

Installation Overview

Purpose and Importance of Installation Manual

The installation manual is not only a technical document but also a critical reference for ensuring the assembly quality, safety, and reliability of photovoltaic brackets. Proper use of the installation manual can reduce error rates, save time, and is an indispensable part of the photovoltaic bracket assembly process.

- Guide installation process: Clarify installation steps, sequence, and methods to avoid operational errors.
- Ensure installation accuracy: Ensure that the dimensions, positions, and fits of the bracket structure meet design requirements.
- Improve safety: Prevent equipment damage or personnel injury caused by installation errors.
- Standardize operations: Unified installation according to specifications can effectively prevent differences caused by human factors.
- Avoid installation errors: Incorrect installation may lead to structural failure or functional failure.
- Improve installation efficiency: Clear installation instructions can reduce debugging time, avoid rework due to errors, and improve installation efficiency.
- Ensure bracket reliability: Correct installation directly affects the operating stability, vibration, noise, and other key performance indicators of the bracket.
- Reduce maintenance costs: Standardized installation can reduce subsequent maintenance frequency and extend service life.



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Materials and Tools List

Materials List: See Appendix 5.2

Tools List:

Name	Image	Quantity	Notes
Torque Wrench		2	With 13mm socket
Pliers		1	
Grinder		1	
Hammer		1	Rubber hammer



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Tape Measure		1	30 meters
Vernier Caliper		1	Accuracy 0.02mm
Laser Level		1	12-line
Screwdriver		1	Hex key (one set)
Electric Wrench		2	2 sets
Marker Pen		2	Black



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Open-end Wrench		2	Size 24mm
Hex Wrench		2	
Large Wrench		2	
Ladder		1	Height 1.5-2 meters

Expected Installation Results and Effects

- **Structural Integrity**

- All components are correctly assembled without omissions or misassembly.
- Connecting parts (bolts, pins) are securely connected and meet strength requirements.

- **Operating Stability**



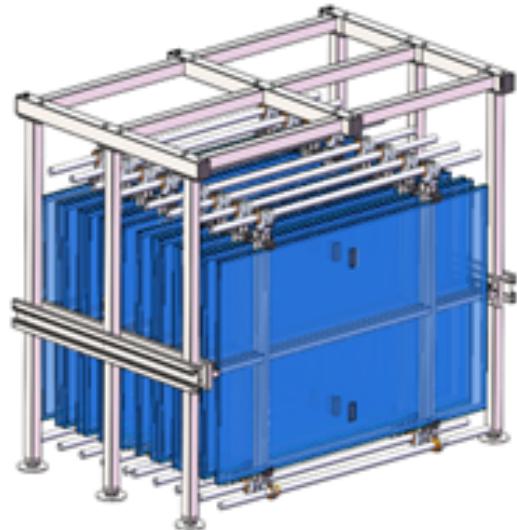
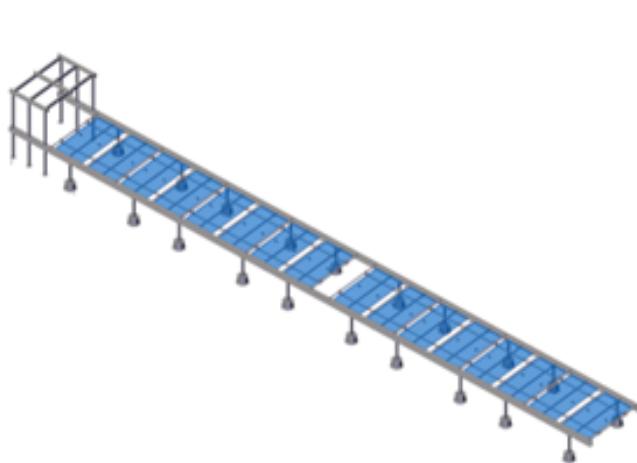
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- The photovoltaic bracket structure operates smoothly without obvious vibration or abnormal noise.
- Transmission components (rollers, bearings, node connectors) fit well without jamming or slipping.
- **Functional Realization**
 - The photovoltaic bracket structure can complete all movements and functions designed (such as folding angle, translation, etc.).
- **Service Life**
 - After installation, wear at connection points is normal without early failure risks (such as bearing end cap falling off and poor lubrication).
 - Avoid structural wear caused by installation stress, misalignment, and other issues that affect service life.

Expected Installation Effect Diagram



Preparation Work



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Ensure Suitable Installation Environment

1. Site Environment

Ensure that the factory installation site size meets the total installation area requirements, there are no safety hazards around the installation site, and the installation site will not affect other emergency uses in the short term to avoid disassembly and rework. Dust, oil, metal chips, and other contaminants should be prevented from entering key components (such as bearings and rails).

2. Basic Protective Equipment

Protective items must be worn (safety shoes, protective gloves, safety helmets, etc.).

Pre-installation Inspection and Testing

1. Component Inspection

- Full inspection of samples, batch sampling of 5% per batch.
- Check whether all components and standard parts in the list are complete, missing, or damaged.
- Check whether key components (such as bearings, rollers, rails) have rust, deformation, or wear.
- Measure key dimensions (such as shaft diameter, hole diameter, installation hole size, etc.) ensure they meet drawing requirements.
- Check whether fit tolerances (such as interference fit, transition fit, clearance fit) are appropriate.



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2. Main Tool Inspection and Verification

- Before installation, check whether all tools are complete and usable, and check whether electric tools have safety hazards.
 - Whether electric tools such as torque wrenches, electric wrenches, and laser alignment instruments are calibrated and usable.
 - Whether lifting equipment such as forklifts and slings meet load requirements and have no safety hazards.
-

Personnel Requirements

1. On-site Installation Personnel

- Minimum 5 installation personnel plus special operation workers as needed.

2. Professional Qualification Certification

- Special operation certificates (such as forklift operation, electrical work, etc.).
- Safety training certificates (such as OSHA, ISO 45001 system certification).

3. Skill Requirements

- Ability to read and understand mechanical drawings, assembly process cards, and technical requirements.
- Proficient use of professional installation tools (laser level, angle grinder, etc.).
- Master level detection skills (one-thousandth accuracy).



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- Ability to detect mechanical installation dimensions (angle dimensions, position dimensions etc.).
- Ability to judge and detect whether the bracket structure is completely installed according to drawings and lists (no missing installation, insufficient tightening, etc.).

Installation Steps

Step 1—Fixed Frame Assembly



Scan QR code to watch video: Fixed-end frame installation



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Required Materials List for Assembly

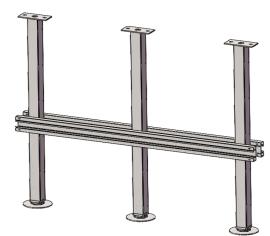
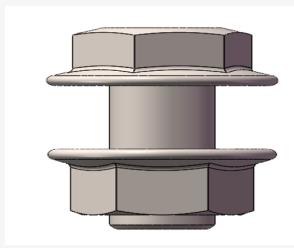
Name	Image	Quantity
Fixed Frame Top		1 piece



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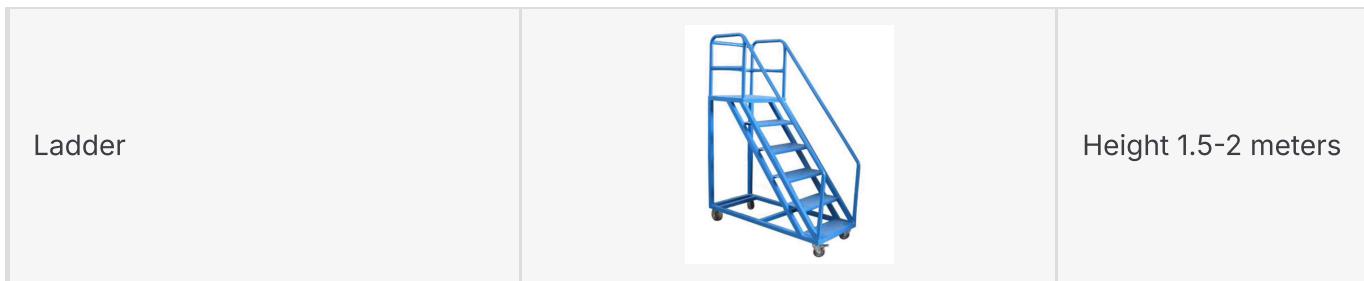
Fixed Frame Side		2 pieces
Installation Limit Piece		2 pieces
Large Wrench		2 pieces
Level		2 units
M16×35 Flange Bolt		12 sets
Electric Wrench with 24mm Socket		2 sets



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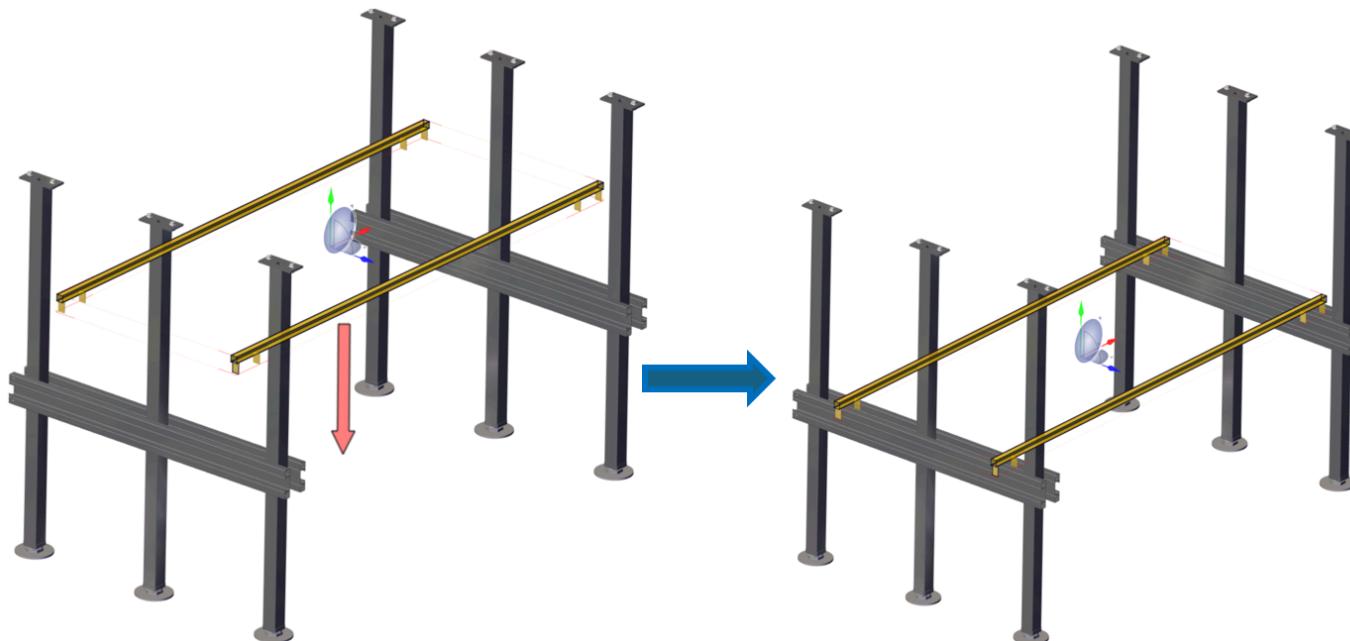
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Step Details

1. Fixed Frame Top and Side Combination

1. Stand up the two fixed frame sides, align them front and back, and fix the spacing with installation limit pieces



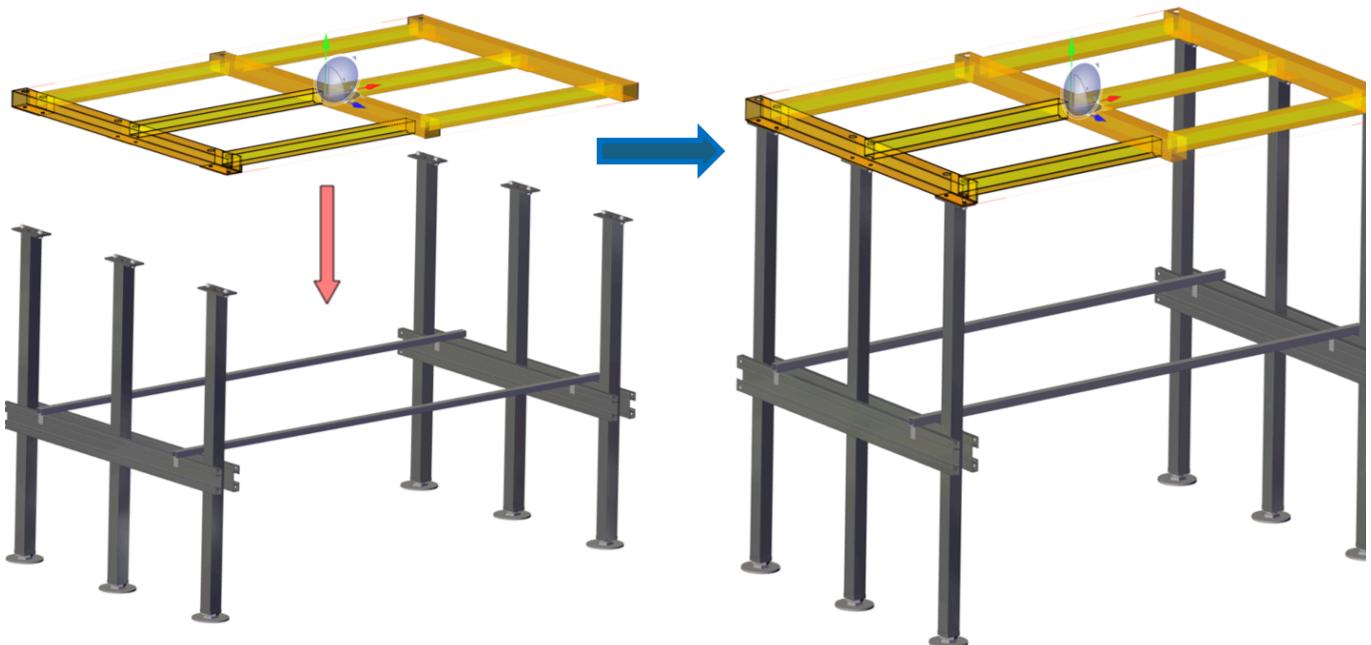
2. Use a forklift to lift the fixed frame top and align it with the installation holes of the fixed frame sides



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3. Workers stand on the ladder and insert M16X35 flange bolts through the aligned installation holes of the fixed frame top and sides, then tighten the bolts with an electric wrench (6 places on each side, 12 places total)

