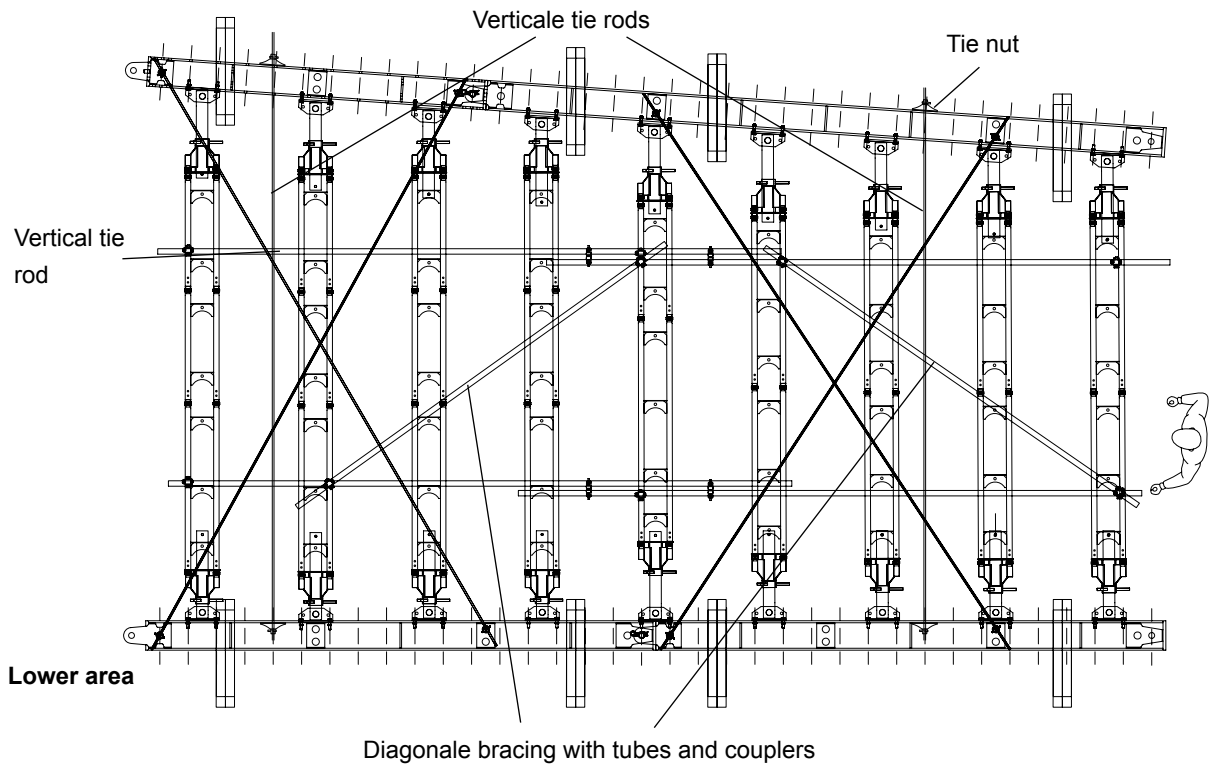
Main Beam



For both options the connection between **Load-bearing frame prop** and **Main beam** is done with the **Load bearing frame prop bolt set**. The required torques are given on the spreadsheet on page 30.

## 5.0 Assembly

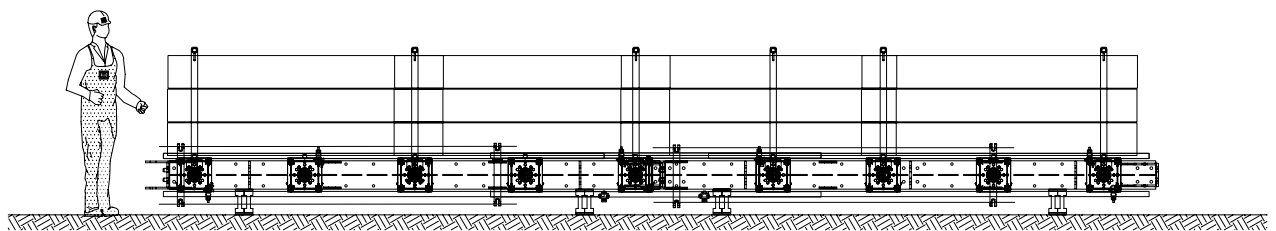
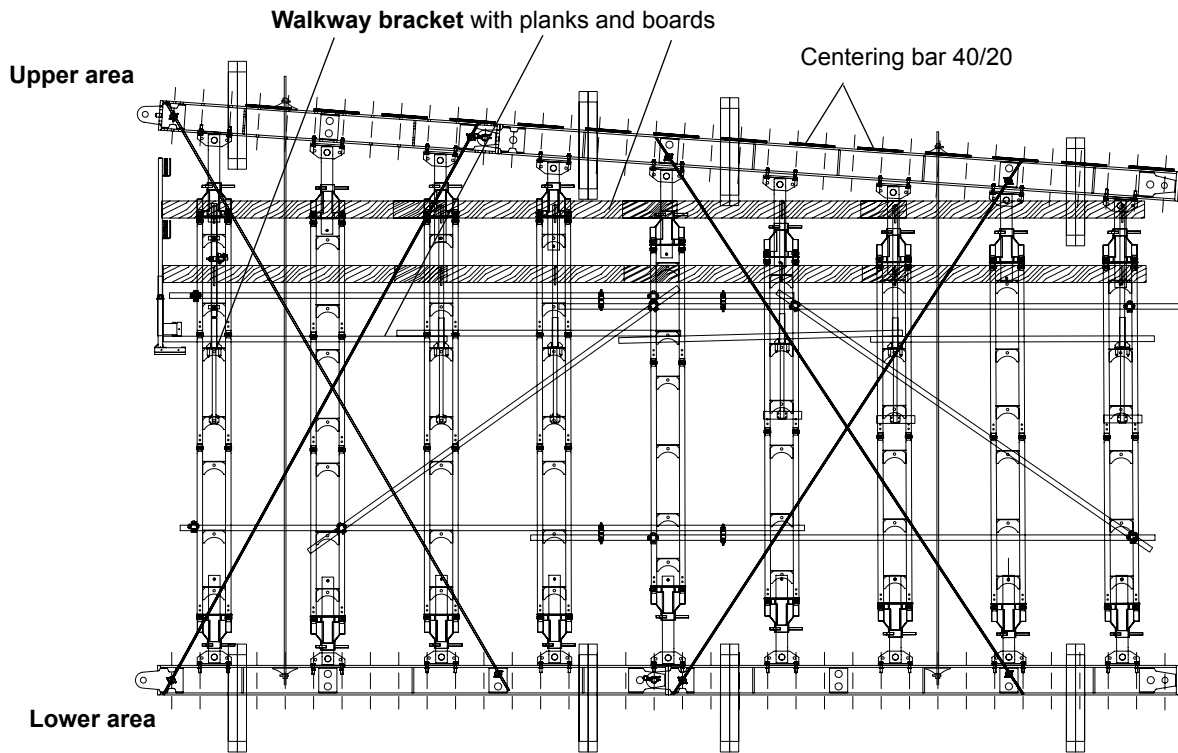
- As temporary stiffening place tubes and couplers as bracing on the upper side of the **Load-bearing frame props**.
- Install the diagonal tie rods to the upper side of the Load-bearing frame props and tighten them. Secure lifting unit with two vertical tie rods per side. Insert tie rods and tighten them with tie nuts in the upper and lower area.
- Place diagonal tie rods to the upper side and tighten the **Hexagon nuts 15/50** against the **Tension bolt** to avoid unintended turning. Then tighten the **Tension nut set DW15** at the lower area (hand-tight only, see page 30).
- Place two diagonal tie rods per pair of Main beams.





- If necessary place walkways, planks, boards and Centering bars 40/20.

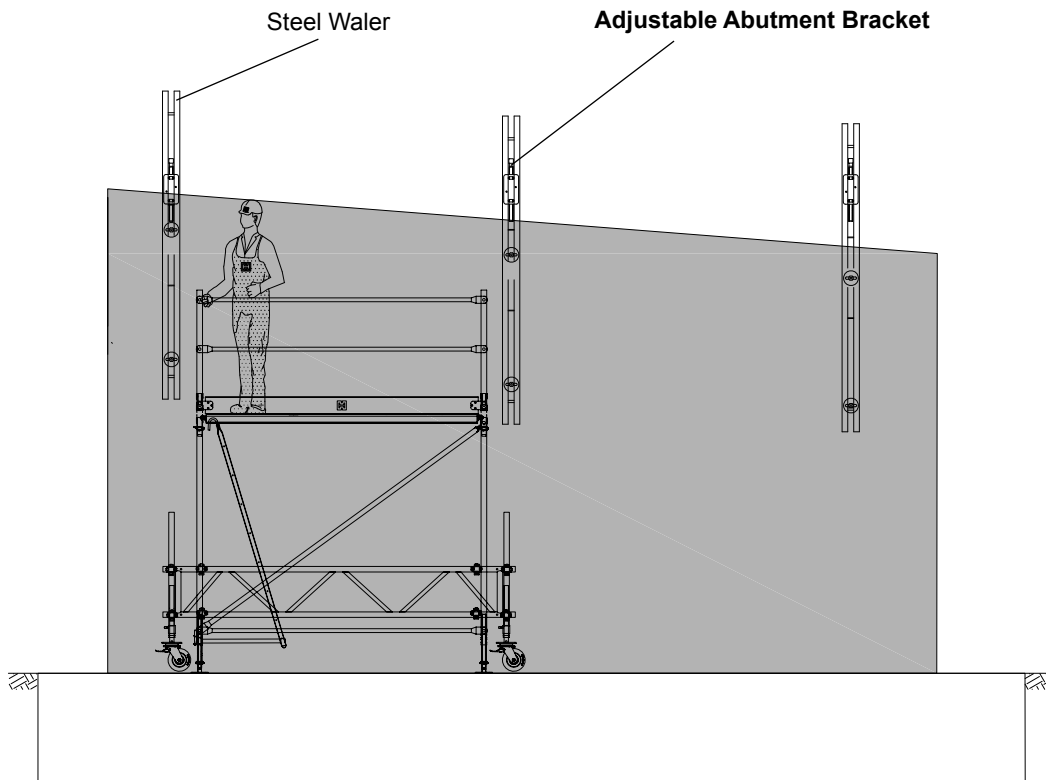
**Note:**  
Load-bearing frame props not fixed with screws must be secured by means of Beam clamps 16/70