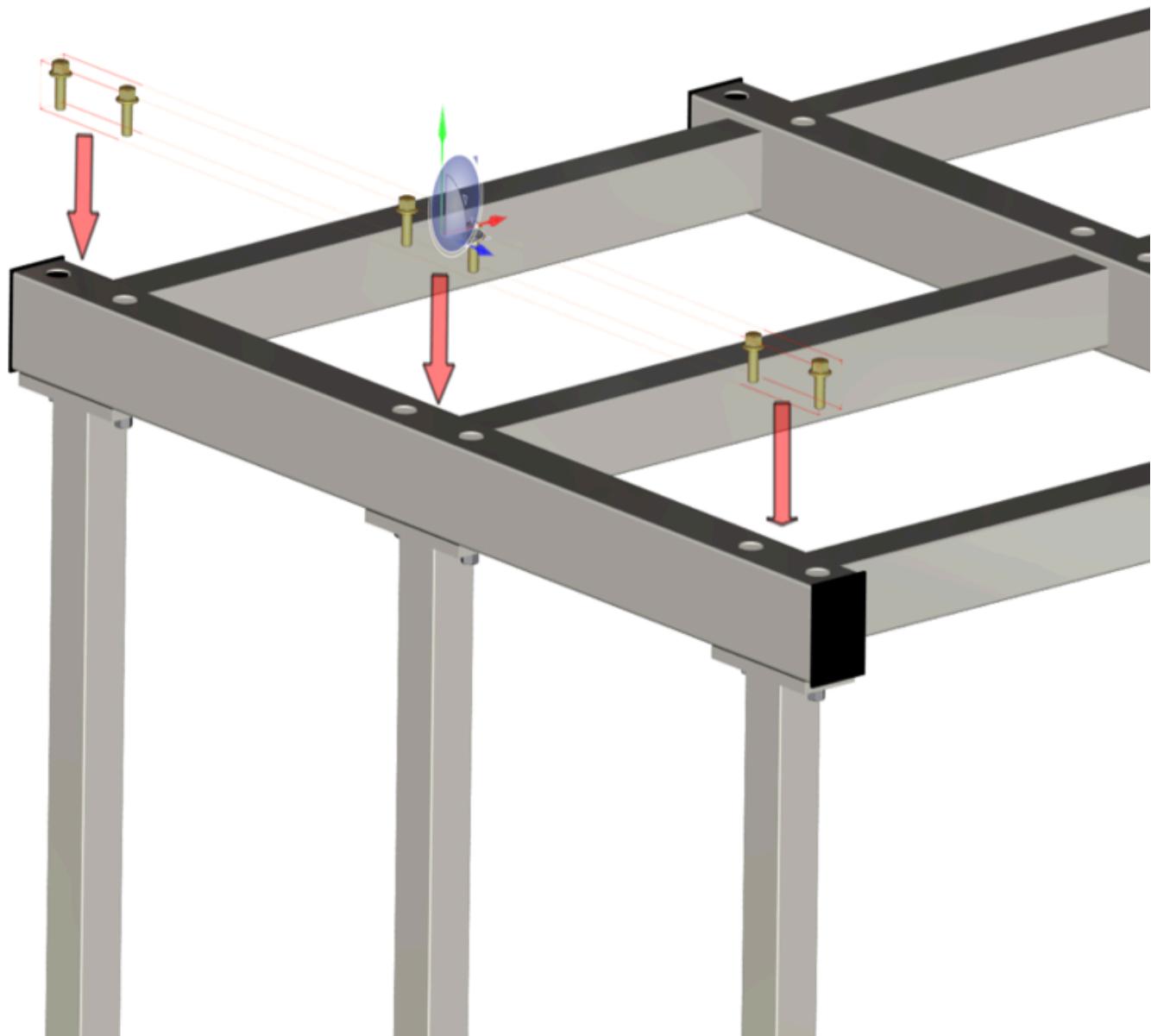
This is the long socket of the electric wrench, which replaces the electric wrench assembly.



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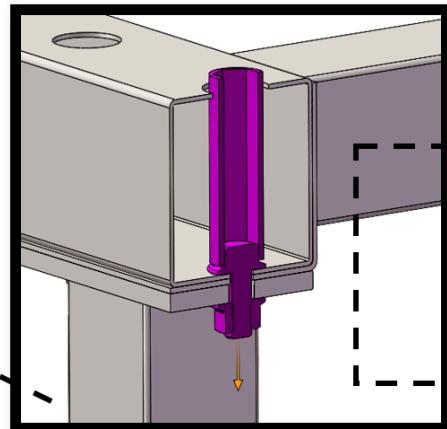
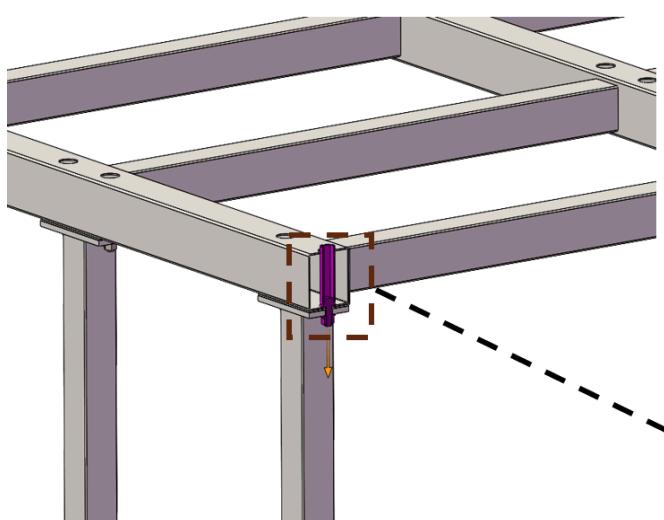
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- After fixing is complete, remove the installation limit pieces for subsequent use in combination frame limiting



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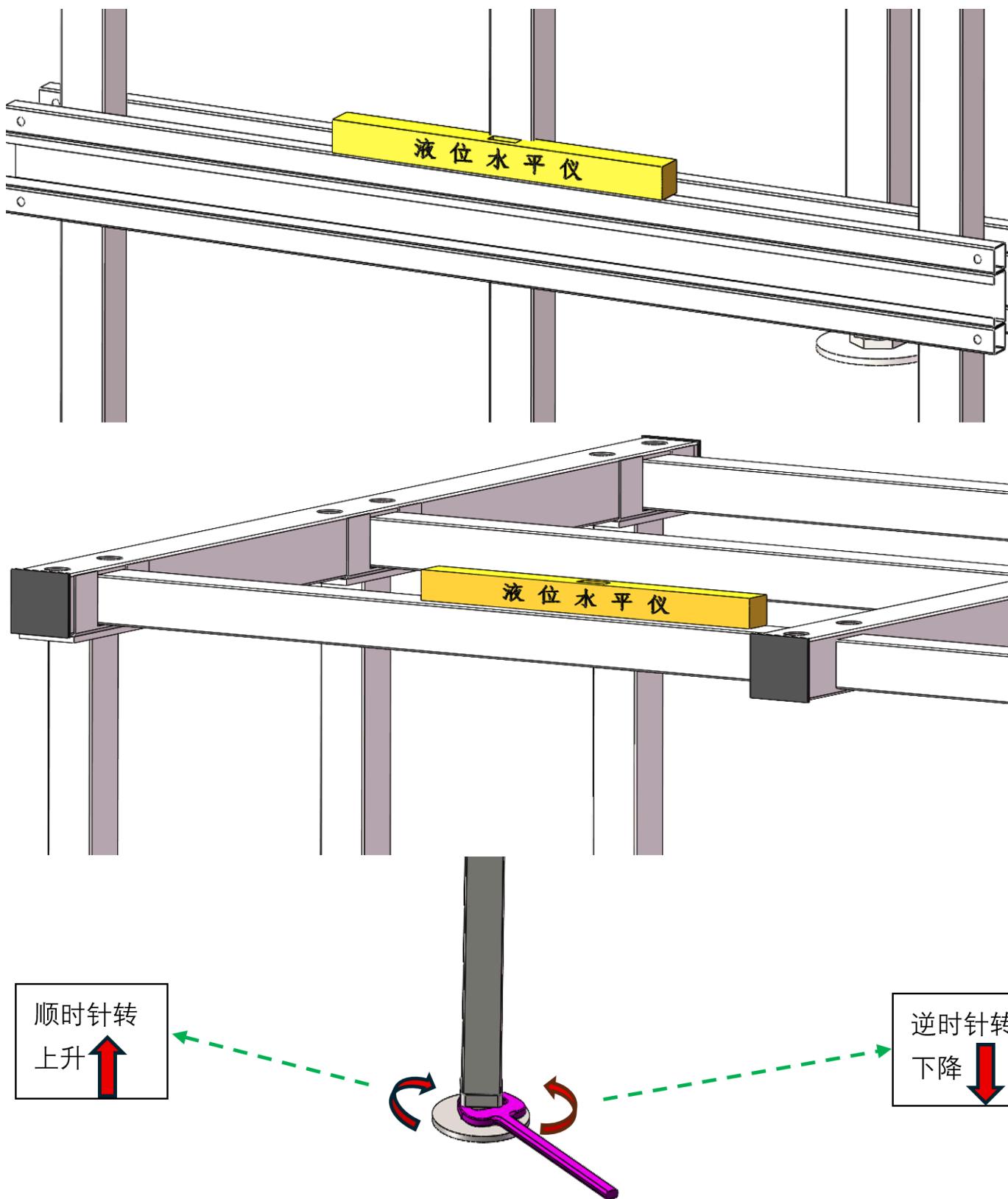
5. Place the level on the fixed frame side rail and the fixed frame top beam respectively. If ground undulation causes overall tilt greater than 1 degree, use a wrench to adjust the adjustment nut on the foot to achieve approximate overall level of the fixed frame, otherwise no adjustment is needed



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Step 2—Combined Frame Assembly



Scan QR code to watch video: Rail and Column Installation



Scan QR code to watch video: Column Adjustment Tube Height Preset (100mm)

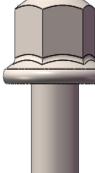


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Required Materials List for Assembly

Name	Image	Quantity
Short Column Weldment		20 pieces
Combined Frame Weldment		10 pieces
M16×35 Flange Bolt		40 sets
Electric Wrench with 24mm Socket		2 sets

Step Details

1. Combined Frame and Short Column Combination

1. First align and lay flat the two short column weldments, then place the combined frame on top the short column weldments and adjust until the installation holes are aligned

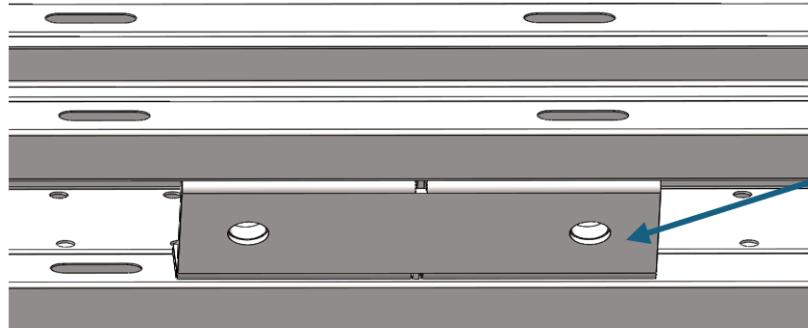


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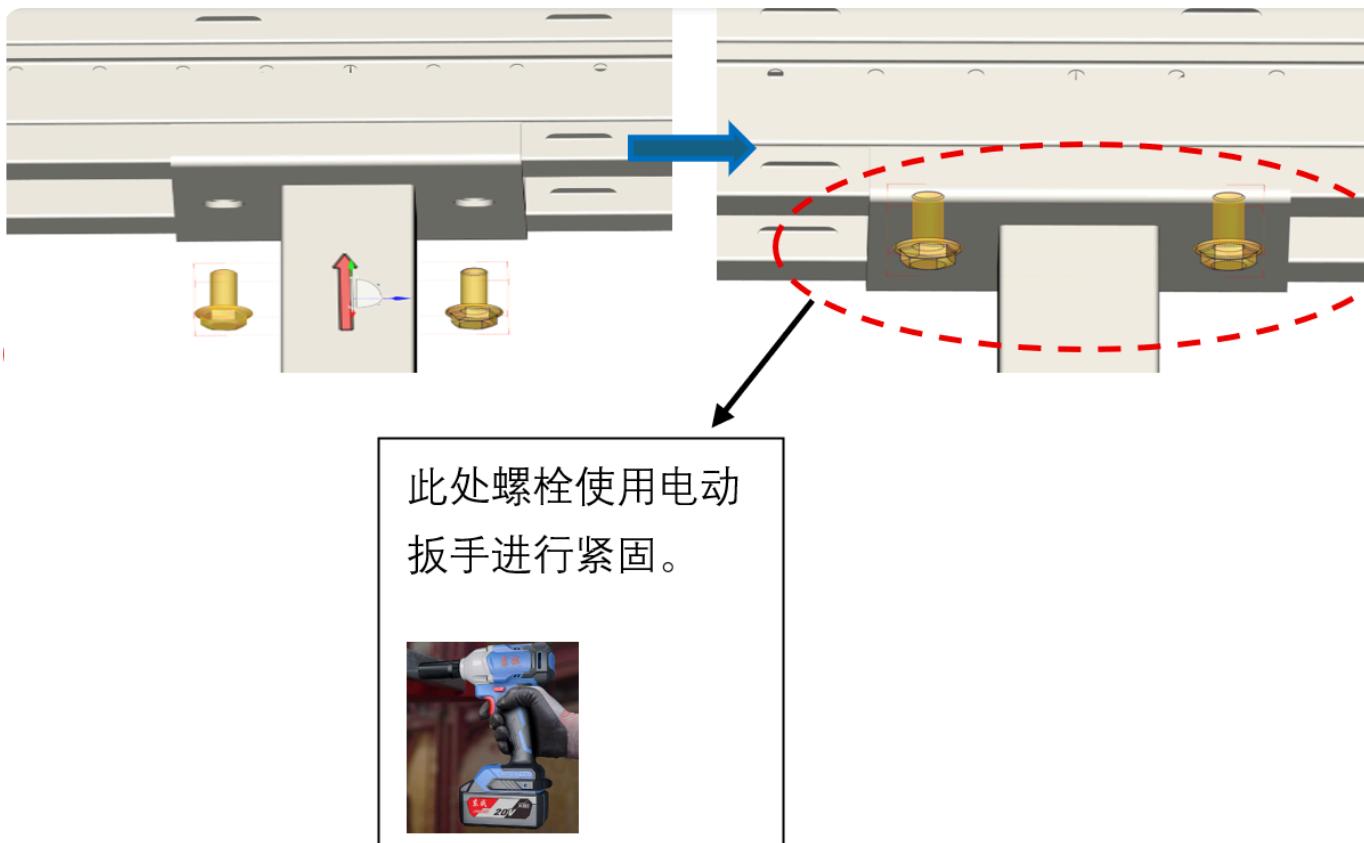
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Note: The rail installation plane faces down and aligns with the holes on the short column installation plane.