## 5.0 Assembly

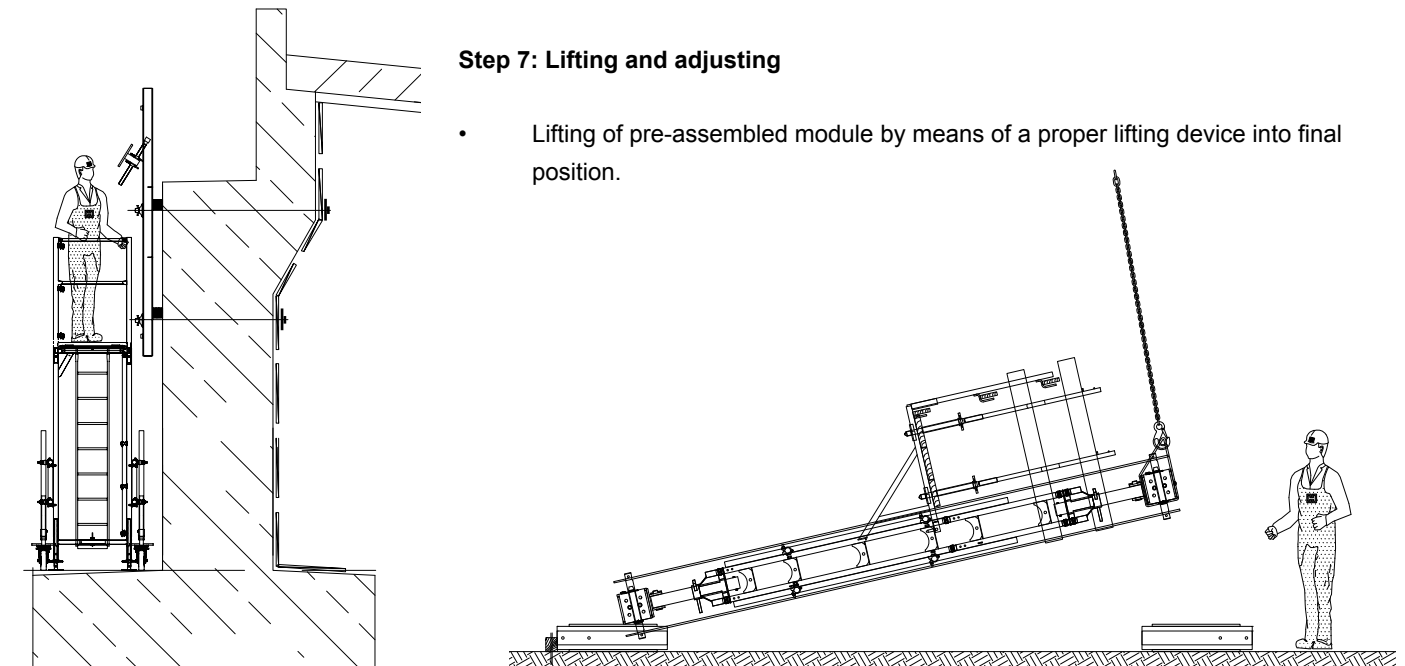
### Step 6: Preparation of tying for horizontal forces alongside abutment or pier.

- Prepare erecting area. The erecting area must be leveled, well compacted, capable to carry the loads and accessible by forklift or crane.
- Arrange safe access to mount the **Steel walers** and **Adjustable Abutment Bracket**.
- Fix Steel walers and Spanning device on abutments or piers. Number and position of sets according to statical calculation. The tying points must be secured against unintended release.
- 

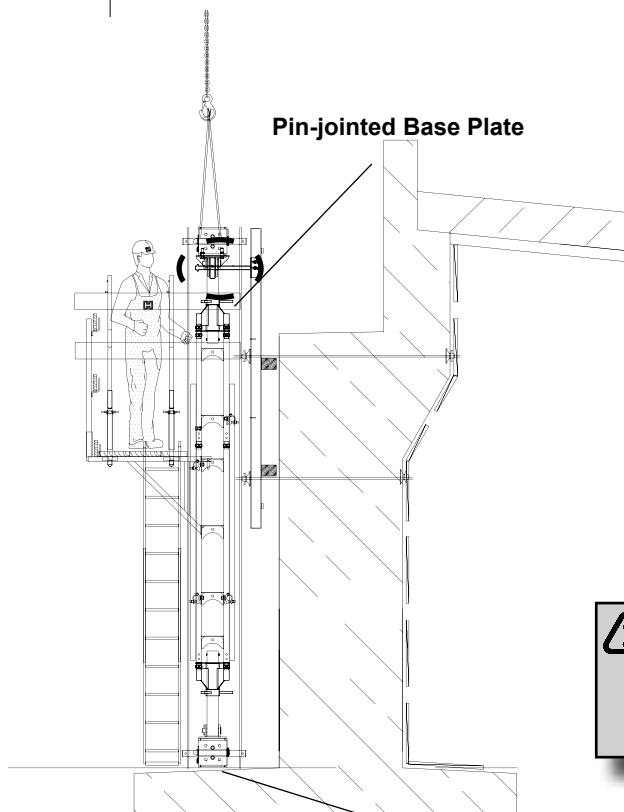
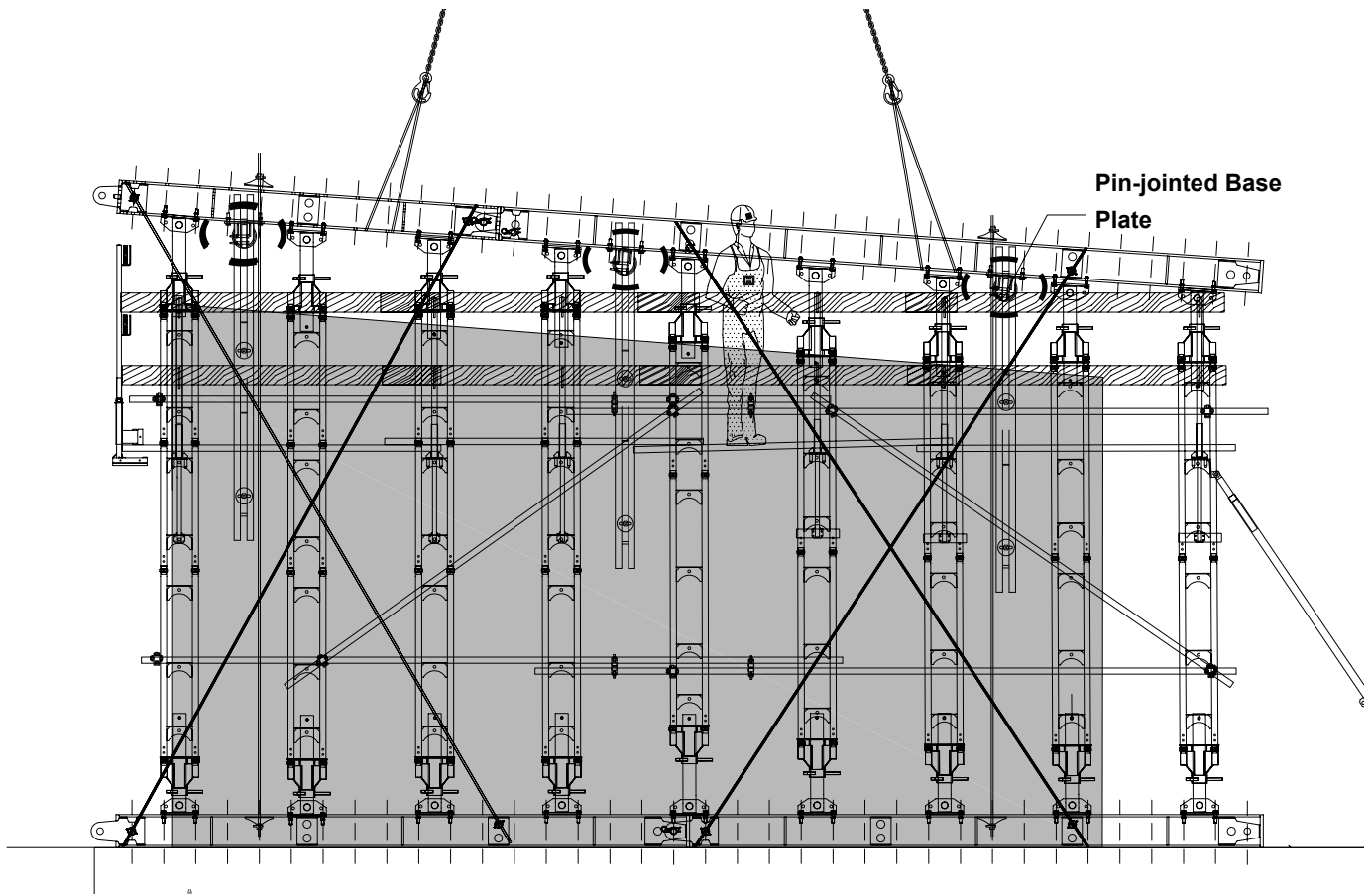


### Step 7: Lifting and adjusting

- Lifting of pre-assembled module by means of a proper lifting device into final position.



- Secure pre-assembled module directly with the **Adjustable Abutment Bracket** to the existing structure while it is still secured with the lifting device.



After releasing the pre-assembled module from the lifting device adjust into vertical position by means of the **Adjustable Abutment Bracket**.

Check and adjust the correct height of the upper **Main beam** by using the upper spindles on the outer **Load-bearing frame props**. Finally turn the upper spindles of the inner **Load-bearing frame props** force-fit under the **Main beam** and tight the screws at the head plate.