2. Use M16X35 flange bolts to pass through and tighten with an electric wrench (4 places total)



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Step 3—Assemble Fixed Frame and Combined Frame



Required Materials List for Assembly

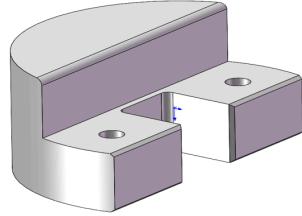
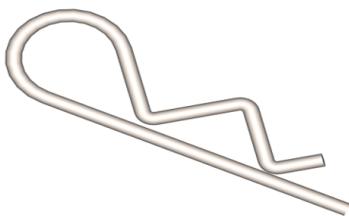
Name	Image	Quantity
Fixed Frame		1 piece
Combined Frame		10 pieces



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Installation Limit Piece		2 pieces
Rail Connector		40 pieces
Concrete Block or Other Heavy Object Substitute (Sandbag)		40 blocks
12X60 Pin		80 pieces
Type B Cotter Pin		80 pieces

Step Details

1. Fixed Frame and Combined Frame Connection



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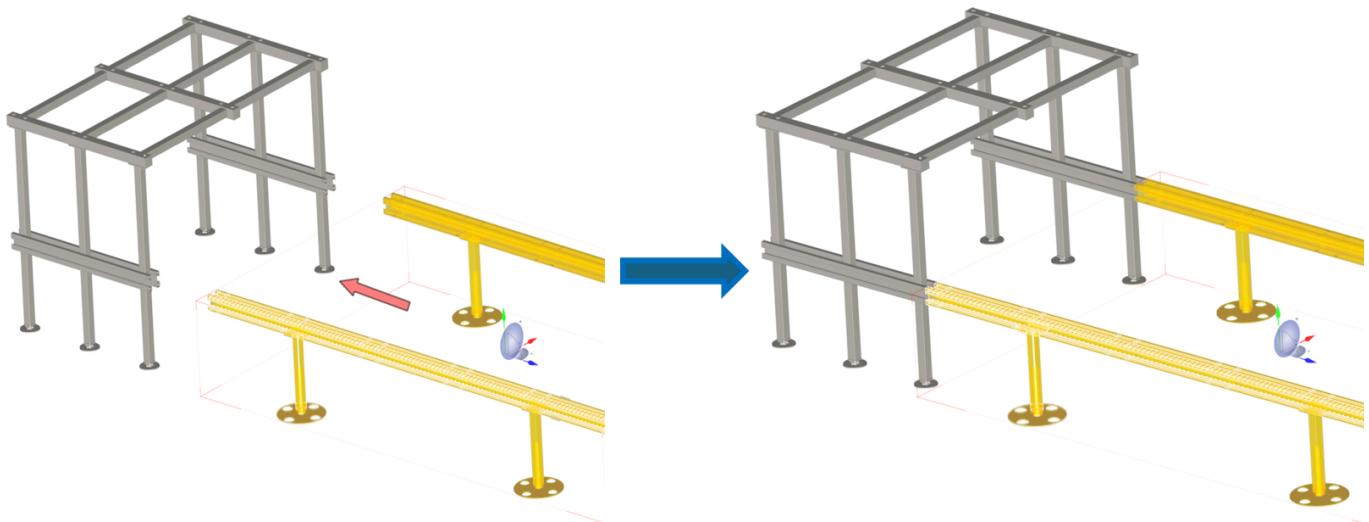
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Scan QR code to watch video: 组合框架（导轨）下固定框架

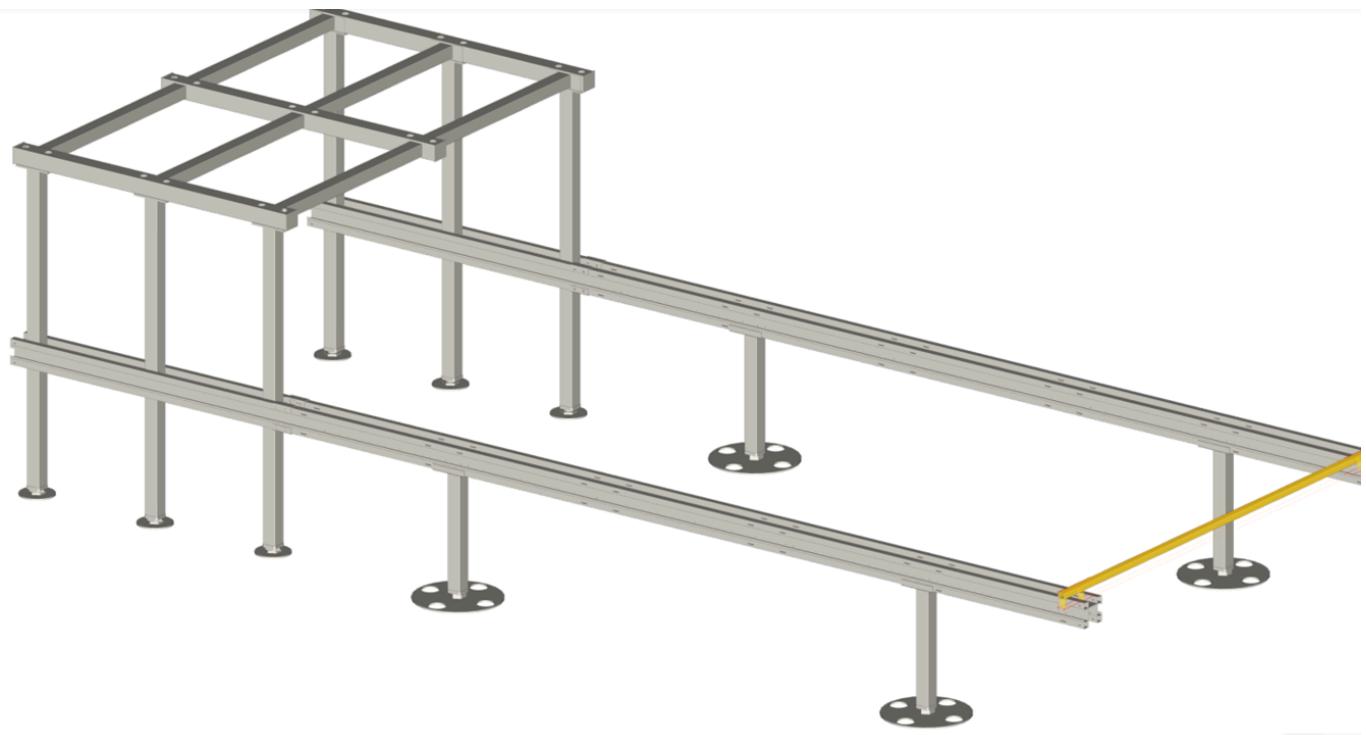
1. Align and place the fixed frame rail and combined frame rail, use installation limit pieces at the end of the combined frame to limit on the rail



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2. If the ground is uneven, use a wrench to adjust the adjustment nut on the foot to make the combined frame rail level with the fixed frame rail

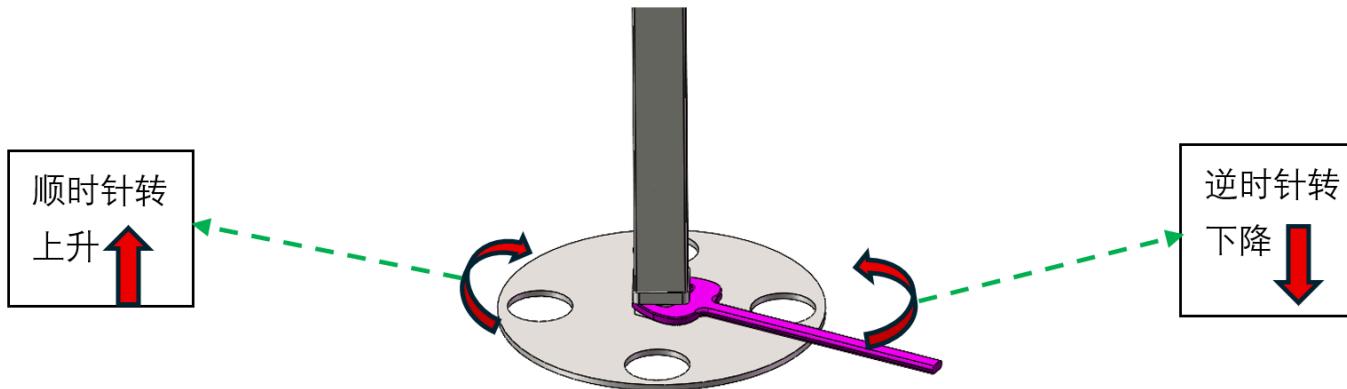


Scan QR code to watch video: Fixed Frame Adjustment Tube Preset

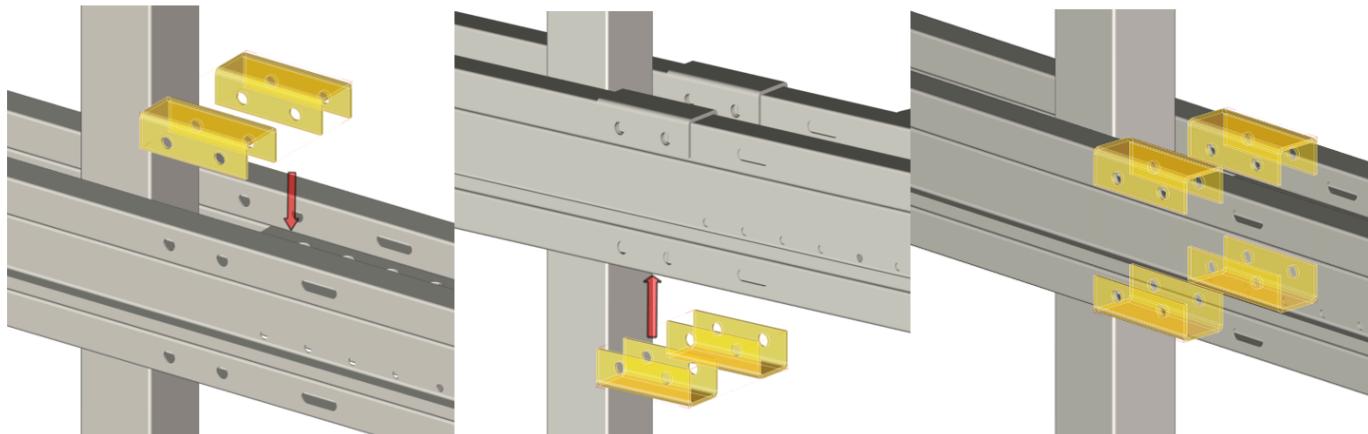


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3. Use 4 rail connectors to connect the fixed frame rail and combined frame rail



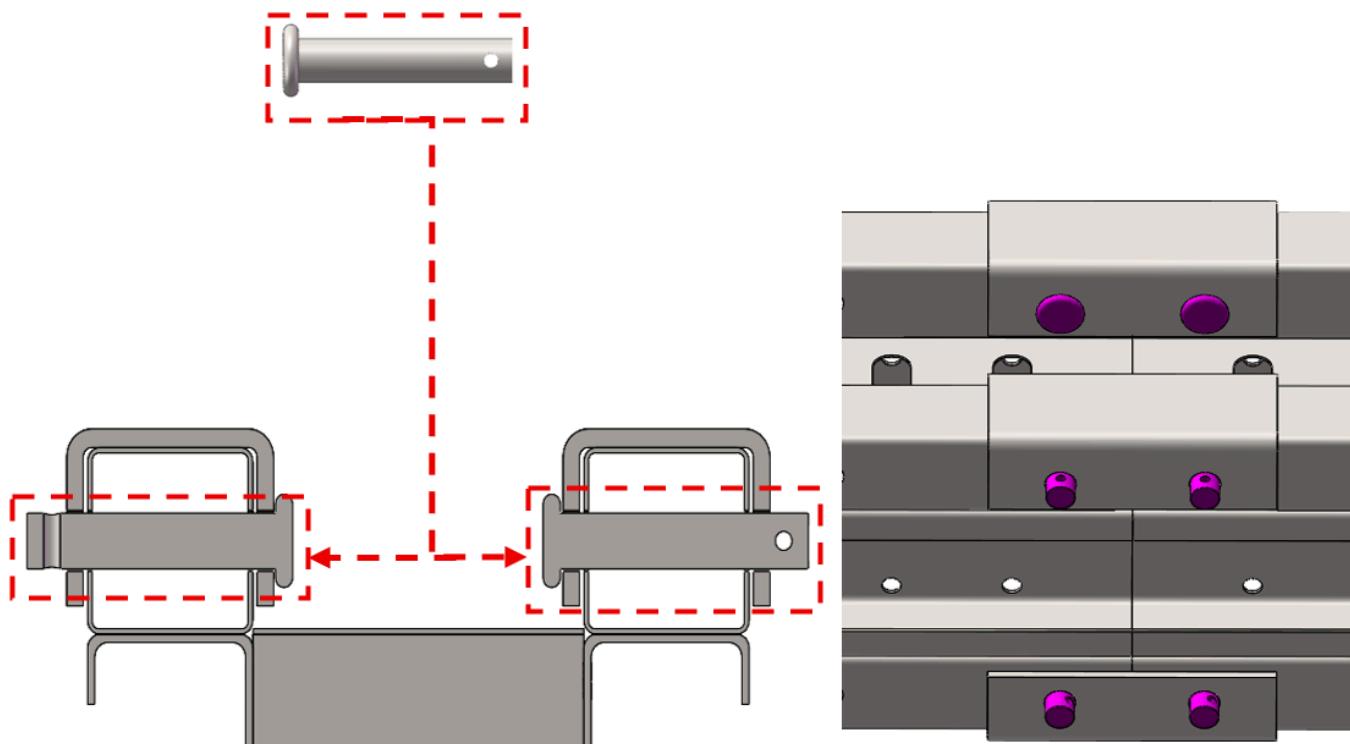
4. Insert 12X60 pins into the rail connector holes and connect with the rail



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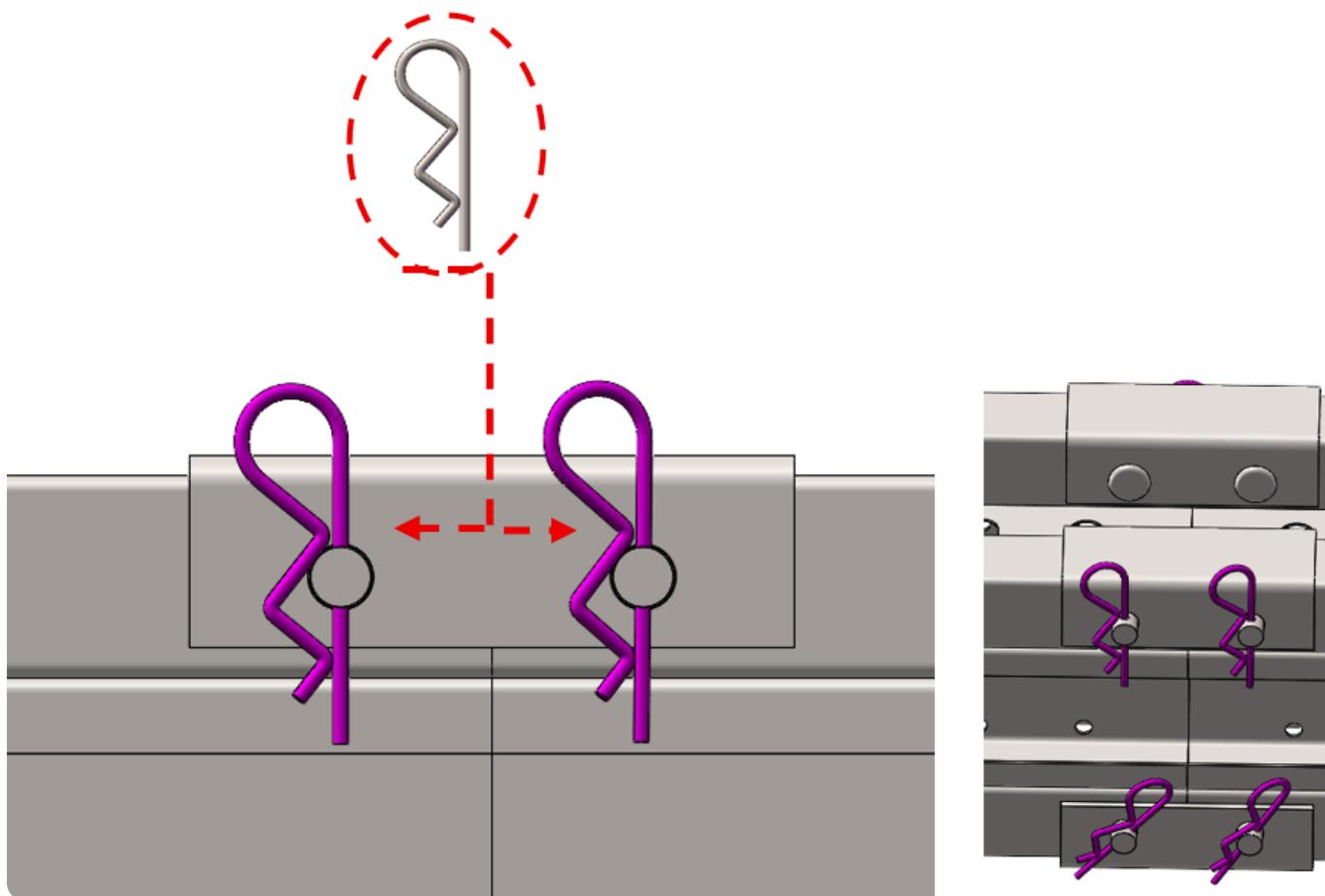
5. Lock with Type B cotter pins



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2. Combined Frame and Combined Frame Connection (Two columns total, five per column) with Level and Wire Harness Assistance



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Scan QR code to watch video: Second Column Rail 2