Adjust the pre-assembled module in crosswise direction. Prestress diagonal tie rods step by step up to 10 kN by with the Tension nut set DW15 (see page 30).

When using several modules a continuous connection of the Main beams is recommended.



**Safety Information:**

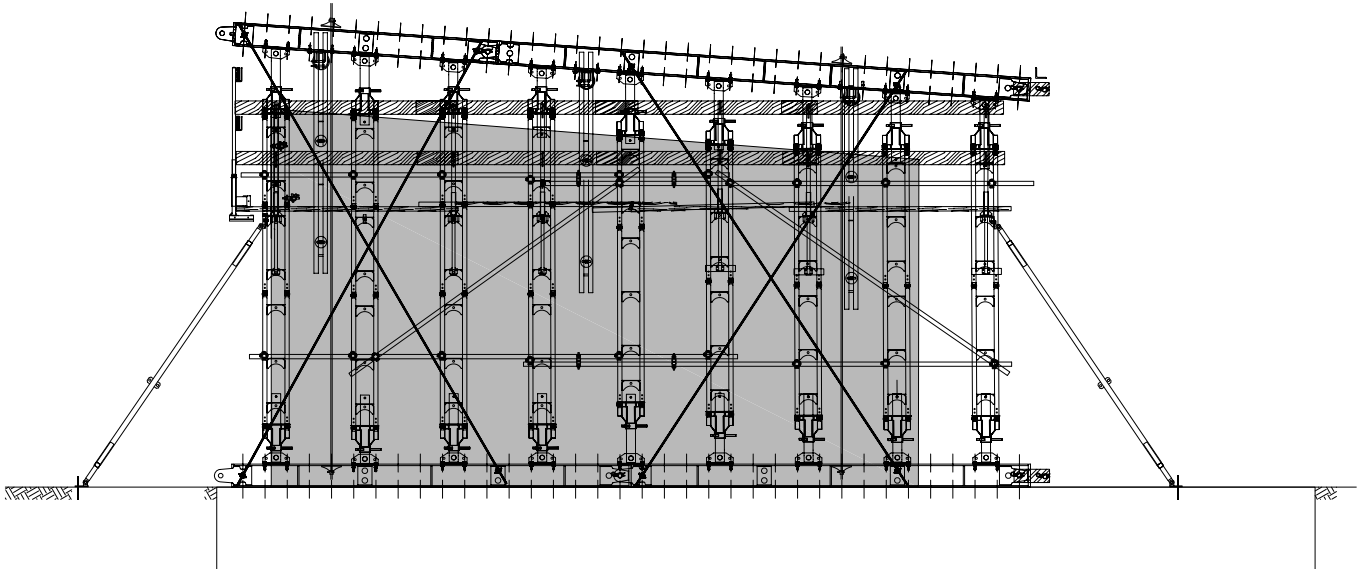
While prestressing the tie rods DW15 apply force step by step. Avoid different tensile forces in the tie rods to eliminate damages and deflections.



**Safety Information:**

Make sure that the lower Main beam rests on his full surface. If required fill cavities with appropriate material (e.g. lean concrete).

## 5.0 Assembly



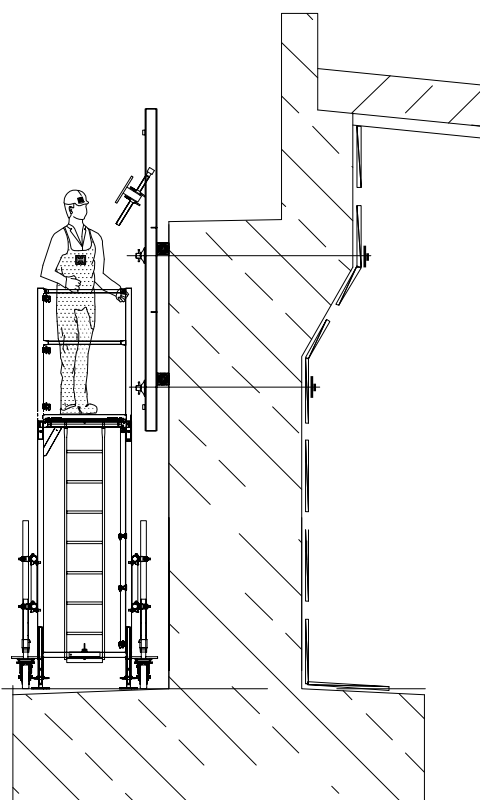
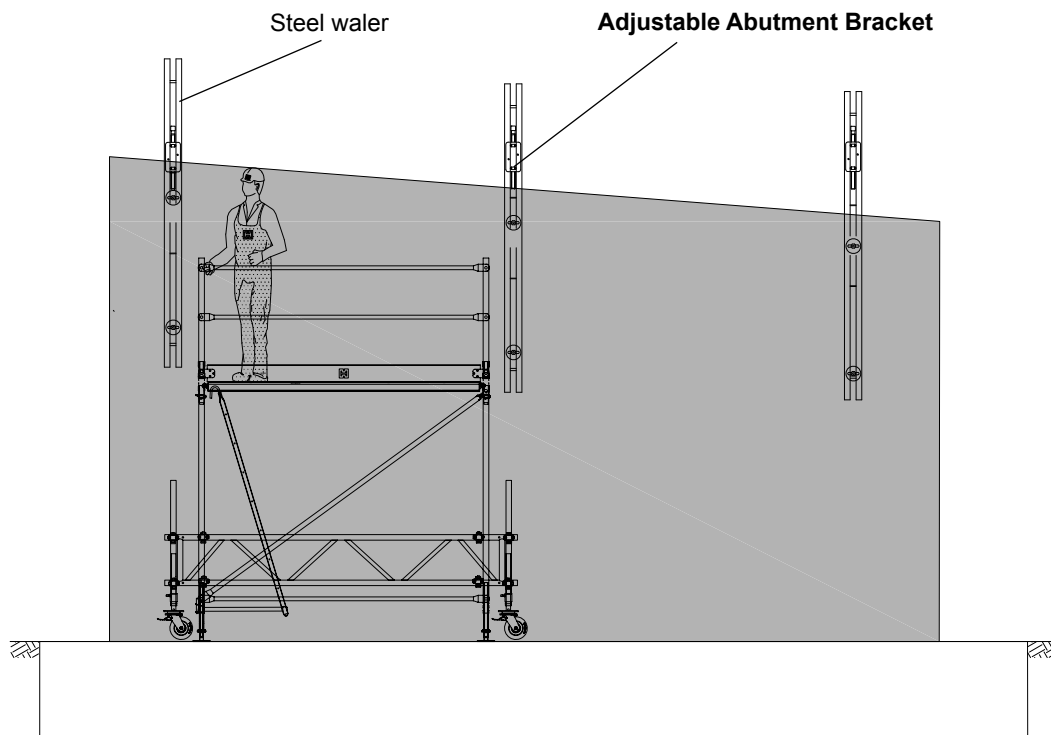
**⚠ Safety Information:**  
Place props vertically! The vertical deflection may not exceed 0.5%!

**⚠ Safety Information:**  
Hünnebeck is not responsible for the safety of the lifting operations.

## 5.2 Recommended working sequence with vertical assembly in final position

### Step 1: Preparations

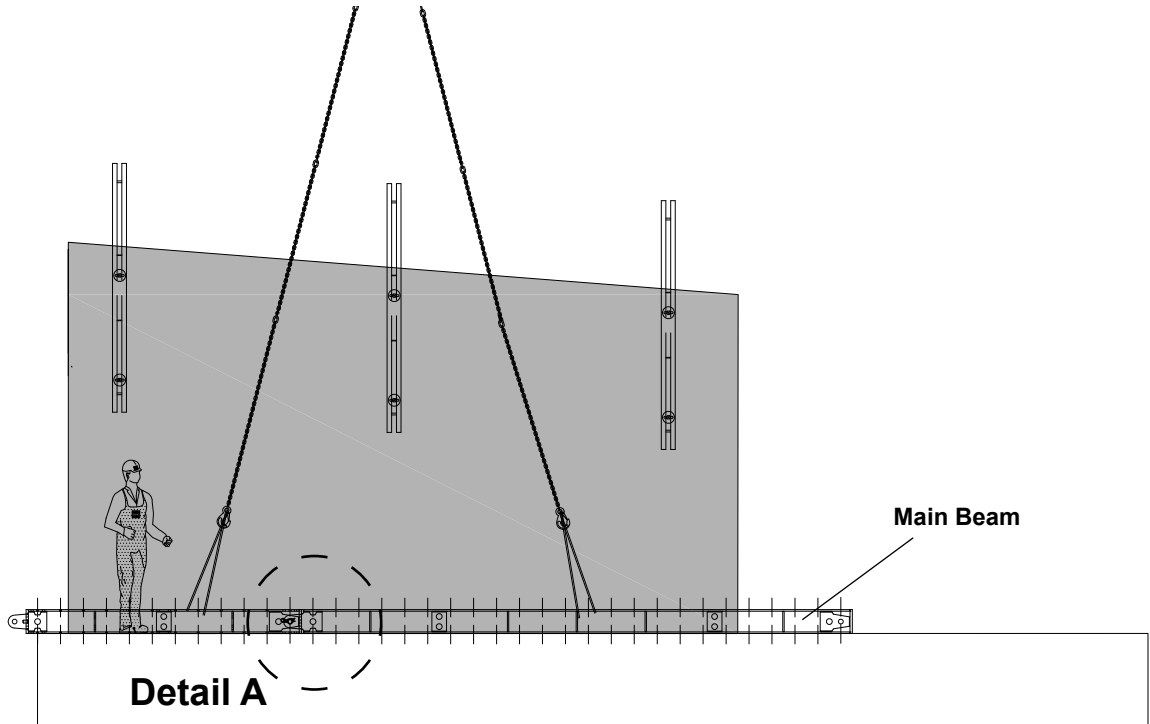
- Prepare erecting area. The erecting area must be leveled, well compacted, capable to carry the loads and accessible by forklift or crane.
- Arrange safe access for the fixation of Steel walers and Spanning device abutment.
- Fix Steel walers and Spanning device on abutments or piers. Number and position of sets according to statical calculation. The tying points have to be secured against unintended release.