Scan QR code to watch video: Single Column Rail Effect

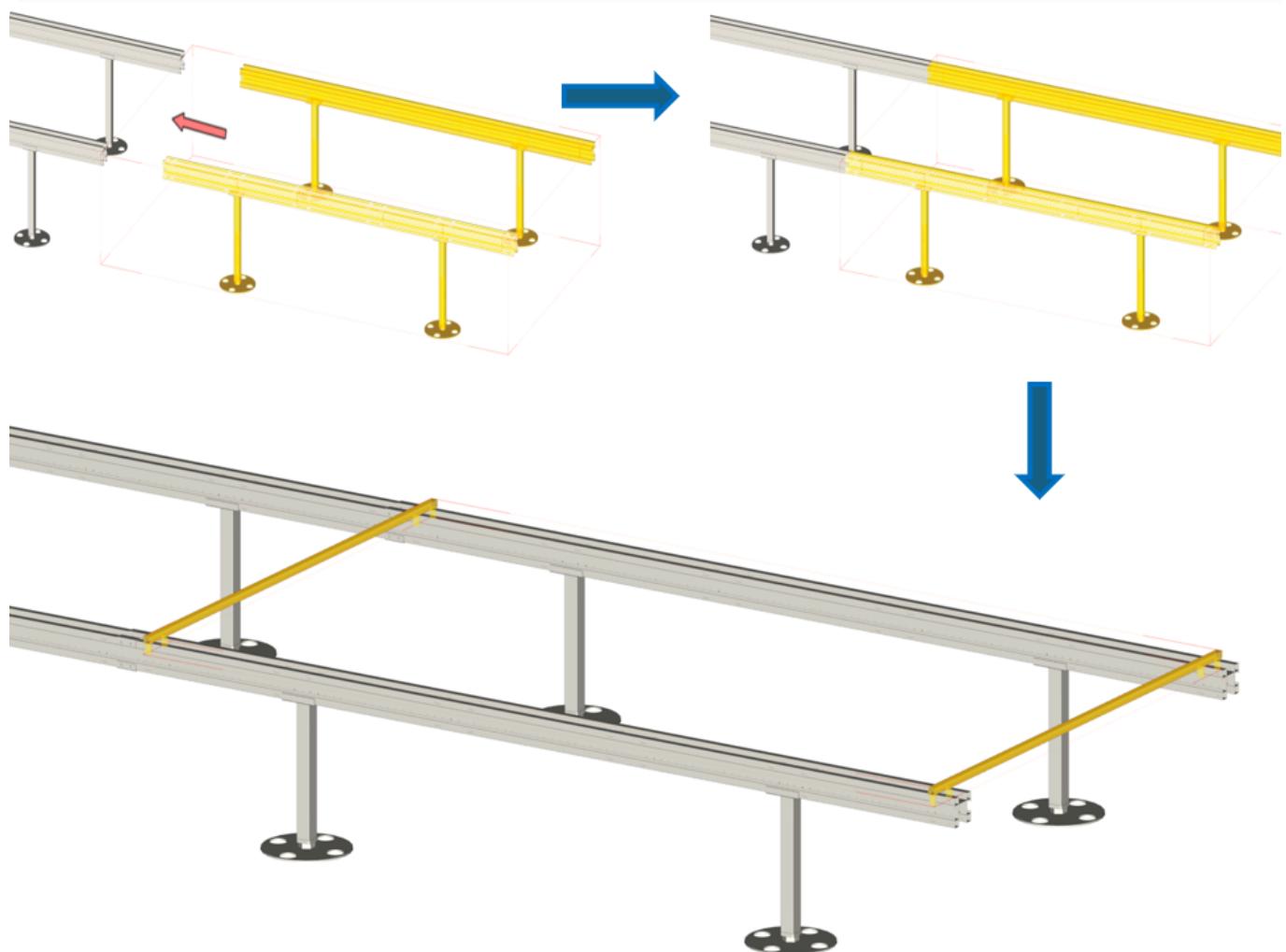
1. Align and place the combined frame rails, use installation limit pieces at both ends for limiting



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2. Adjust the foot nut to make the combined frame rail level with the combined frame rail



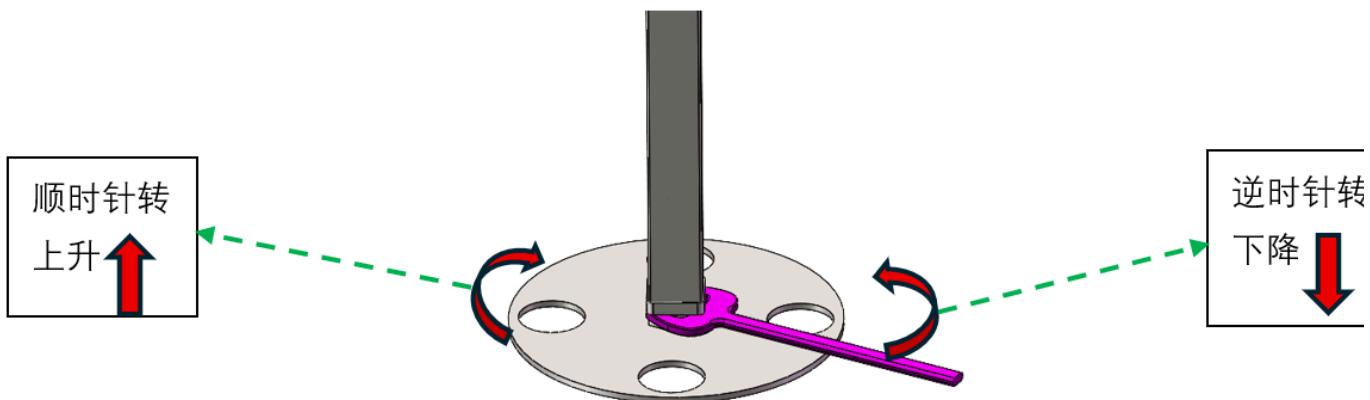
Scan QR code to watch video: Rail Height Difference Adjustment Method



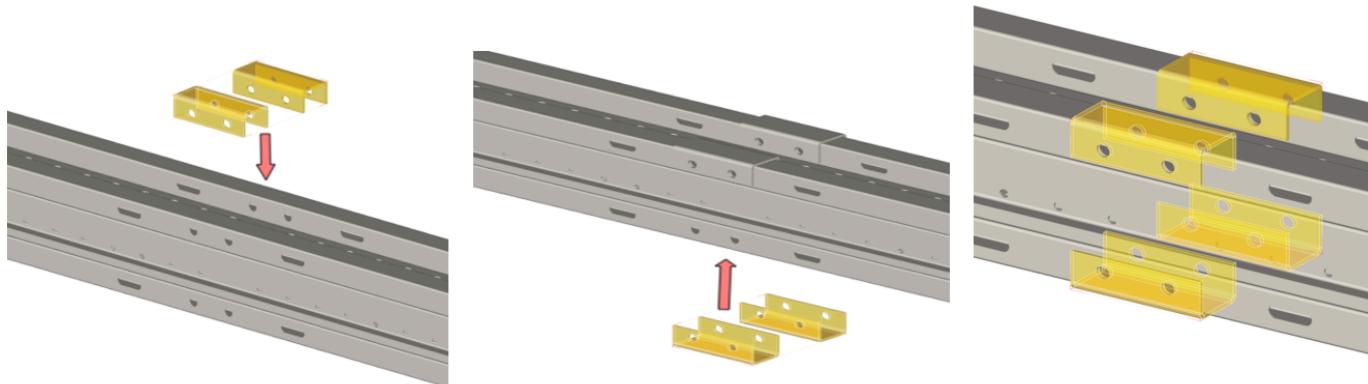
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3. Use 4 rail connectors to connect the two combined frame rails



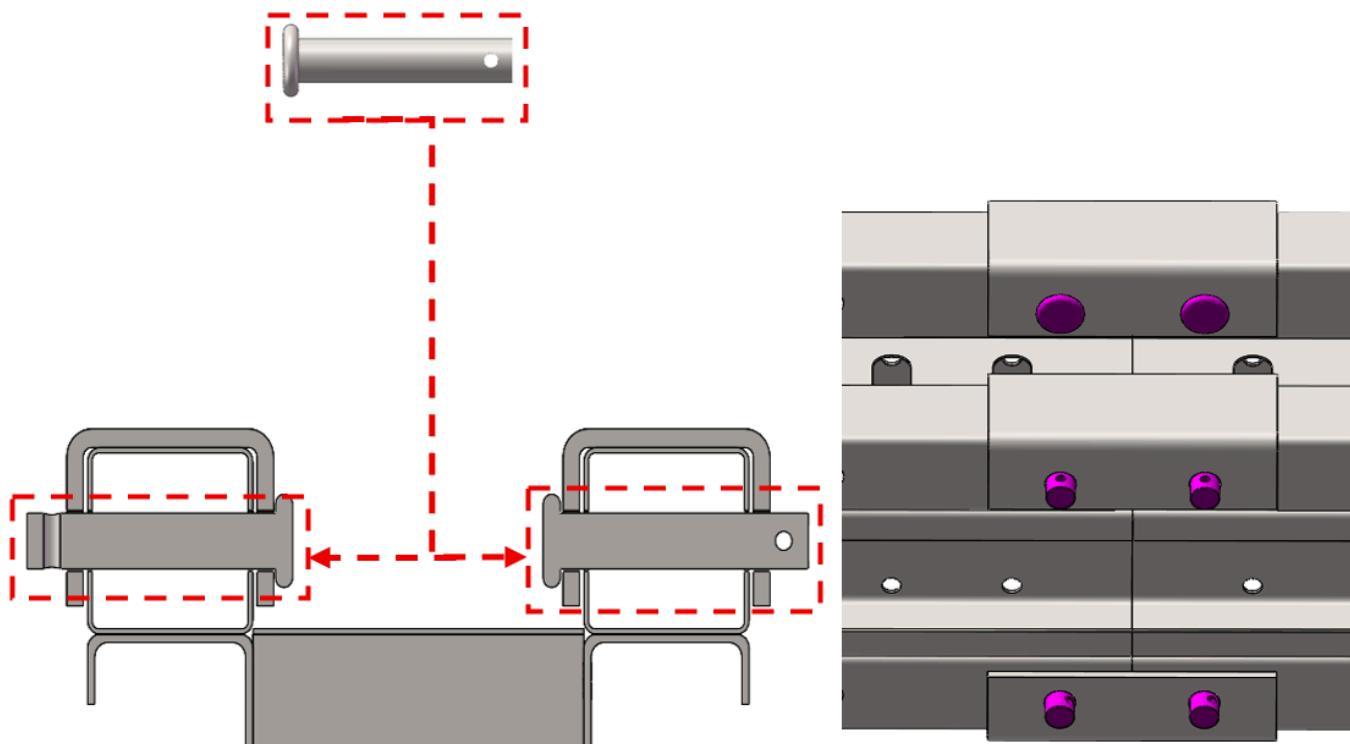
4. Insert 12X60 pins into the rail connector holes and connect with the rail



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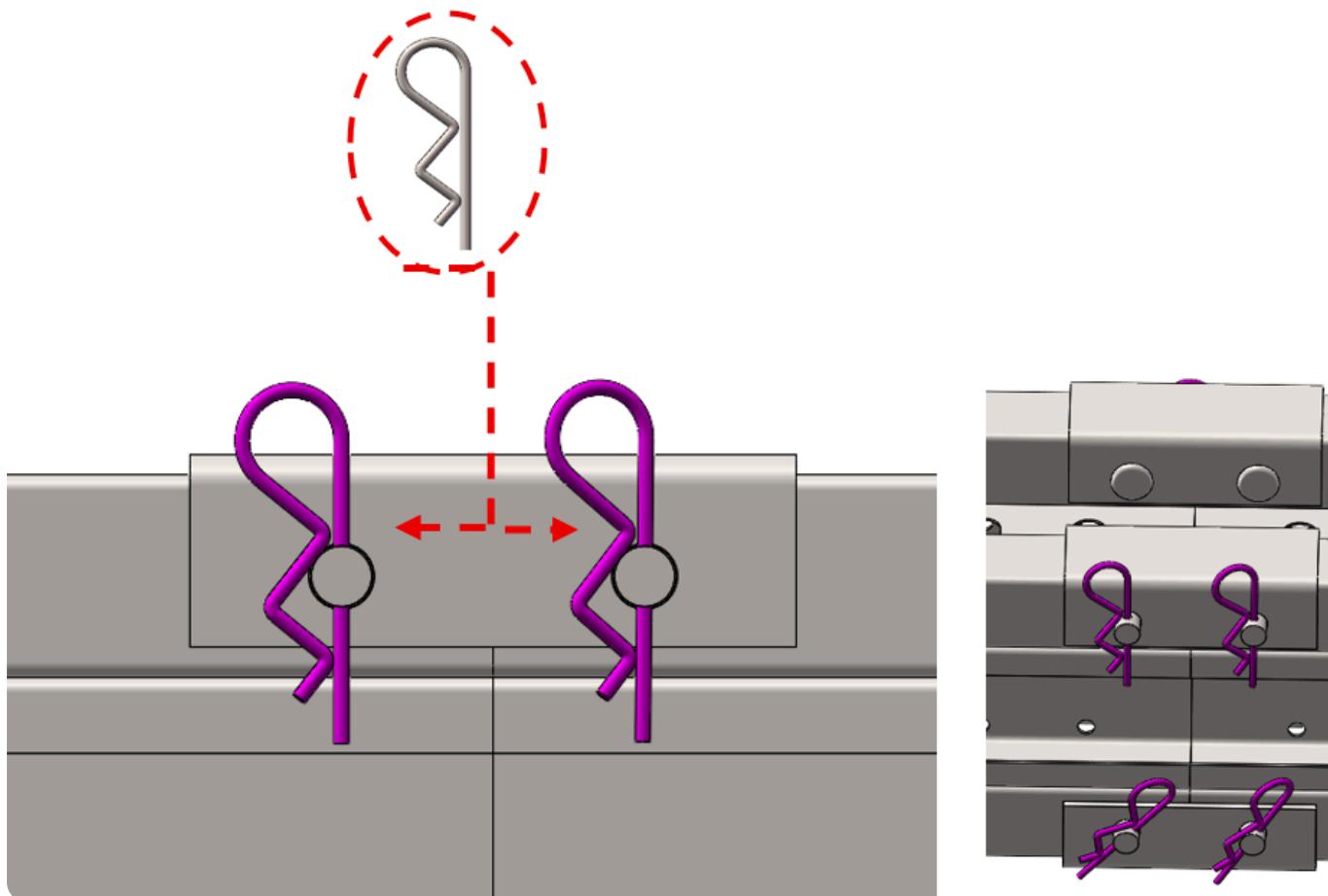
5. Lock with Type B cotter pins



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3. Fix Combined Frame Foot Plate (Two columns total, ten per column)

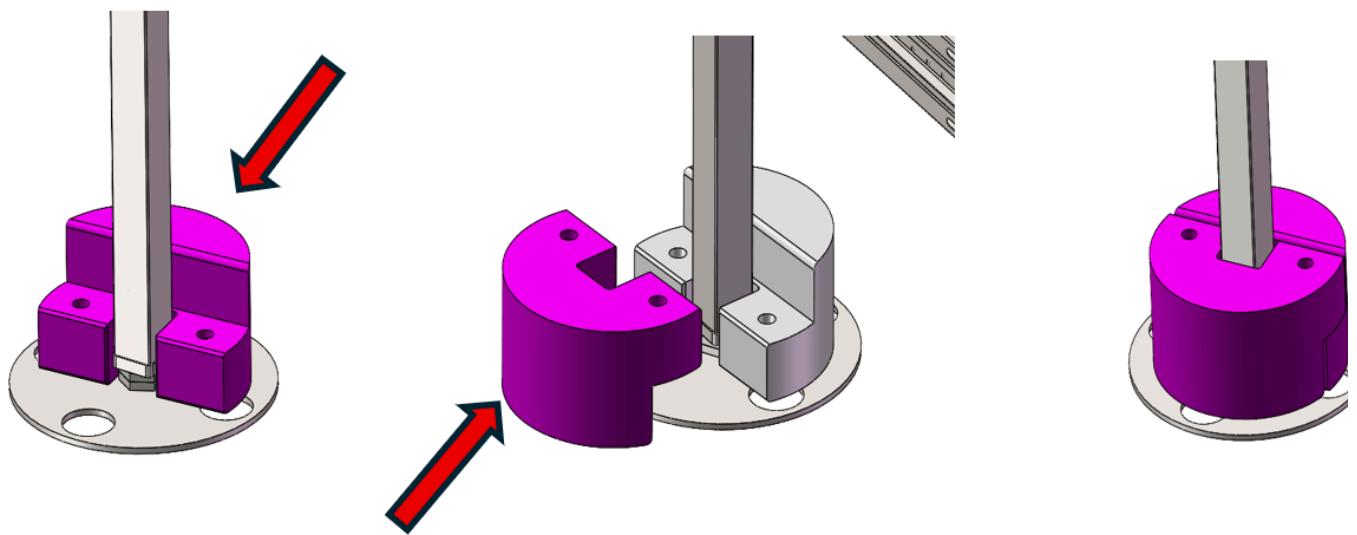
Note: If concrete blocks are not available, sandbags or other heavy objects can be used substitutes.