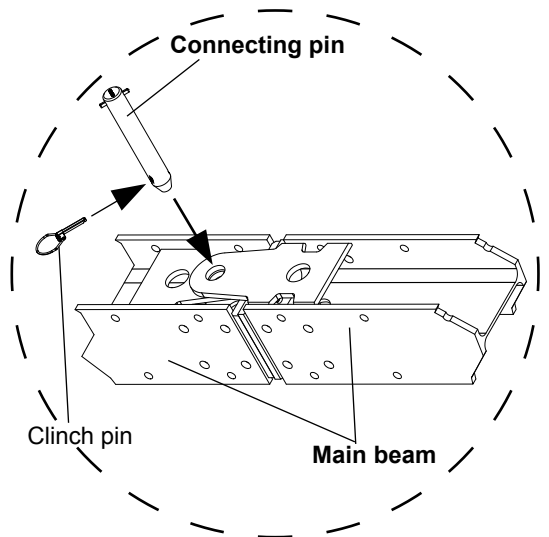
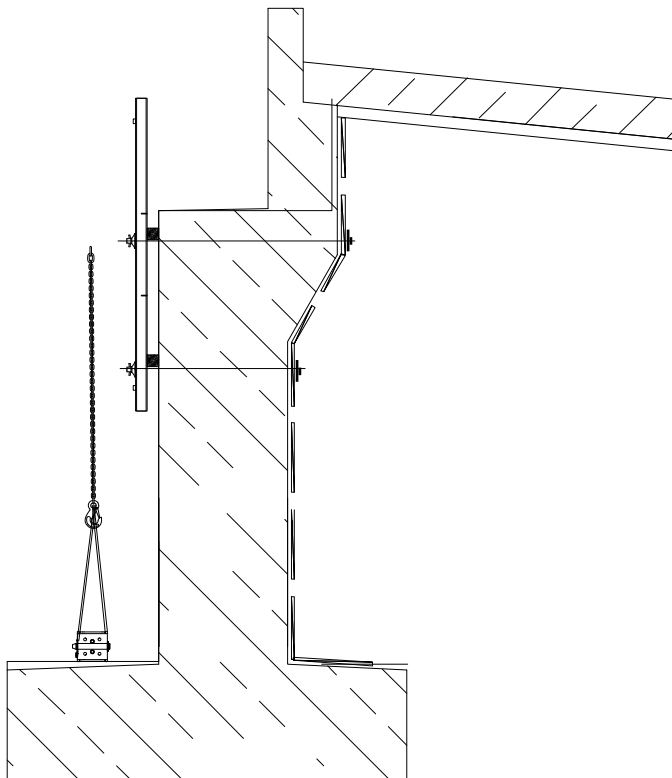
# 5.0 Assembly

## Step 2: Lower Main beams

- Remove **Connecting pins** of **Main beams** and place **Main beams** with adequate lifting device into assembly position.
- Align **Main beams** and insert **Connecting pins**. Secure **Connecting pins** with clinch pins.



Detail A

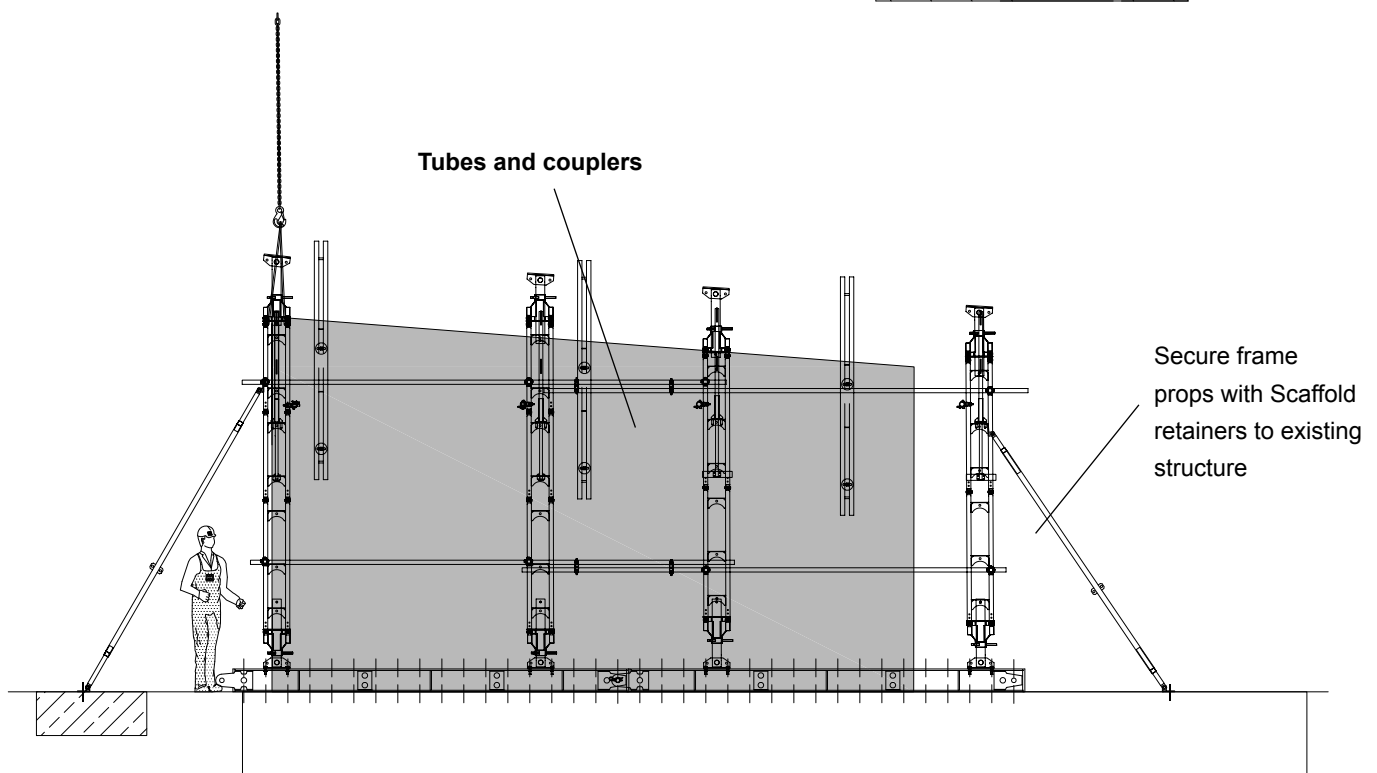
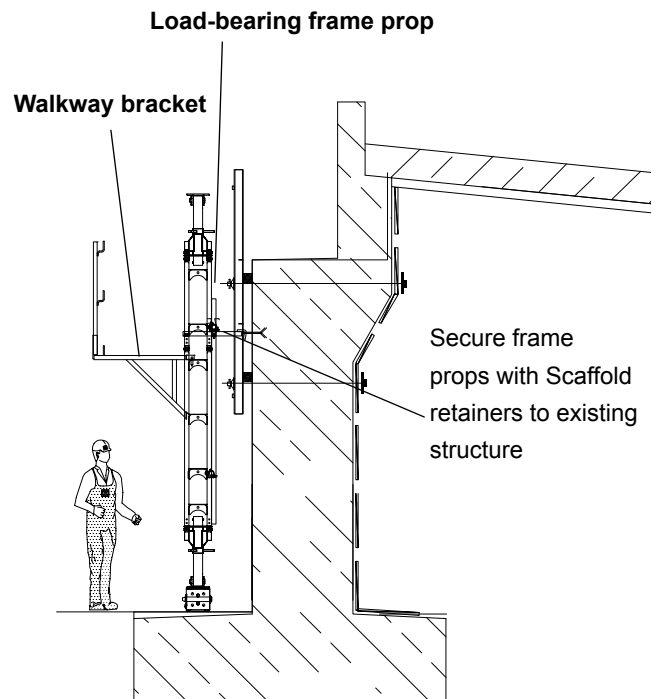


To bolt the **Main beams** push them together as shown and connect them with the **Connecting pin**. The **Connecting pin** is finally secured with the clinch pin (flipped over).

## Step 3: First Load-bearing frame prop

- Check actual foundation height on site and approximate height of frame prop before starting assembly.
- Pre-assemble **Load-bearing frame props** (including walkways) on correct length, pre-adjust spindles.
- Alternative: Assemble **Load-bearing frame props** step by step.
- Connect first **Load-bearing frame prop** in right position with bolt set on Main beam.
- Secure frame prop on existing structure with Scaffold retainers and Wall struts.
- Adjust frame prop vertically.
- Loose lifting device when frame prop is secured against tilting and turning.

**Note:**  
Scaffold retainers to secure the frame props must be ordered separately.



**Note:**  
With bigger distances between first and last frame prop the middle props should be adjusted with a 5 cm play at the top.  
They are to be connected by means of tubes and couplers.

**Safety Information:**  
Place props vertically! The vertical deflection may not exceed 0.5%!

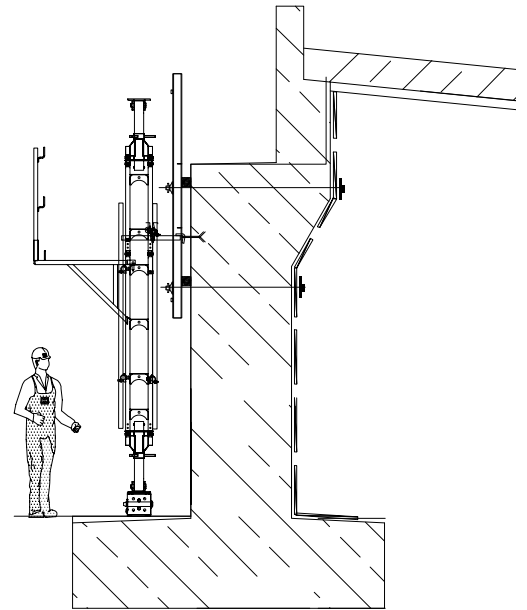
## 5.0 Assembly

### Step 4: Middle Load-bearing frame props

Connect the **Load-bearing frame prop** in correct position with the bolt set to the **Main beam**.

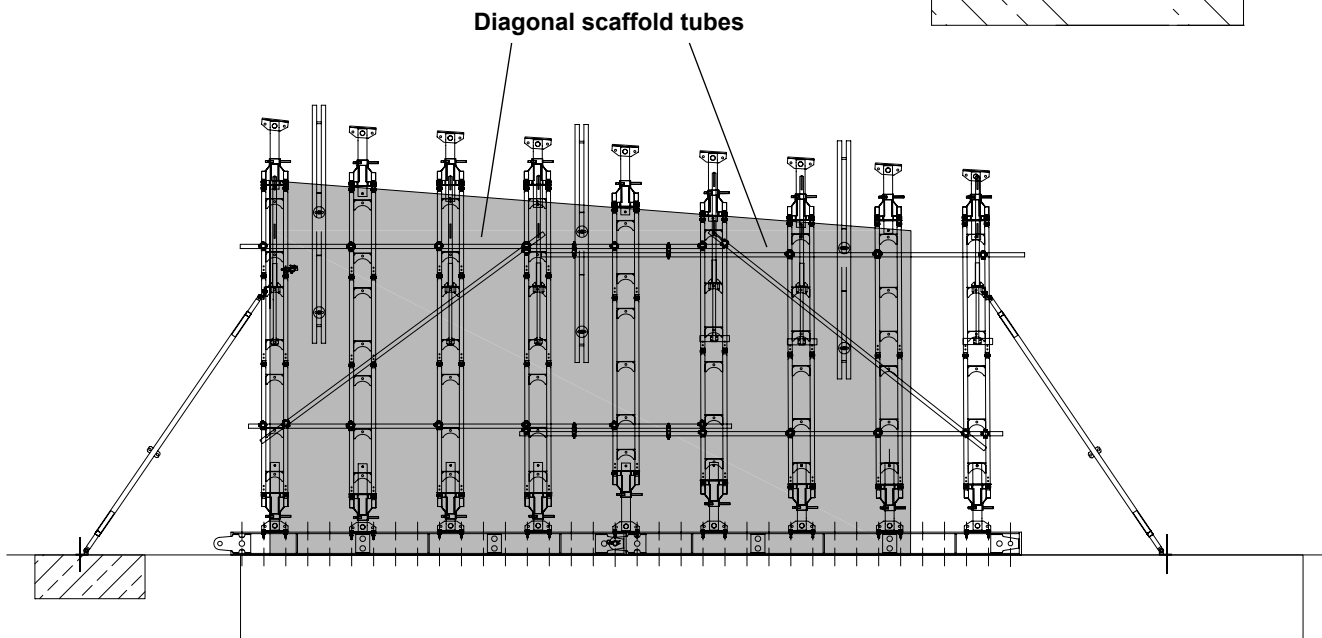
Secure Frame props to already fixed tubes with Scaffold couplers.

- Adjust bottom spindles to correct length, adjust top spindles 5 cm short the required length.
- Connect diagonal scaffold tubes by means of couplers on **frame props**.



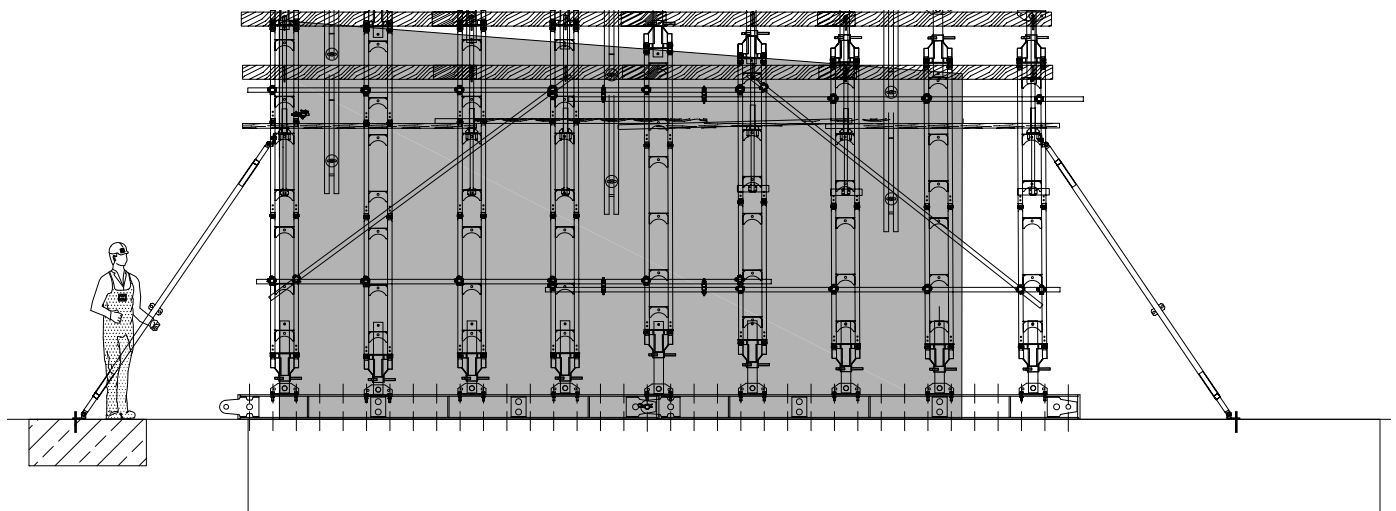
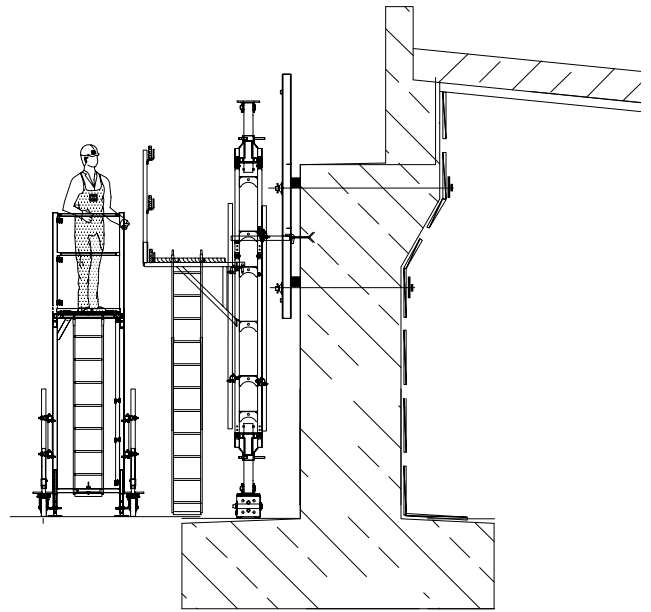
**Note:**

To allow an easy adjustment of the vertical truss on the final height we recommend to fix the middle props temporary with a 5 cm play on top.





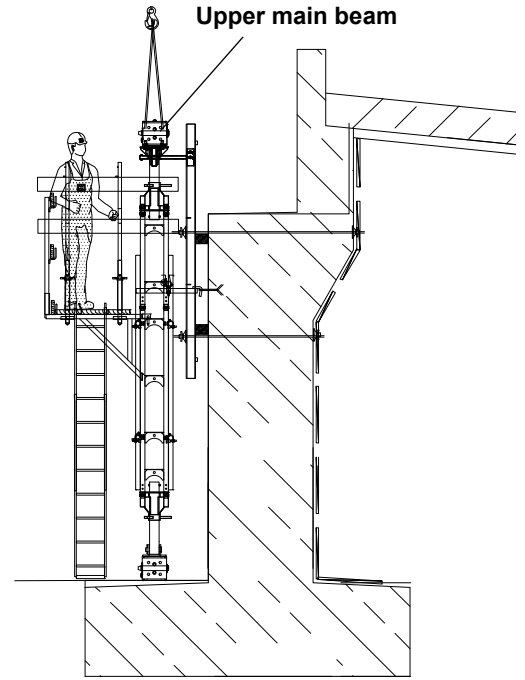
- Add walkways, planks and boards, according to requirements.