1. Use concrete blocks to press down on the combined frame foot plate

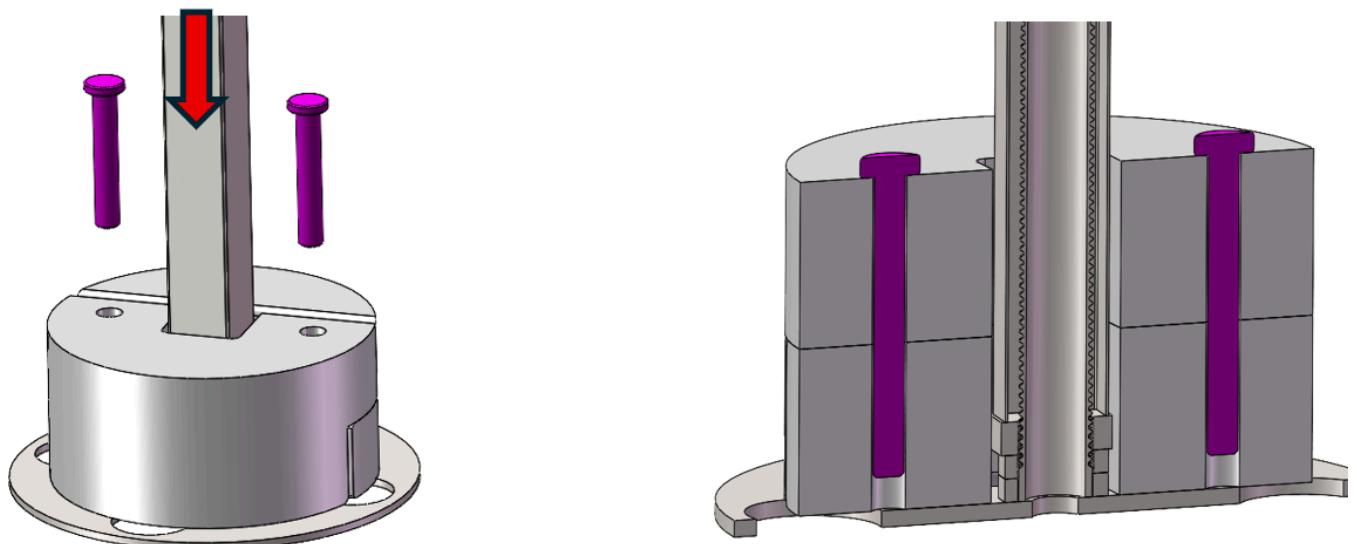


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2. Insert 30X180 pins to fix the two concrete blocks



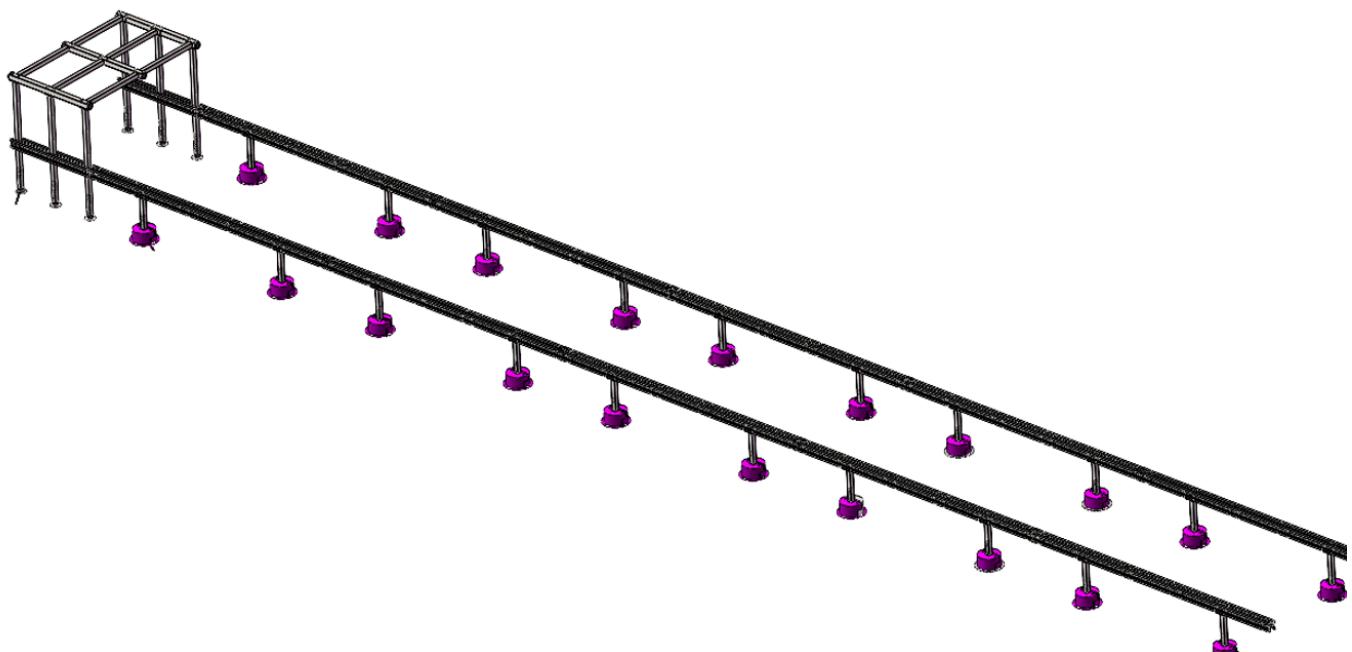
3. Foot plate fixing effect diagram



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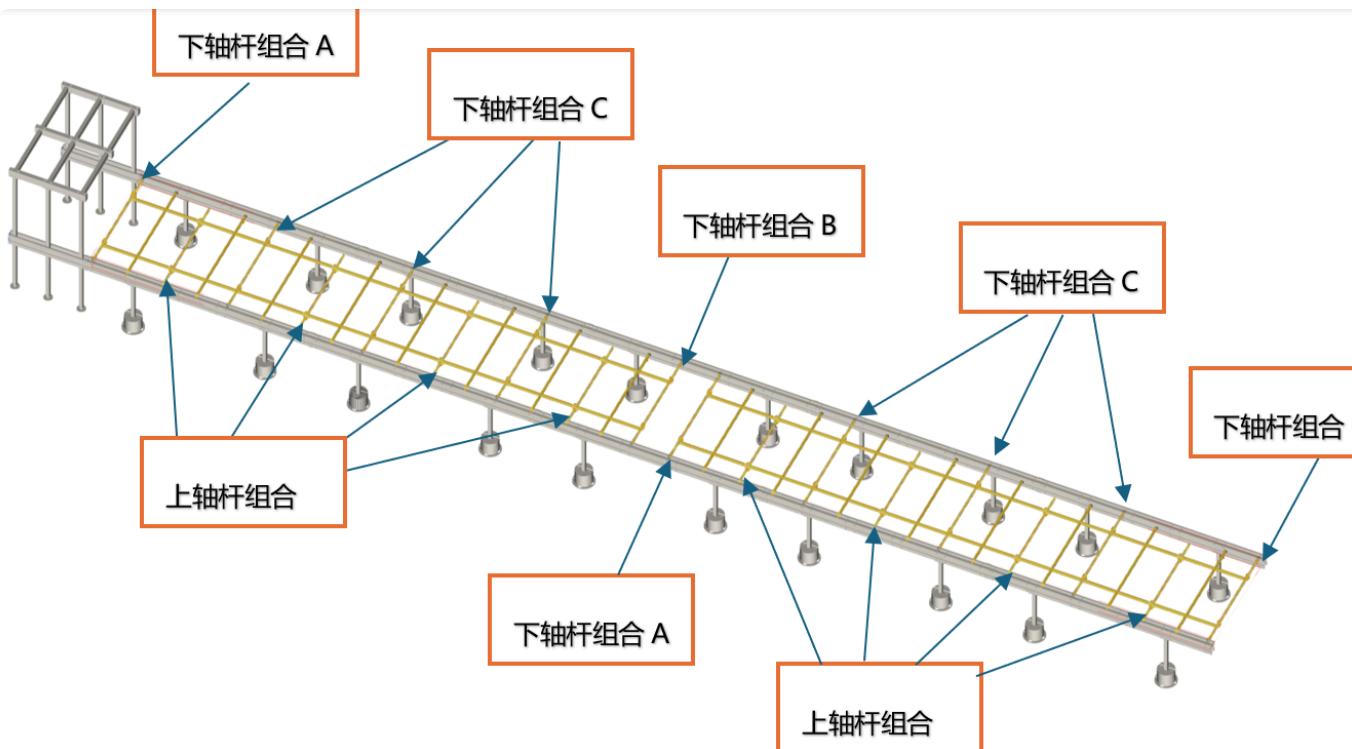


Step 4—Connect Various Shaft Rod Combinations to Component Beam Frame



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Required List for Assembly

Name	Image	Quantity
Component Beam Frame		16 pieces
Lower Shaft Rod Combination A		2 pieces



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Lower Shaft Rod Combination B		2 pieces
Lower Shaft Rod Combination C		6 pieces
Upper Shaft Rod Combination		8 pieces
Clamp Piece		20 pieces
Node Reinforcement Piece		64 pieces
10X60 Steel Ball Pin		20 pieces



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10X60 Pin		20 pieces
M10X25 Hex Flange Bolt		144 pieces
Type B Cotter Pin		20 pieces
Thread Lock		2 bottles
Hex Wrench		2 sets

Step Details

1. Install Component Beam Frame



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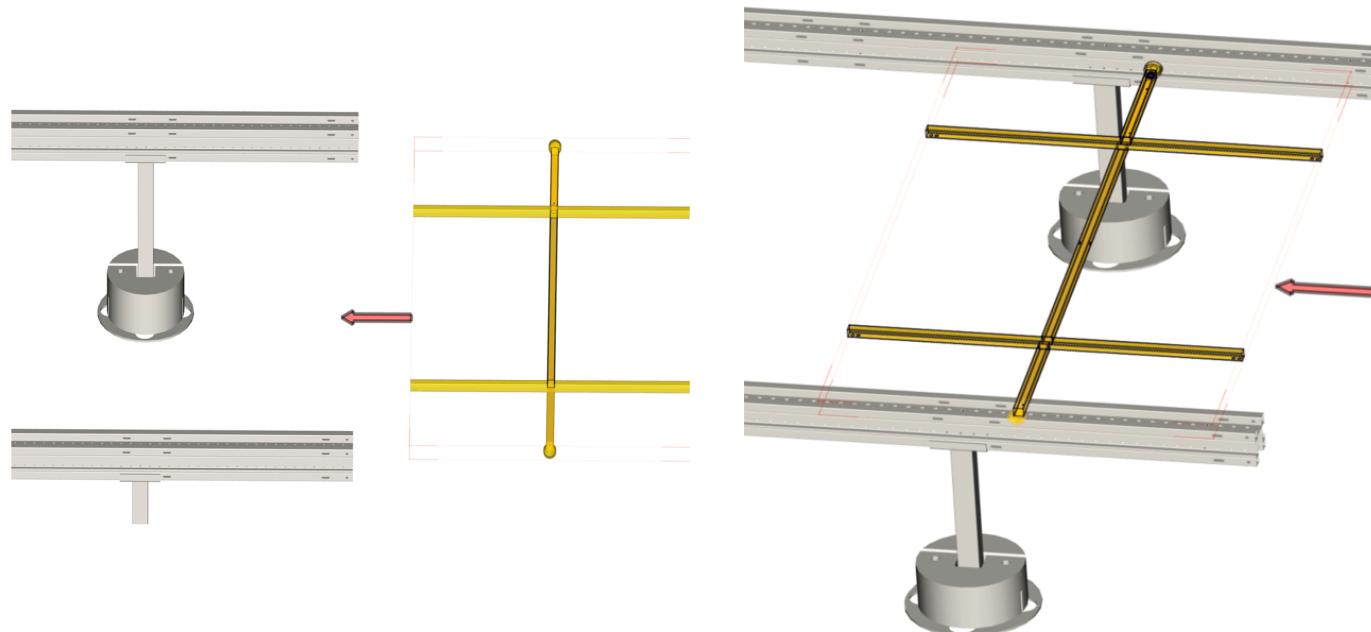
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Scan QR code to watch video: Component Beam Frame Installation

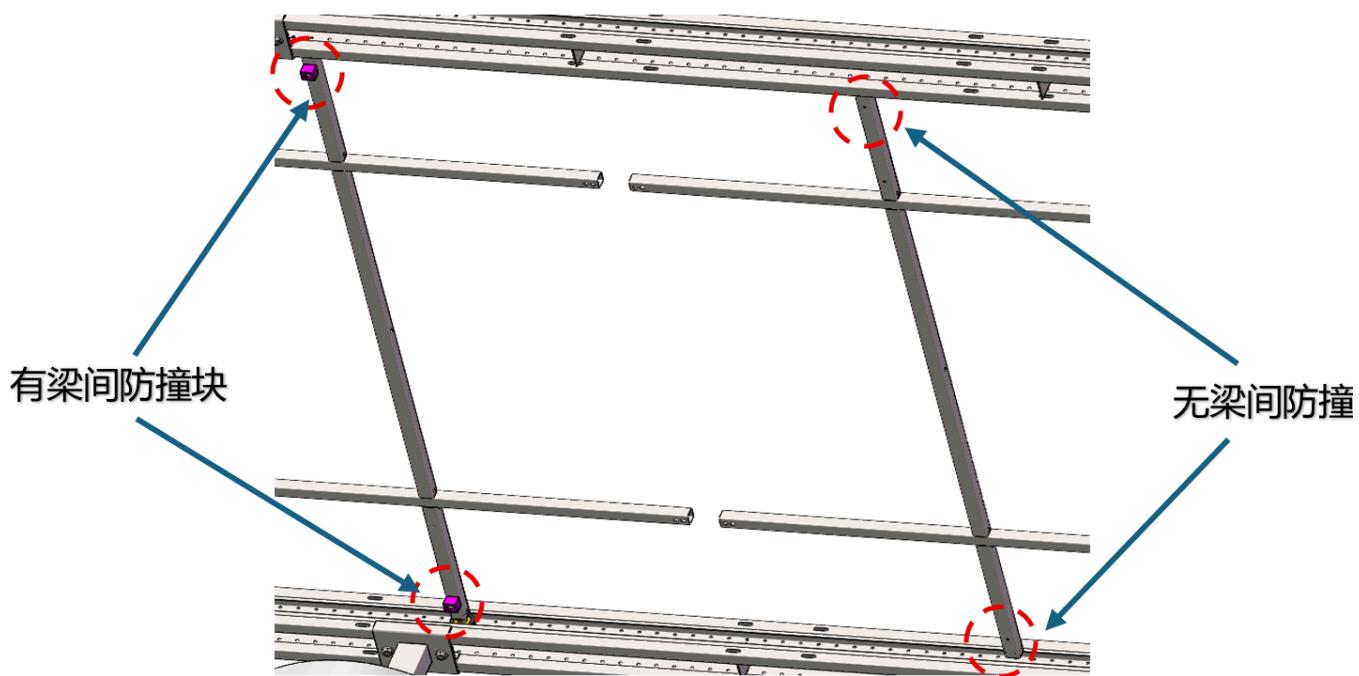
1. Slide 16 component beam frames into the combined frame rail groove through rollers, 8 per group, 2 groups total

Note: The 16 beam frame components are arranged alternately with "with anti-collision block" and "without anti-collision block".