# 5.0 Assembly

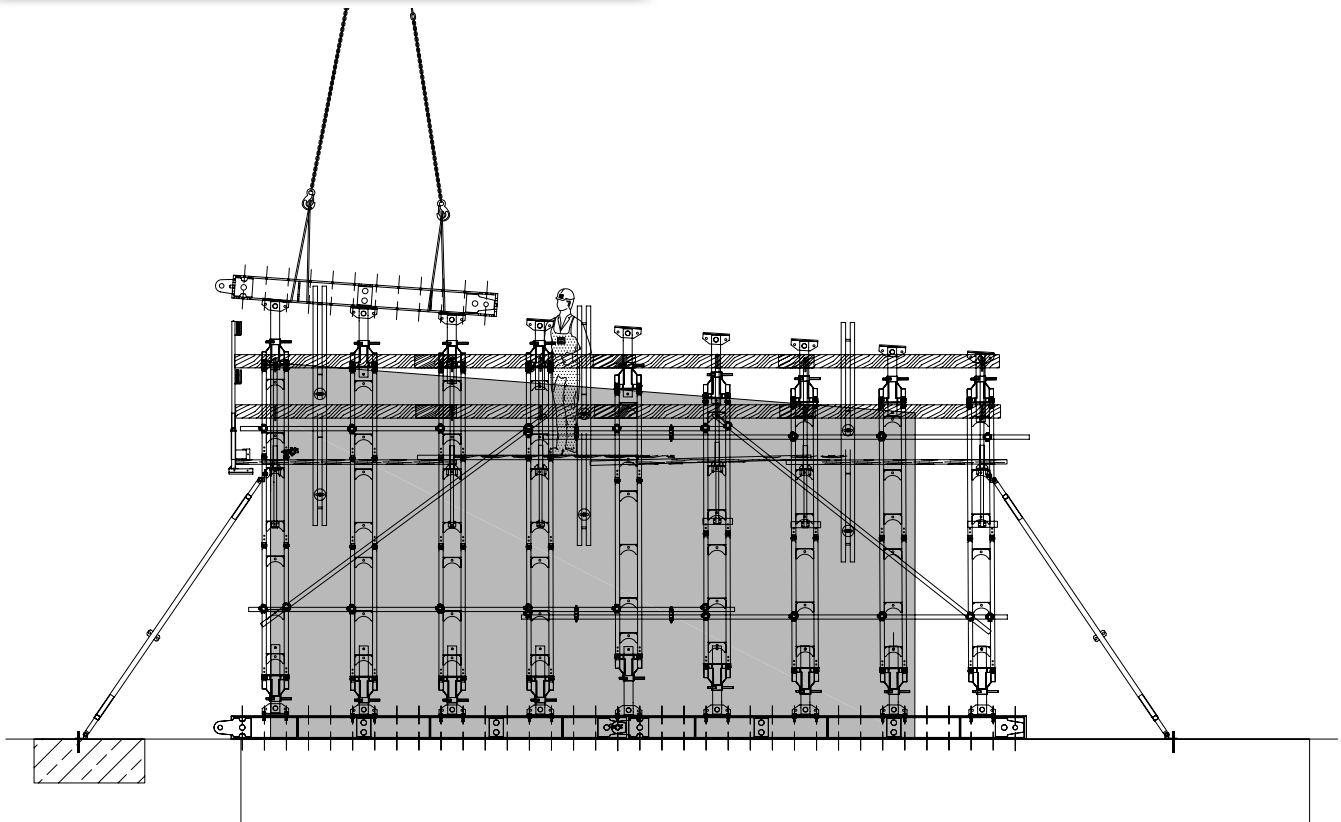
## Step 5: Upper Main Beam

- Place the **Main beam** with an adequate lifting device into the correct position to the **Load-bearing frame props**.
- Connect Main beam with outer **Load-bearing frame prop** with the bolt set.
- Secure **Main beam** with **Adjustment Abutment Bracket** on existing structure.
- Check beam height and, if required, adjust via outer frame props. Finally turn the upper spindles of the inner **Load-bearing frame props** force-fit under the **Main beam** and fix with screws.



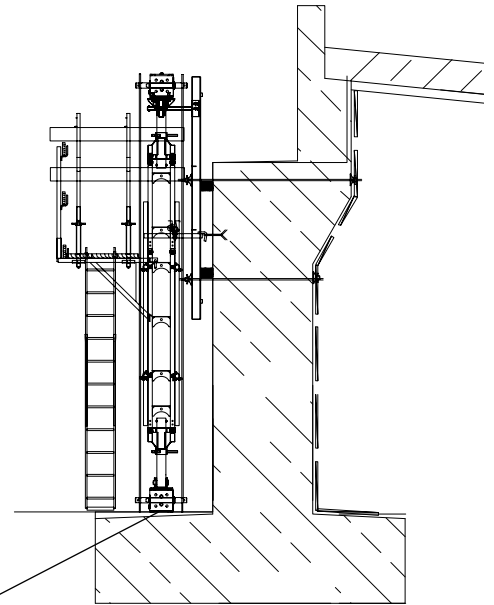
**⚠ Safety Information:**  
Load-bearing frame props not fixed by screws must be secured by means of Beam clamps 16/70.

**⚠ Safety Information:**  
Hünnebeck is not responsible for the safety of lifting operations.



## Step 6: Diagonal bracing with tie rods

- Insert **Tension bolts**.
- Place tie rods diagonal, according to local situation.
- Fix tie rods to the upper **Main beam** and tighten them with **Hexagon nuts 15/50** against the Tension bolt to avoid unintended turning. Then tighten the **Tension nut set DW15** at the bottom (hand-tight only, see page 13).
- Prestress diagonal tie rods step by step up to 10 kN with of the **Tension nut set DW15** or the **Hexagon nuts 15/50** (see page 30).



### Safety Information:

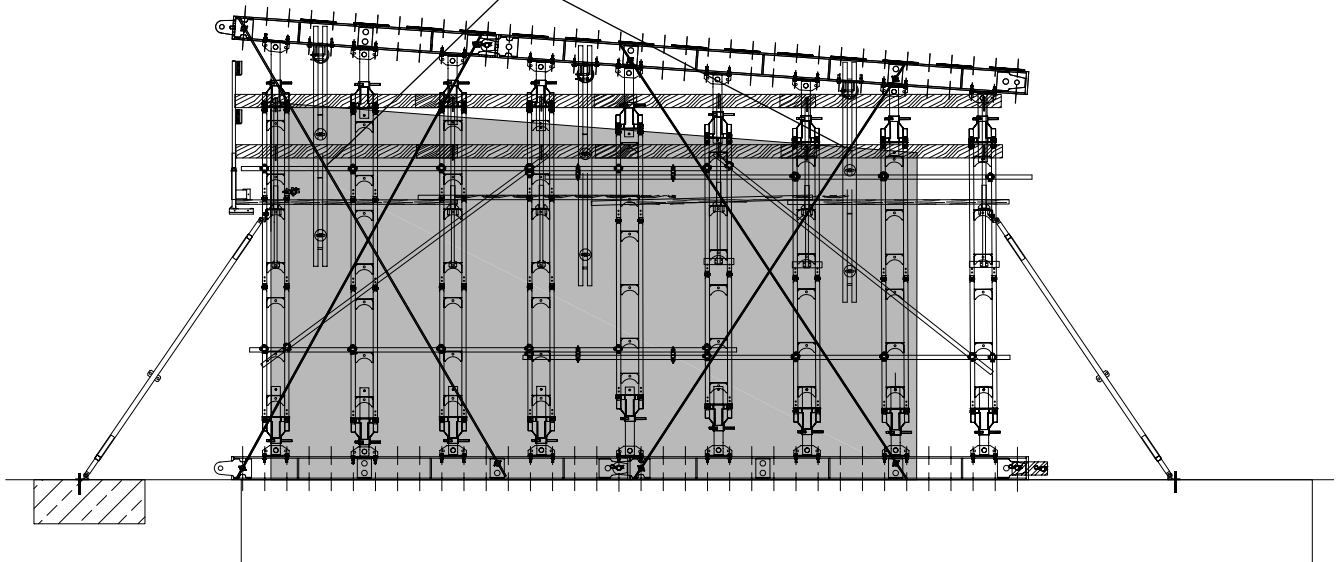
While prestressing the tie rods DW15 apply force evenly in small steps by step. Avoid different tensile forces in the tie rods to prevent damages and deflections.




### Safety information:

Make sure that the lower **Main beam** bears with fully contact on the foundation or base slab. If required fill gaps with appropriate material (e.g. lean concrete).

Diagonal bracing

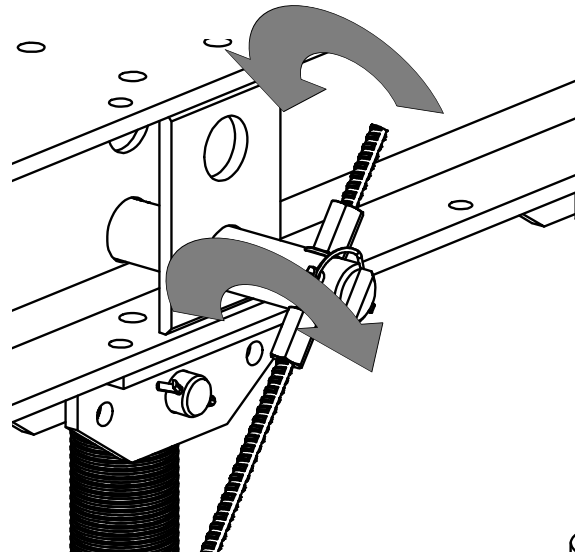


## 6.0 Prestressing of diagonal tie rods

 **Safety Information:**  
While placing the diagonal tie rods make sure that the prestress is within the limitations given in the statical calculation. The described procedure has to be done alternating on a pair of ties and inside the complete bracing until reaching the required force. Loads occurring during the prestress process are to be considered when calculating main beams and frame props.

### 6.1 Counter tie rods on upper beam

The two **Hexagon nuts 15/50** have to be placed in such a way that they are on both sides of the **Tension bolt**. Make sure that the Clinch pin is inserted. Tight now both **Hexagon nuts 15/50** with a spanner 30 mm.

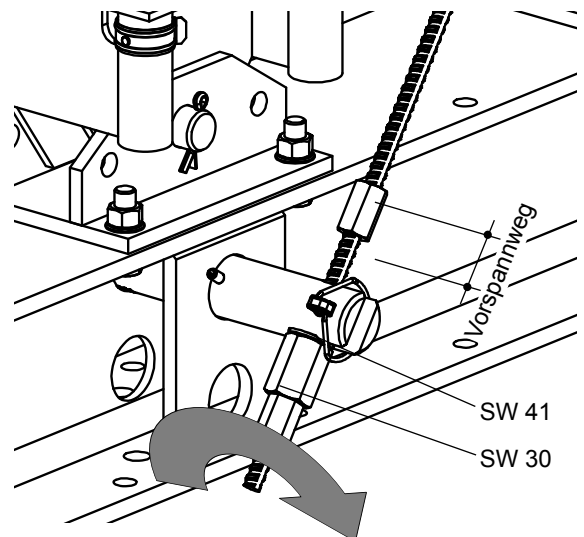


### 6.2 Prestress tie rods on lower beam with Tension nut set DW15

Check if the **Tension nut set** is fully inserted.

Place **Washer 25** on the tie and fix the **Tension nut** hand tight. The outer nut size 41 mm is now tightened until reaching a 10 kN prestressed force. The force is imposed via tie elongation (see 6.3) or with a defined turning moment (see 6.4).

The force has to be placed alternating on a pair of ties and inside the complete bracing (maximum a single turn of tie nut) until reaching the required force.



## 6.3 Impose of a defined prestress force with a tie elongation

First the prestress distance needs to be calculated. It is given by the tie elongation (see diagram below) and the distance between the Tension bolts.

Adjust the prestress distance between **Tension bolt** and inner **Hexagon nut 15/50**. Now stress tie rod with a only one single rotation of the Tension nut. Act the same way with the other tie rods in the bracing. Repeat this sequence alternating until all inner Hexagon nuts are placed tight to the Tension bolt.

### Example calculation of tie elongation

- Tie force 10 kN
- Tie rod DW15, stressed length 6 m
- Slip 1mm

The diagram shows the tie force in kN and the resulting tie elongation, here approx. 0.3 mm/m.

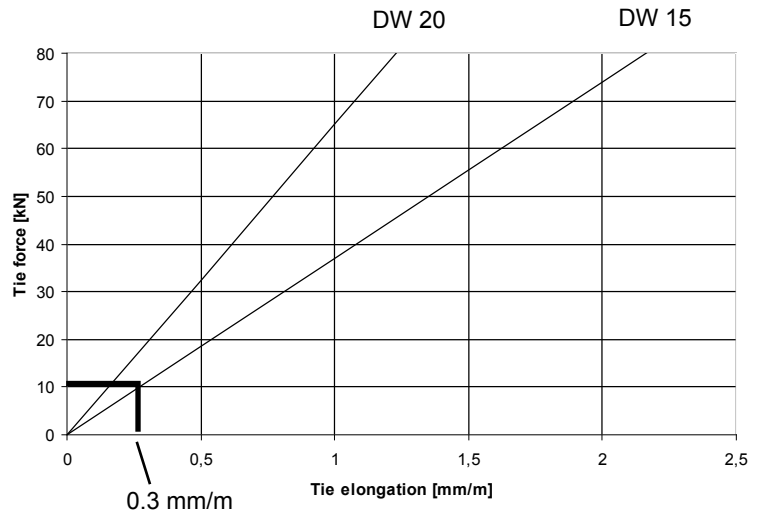
With a tie length of 6 m the stress distance **a** ist:

### Formula:

Prestress Distance (**a**) = tie elongation (from diagram 1) · stressed length + 1mm slip

$$a = 0.3 \text{ mm/m} \cdot 6 \text{ m} + 1\text{mm} = 2.8 \text{ mm}$$

⇒ Prestress distance **a** = 3.0mm



Diagramm

## 6.4 Impose of a defined prestress force with a turning moment

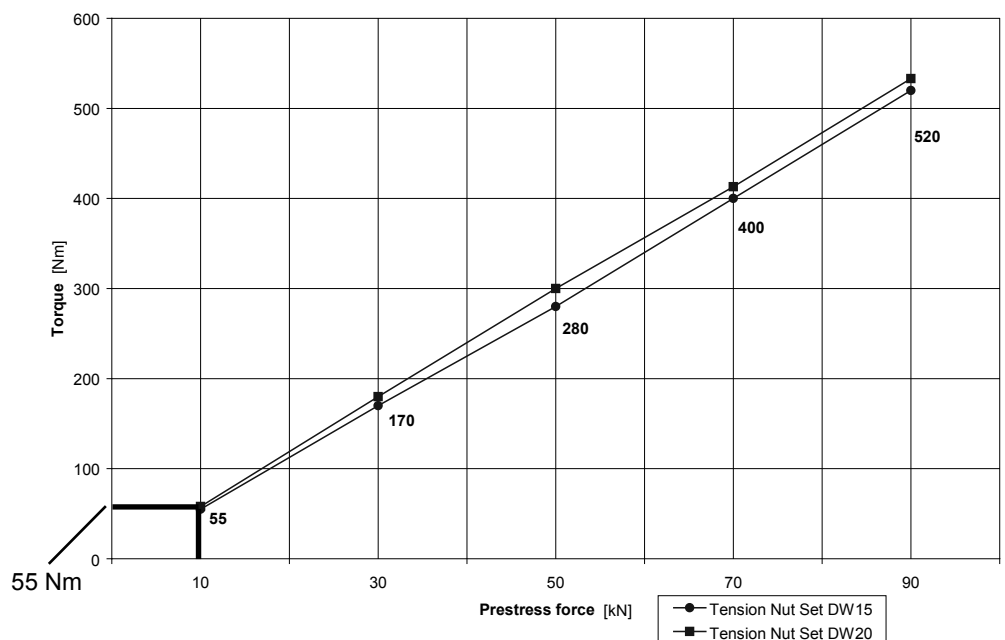
Take the appropriate torque out of the diagram.

Adjust the torque spanner to that torque and turn the the Tension nut only for one rotation.

Act the same way with the other tie rods in the bracing.

Repeat the sequence alternating until the torque spanner releases.

**DW15:** 10 kN = reading 55 Nm



## 6.0 Prestressing of diagonal tie rods

### 6.5 Torque for screws with metric thread

All screws must be tightened with the torque mentioned on this spreadsheet!

Torque for high tensile screws grade 10.9			
Screw	required prestress force Fv	Prestressing of screws with Torque methode	
		Necessary torque Mv	
		Mo S2 - greased	slightly oiled
	kN	Nm	Nm
M 12	50	100	120
M 16	100	250	350
M 20	160	450	600
M 22	190	650	900
M 24	220	800	1100
M 27	290	1250	1650
M 30	350	1650	2200
M 36	510	2800	3800

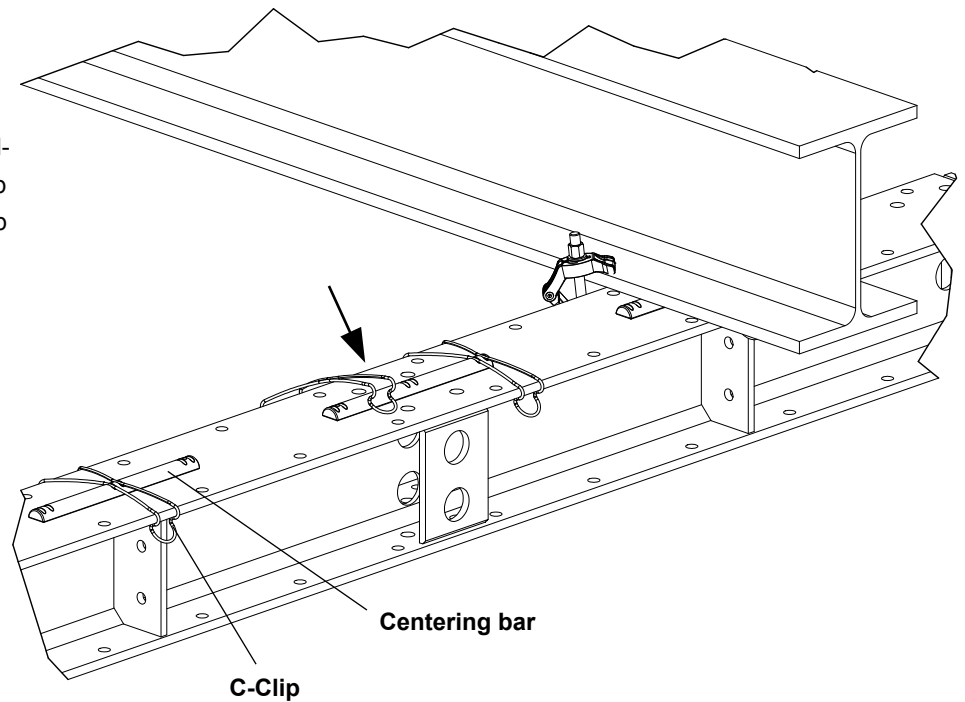
Mo S2 greased for galvanized screws, slightly oiled - for non galvanized screws

## 7.0 Assembly of Centering bar

The **Centering bar** ensures the centered transfer of vertical loads into the **Main Beams**.

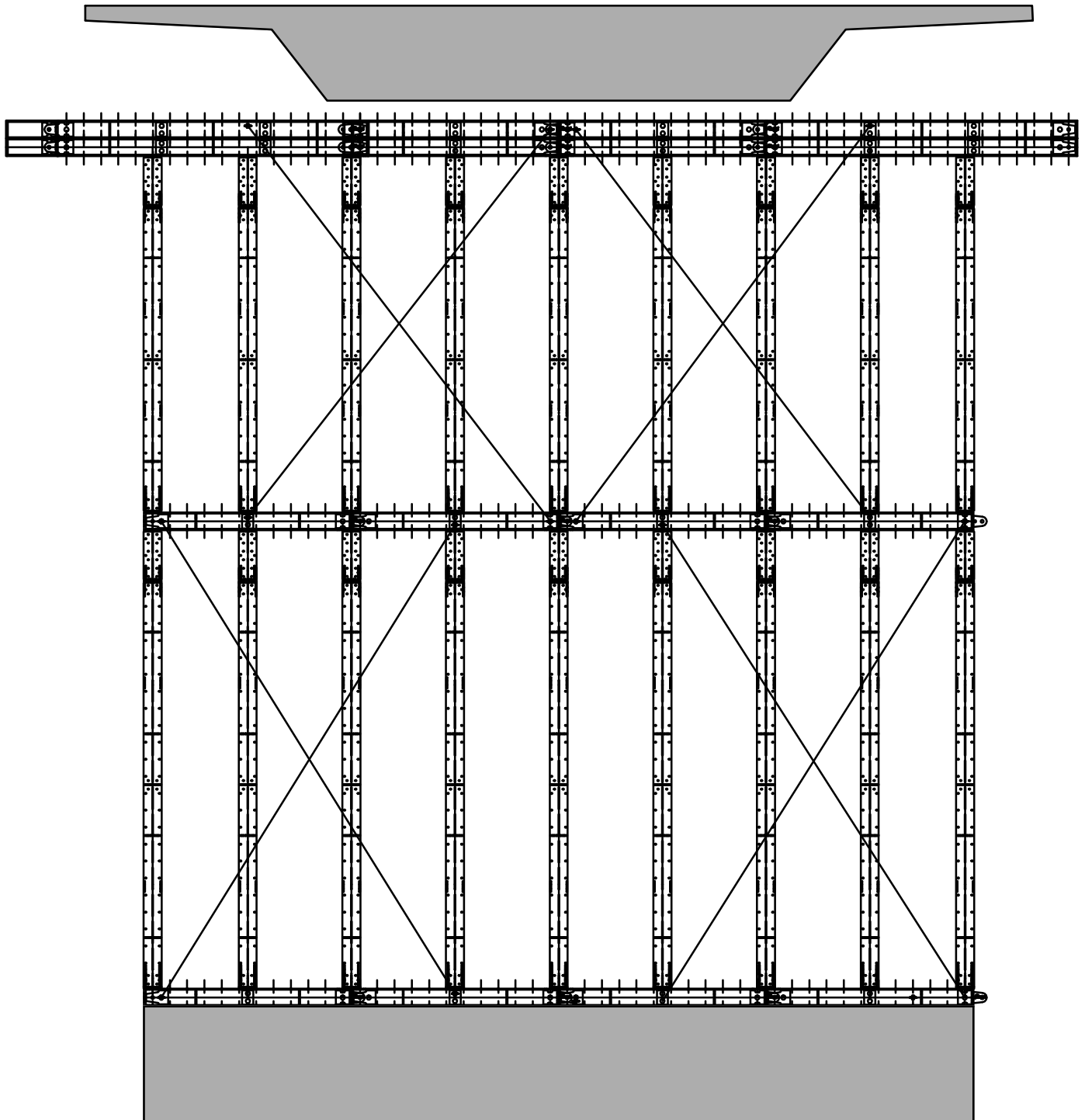
The bar is secured against sliding and falling with the **C-Clip**. Typically a single clip fixes the bar safely to the **Main beam**. Up to three clips per bar can be connected.