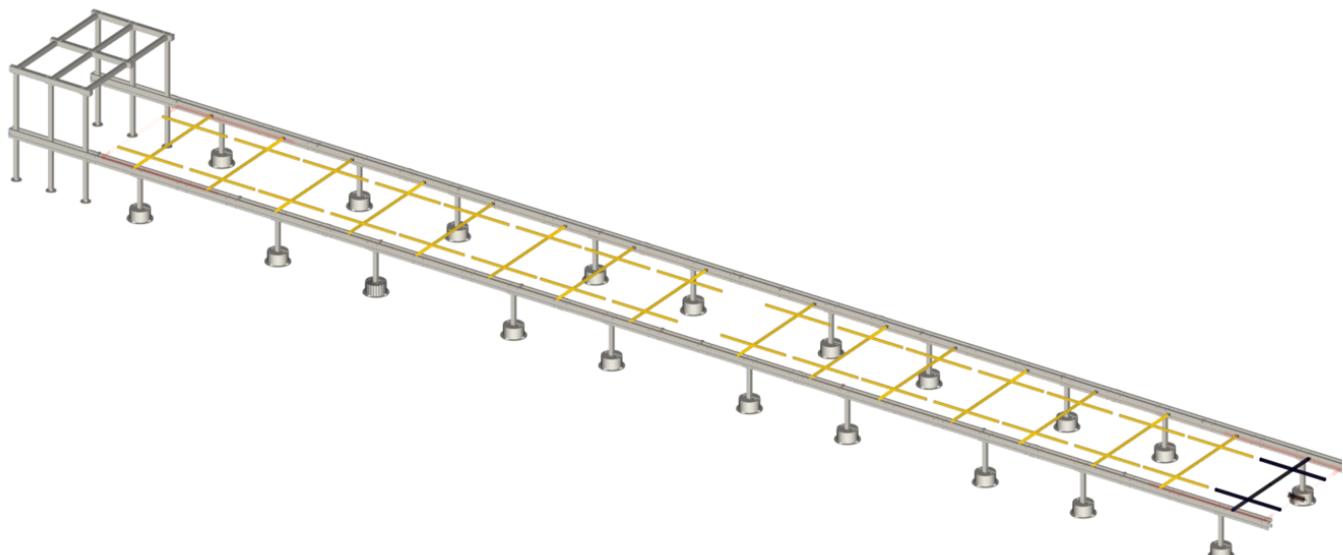


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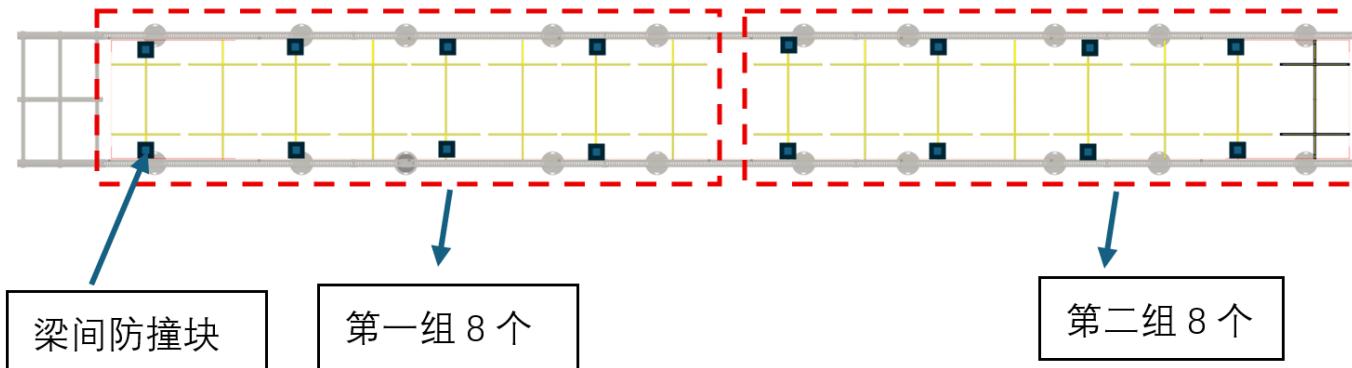
2. Component beam frame two groups effect diagram



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Scan QR code to watch video: Rod Installation Preparation

2. Connect Lower Shaft Rod Combination A (First installation of each group)



Scan QR code to watch video: Lower Rod A Installation

1. Install clamp pieces on both ends of lower shaft rod combination A (pay attention to the installation direction of the clamp piece sleeve, install according to the diagram, both ends need to be installed)

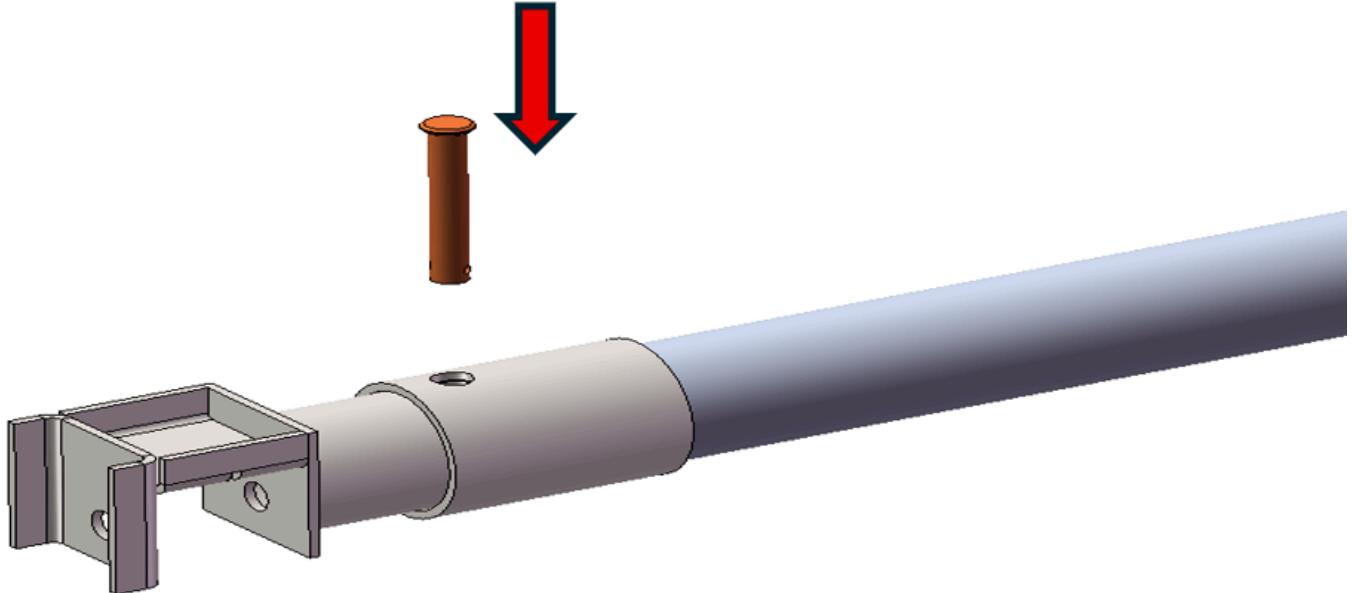


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2. Use 10X60 pins to connect the clamp piece and lower shaft rod combination A



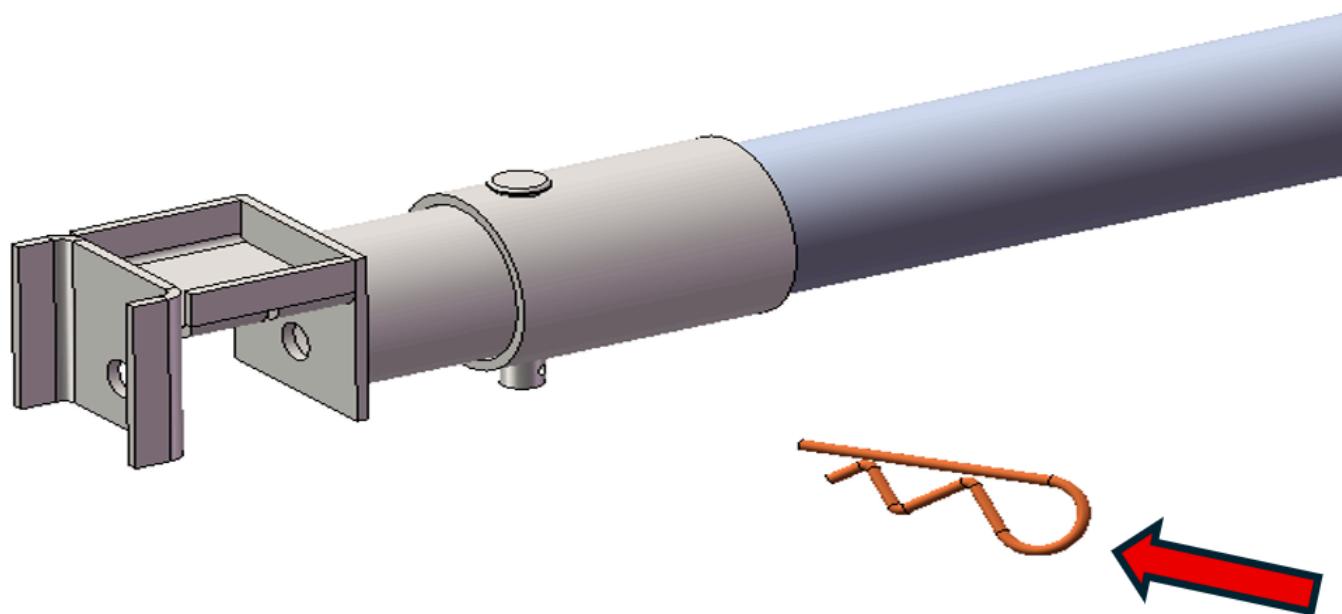
3. Finally use Type B cotter pins to fix



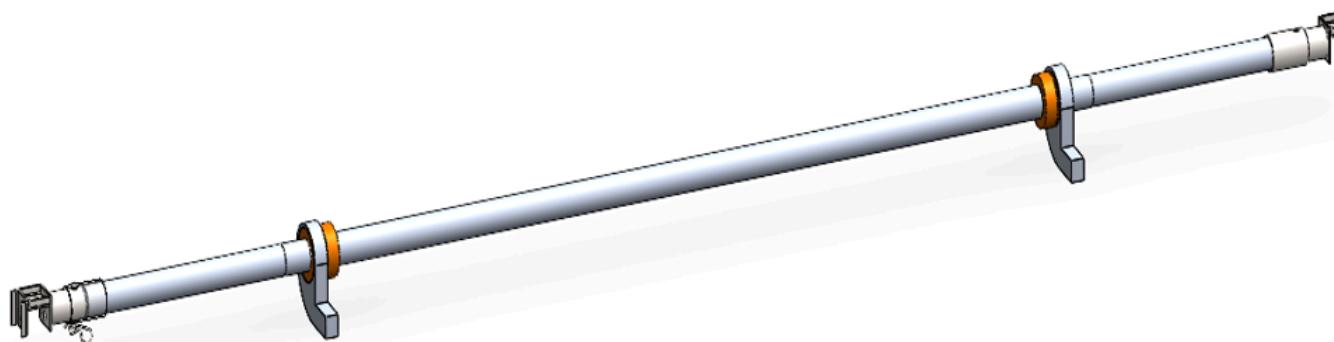
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4. Lower shaft rod combination A combined clamp piece effect diagram

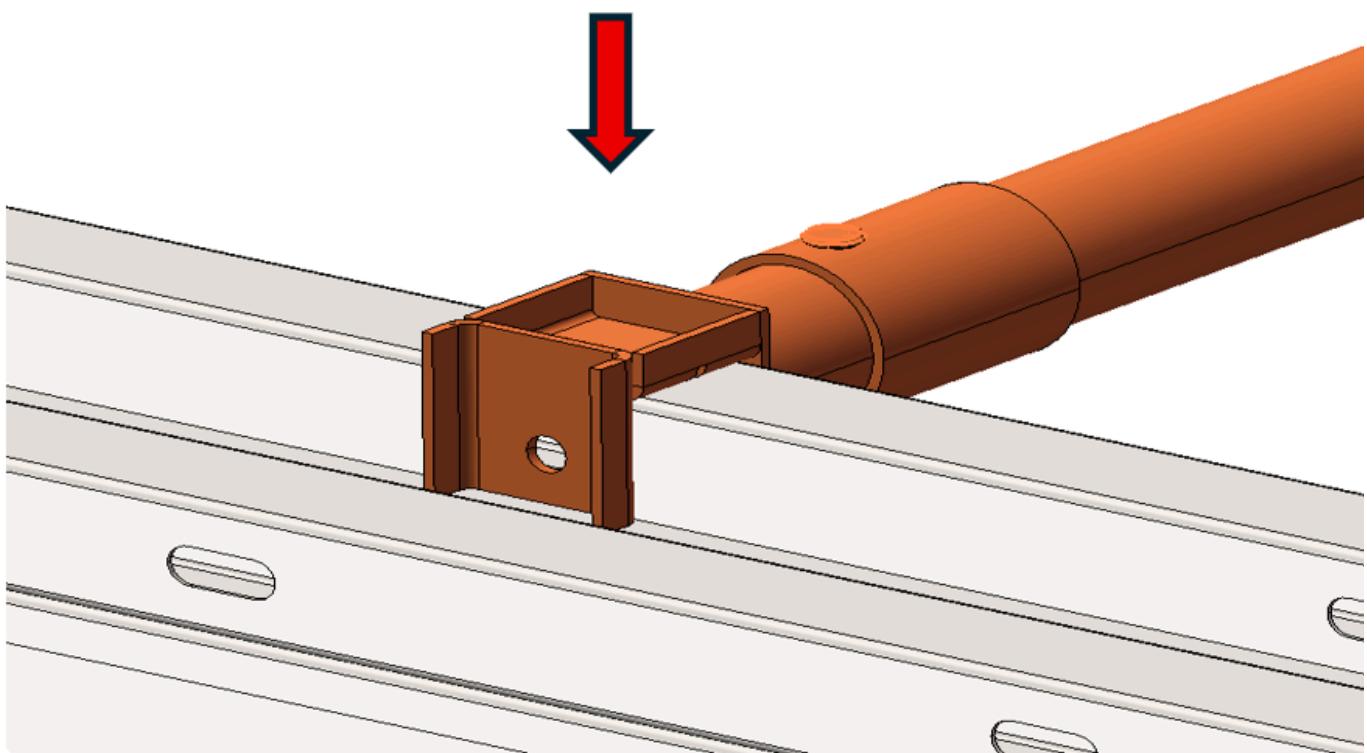


5. Clamp the clamp pieces on both sides of lower shaft rod combination A on the combined fram rail, aligning with the first hole position on the rail