The indentations for the clip ensure the correct position and embed the clip flush with the top of the centering bar.



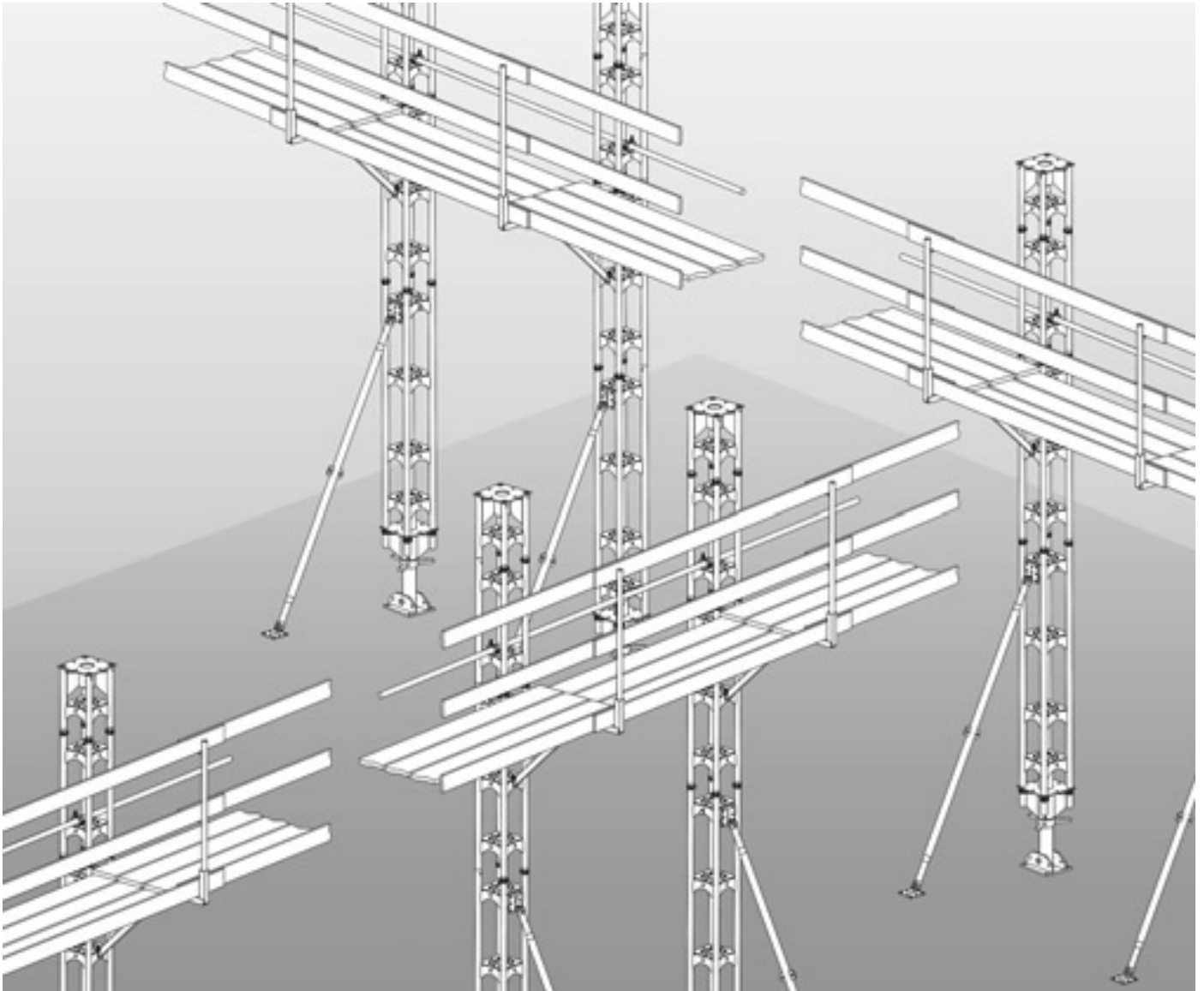
## 8.0 Another example of usage

High capable vertical support for bigger spans or bridge refurbishments (replacement of bridge bearings).



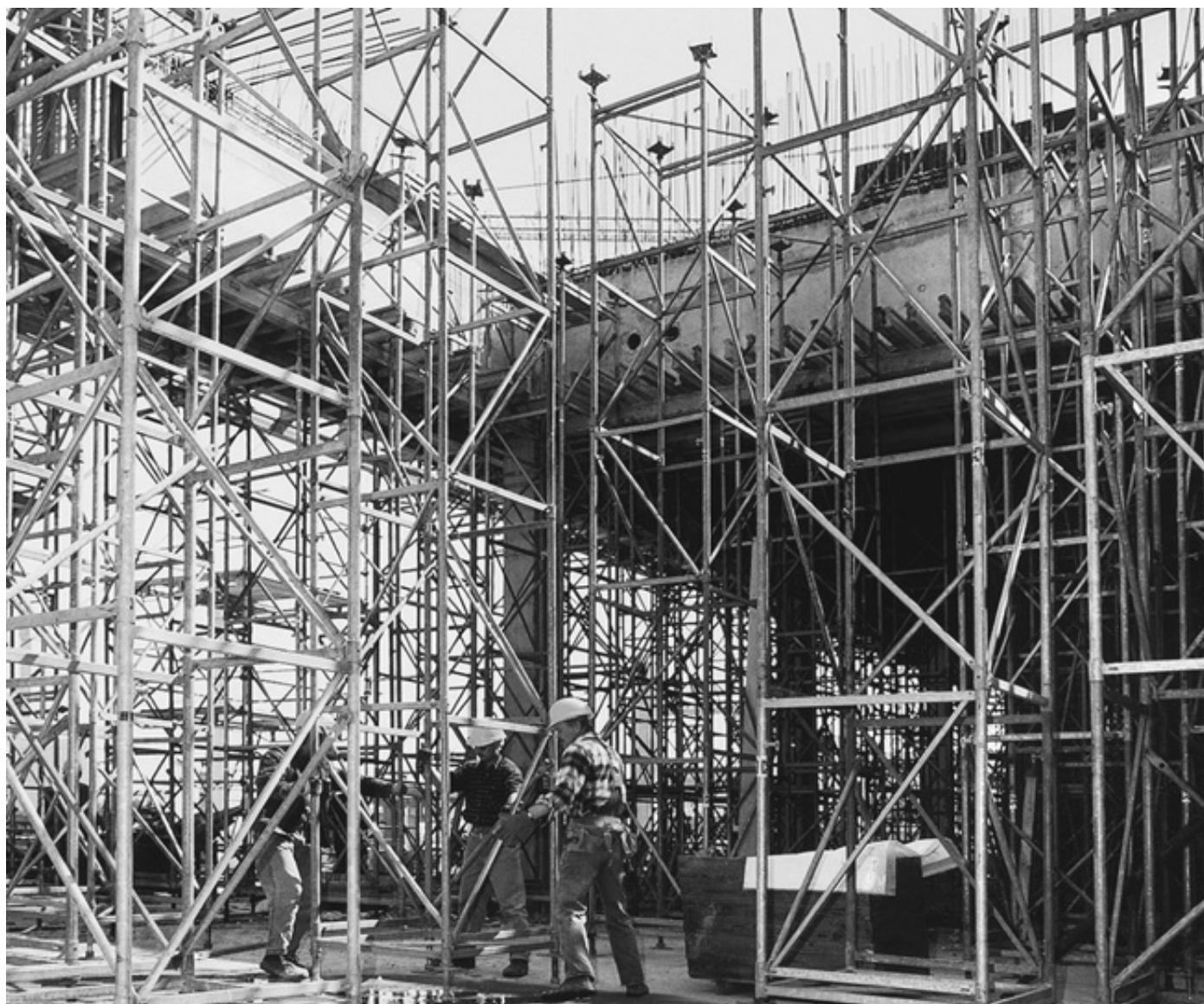
## 9.0 Information on Load-bearing frame prop

For detailed information on Load-bearing frame prop please refer to the relevant instructions for assembly and use.





For detailed information on ID15 frame support please refer to the relevant instructions for assembly and use.



## 11.0 Information on PROTECTO Side Protection

For detailed information on the PROTECTO Side Protection System see Instruction for Assembly and Use of PROTECTO.





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