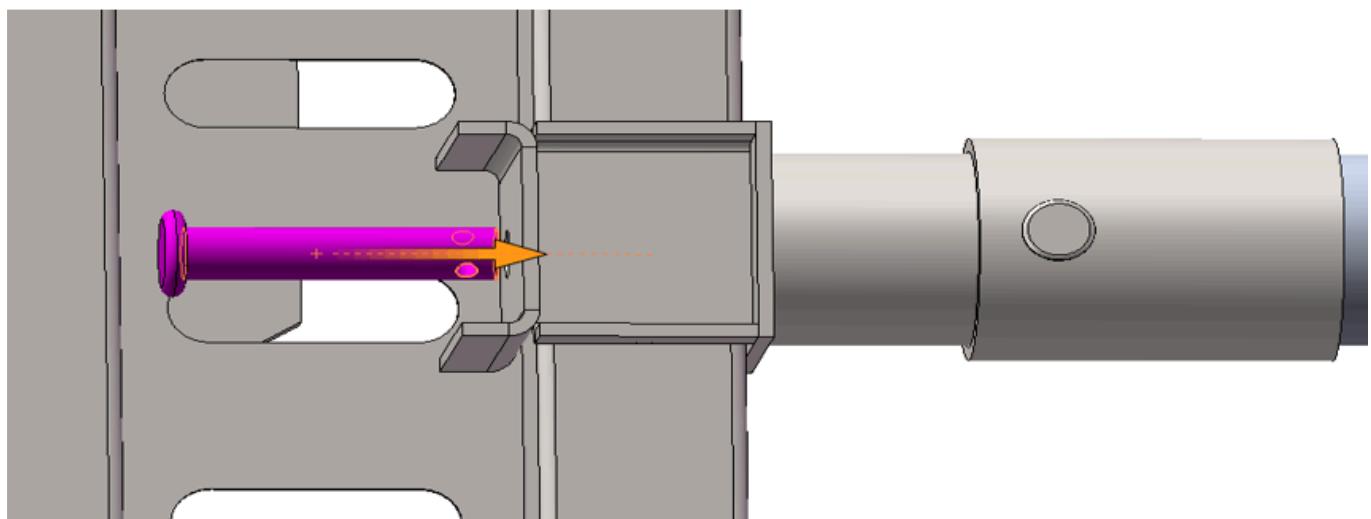


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6. Then use steel ball pins to fix the clamp pieces

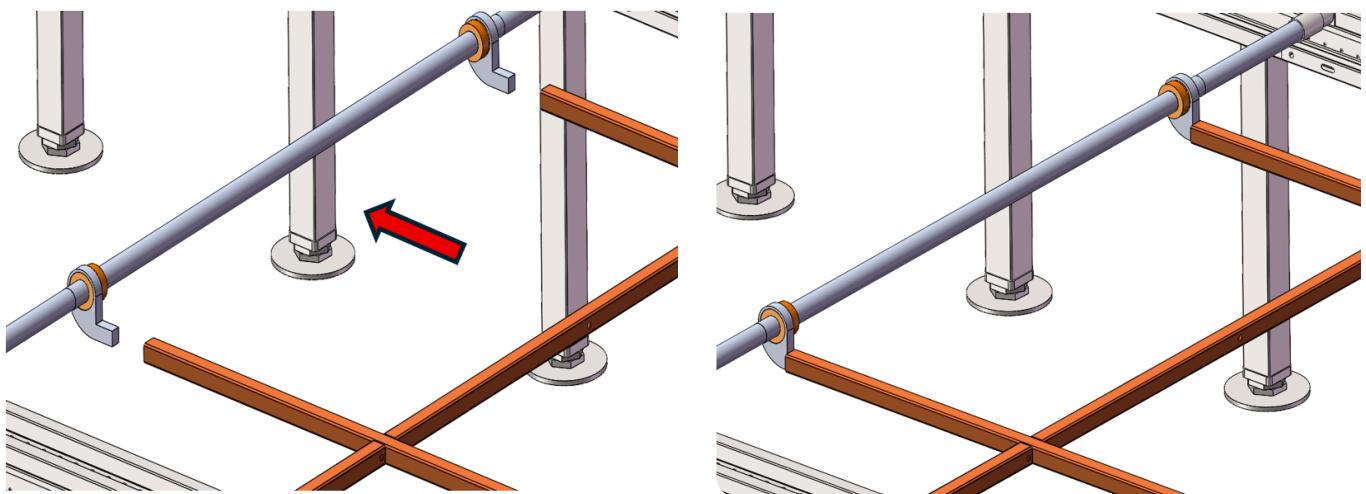


7. Align and insert the installation hole position of the component beam frame with the installation head of lower shaft rod combination A

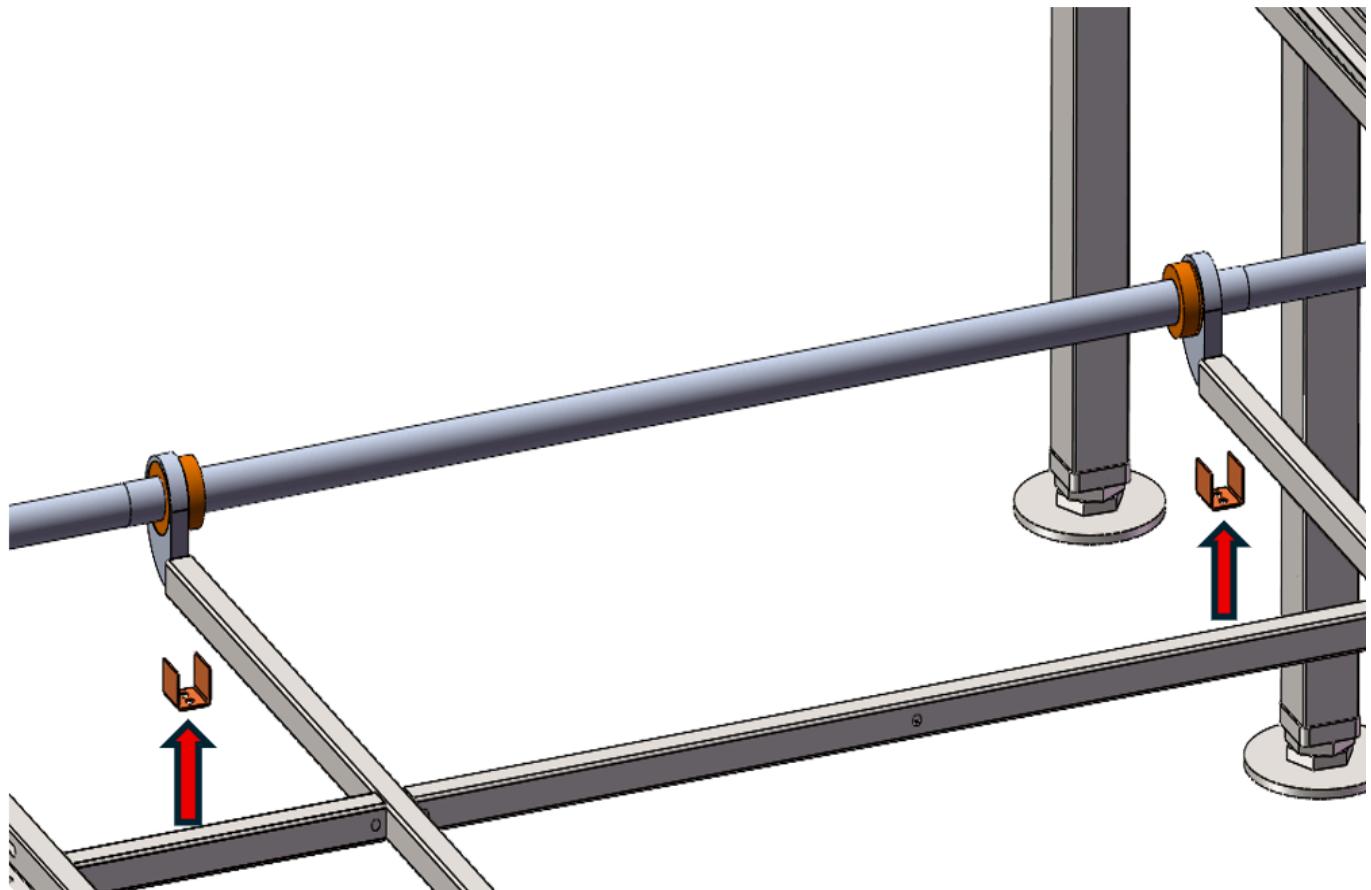


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8. Place node reinforcement pieces from below



9. Apply thread lock to M10X25 hex bolts and then tighten them

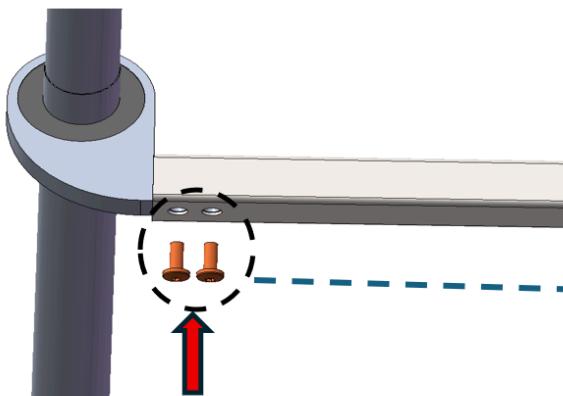


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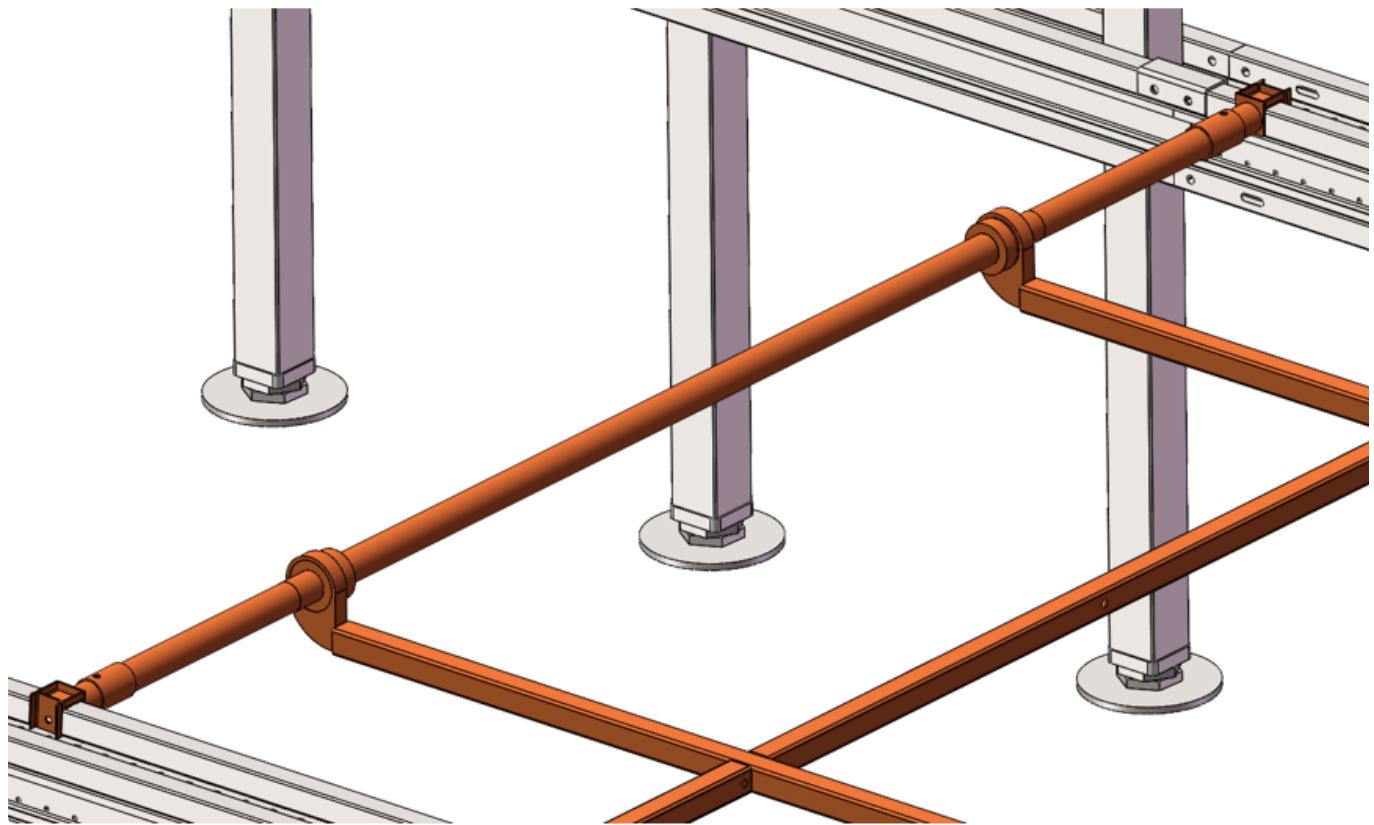
After applying the lock, use a hex wrench to tighten.



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10. Lower shaft rod combination A and component beam frame assembly effect diagram



3. Connect Upper Shaft Rod Combination (Alternate installation with lower shaft rod combination C, 4 upper shaft rod combinations per group)



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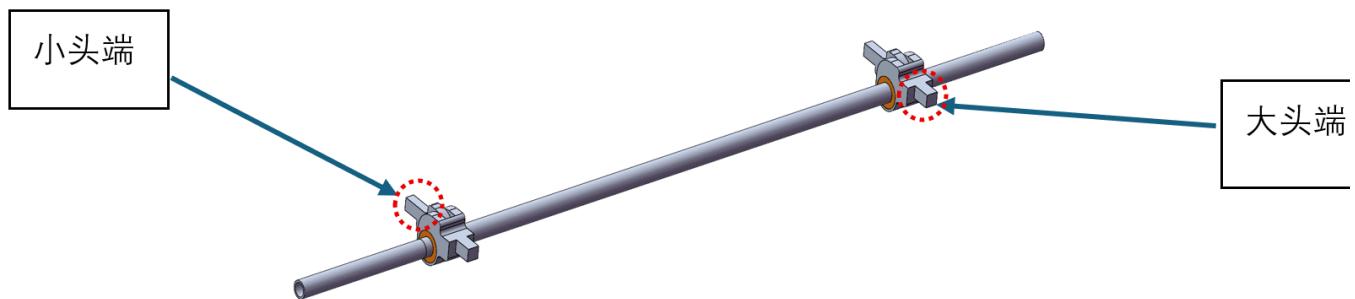
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Scan QR code to watch video: Upper Rod Installation

1. After the first group's first lower shaft rod combination A, connect the upper shaft rod combination (distinguish between large and small ends, connect the large end first)



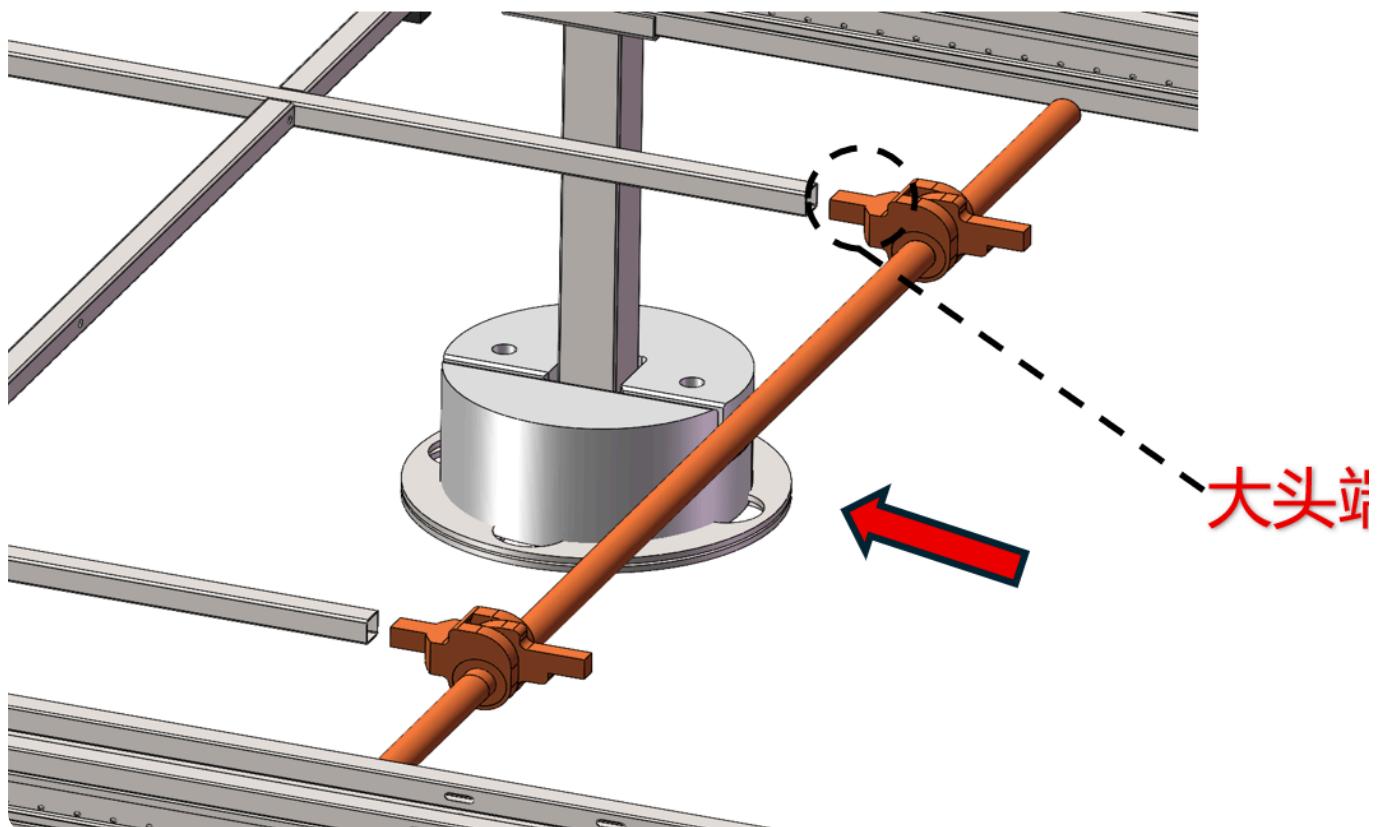
2. Align the large end hole position of the upper shaft rod combination with the installation hole position of the component beam frame

Note: Regarding the orientation of the upper shaft rod combination connection, the large end with threaded hole surface direction needs to face down.



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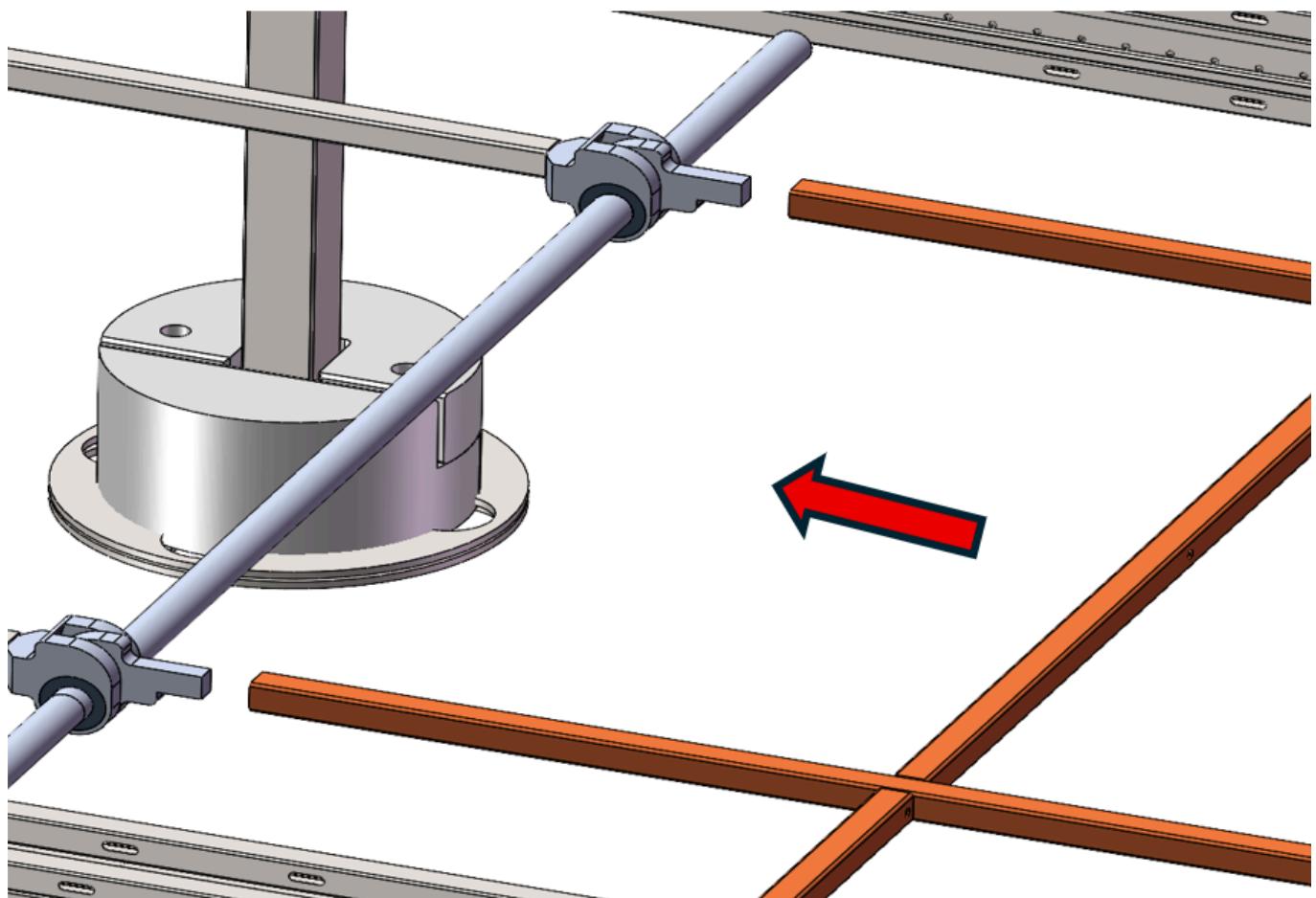


3. Align the small end hole position of the upper shaft rod combination with the installation hole position of the component beam frame



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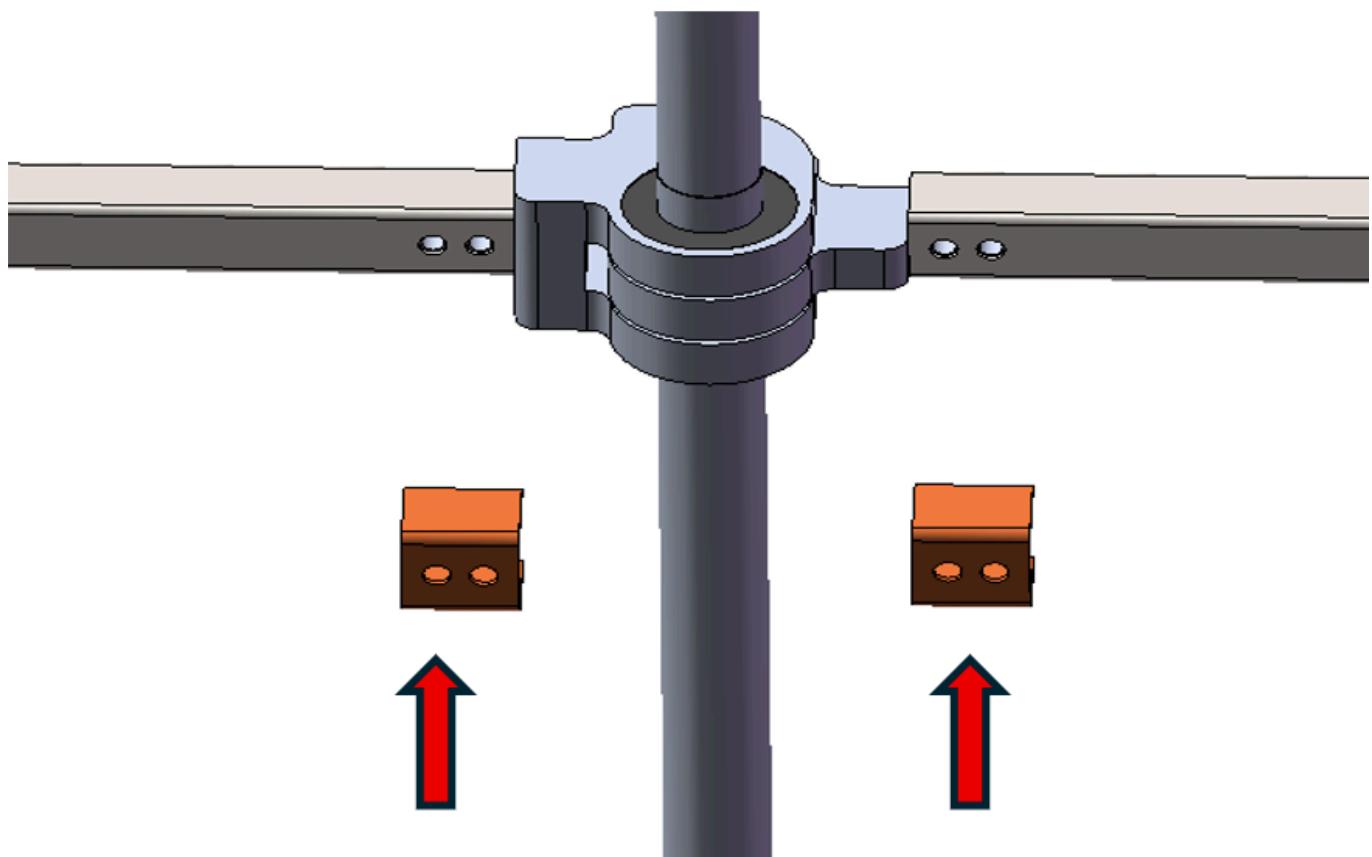


4. Add node reinforcement pieces at both ends



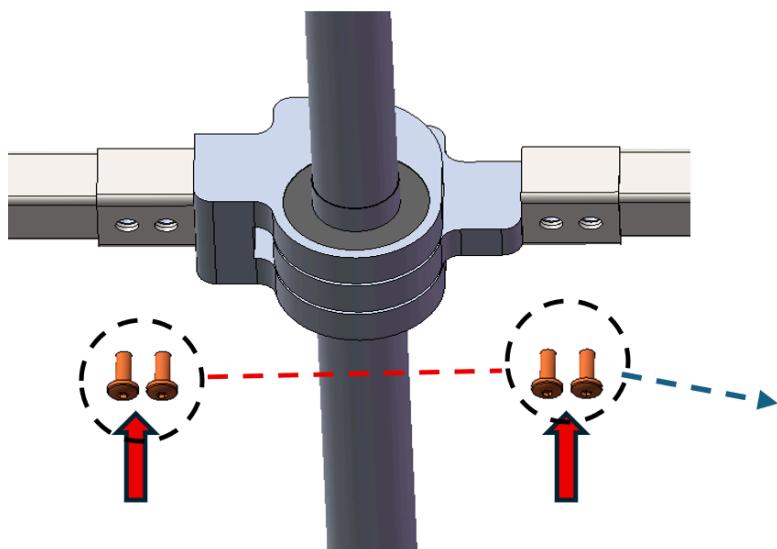
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5. Apply thread lock to M10X25 hex bolts and then tighten them

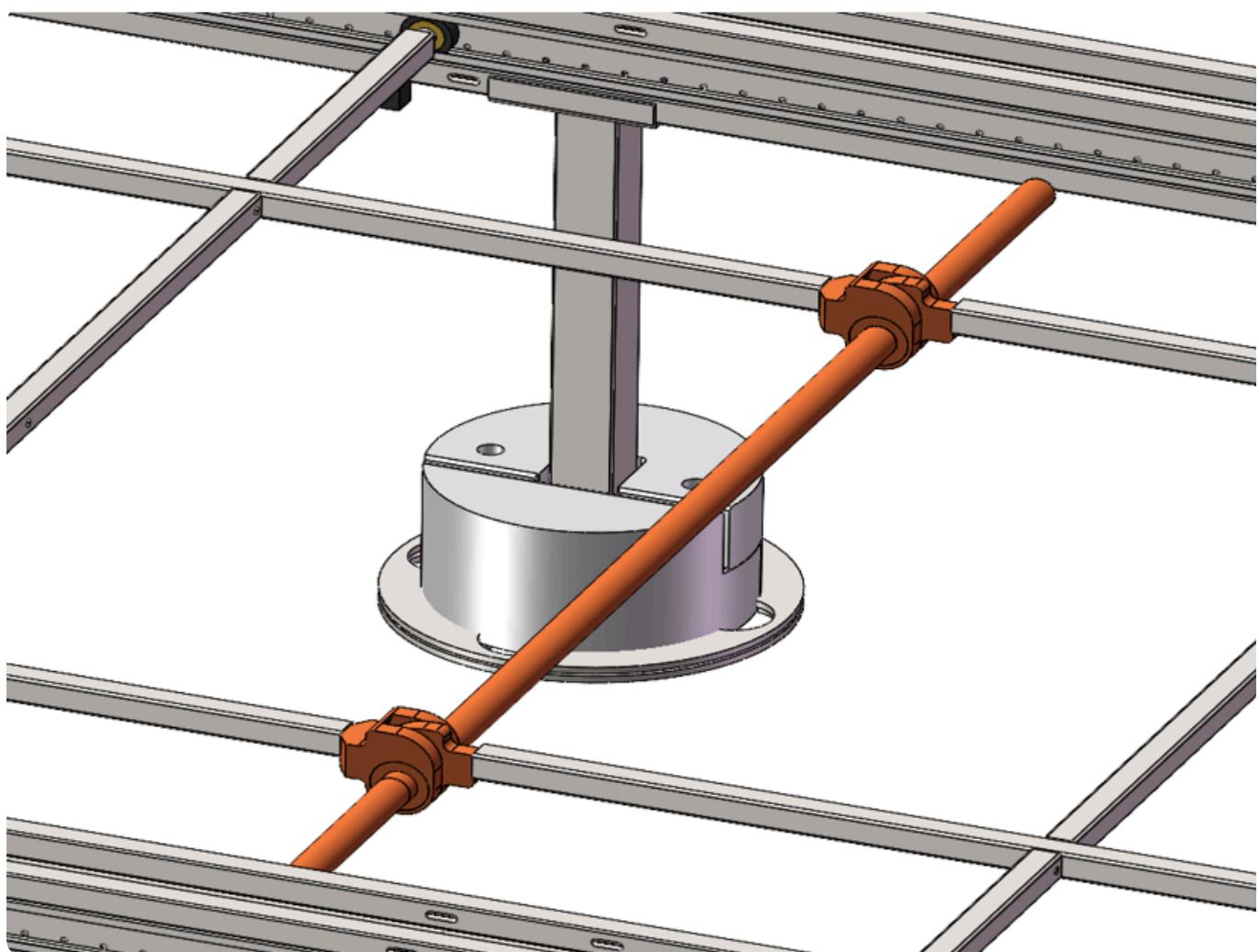
After applying the lock, use a hex wrench to tighten.



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6. Upper shaft rod combination connection effect diagram



4. Connect Lower Shaft Rod Combination C (Alternate installation with upper shaft rod combination, 3 lower shaft rod combinations C per group)



Scan QR code to watch video: Lower Rod C Installation

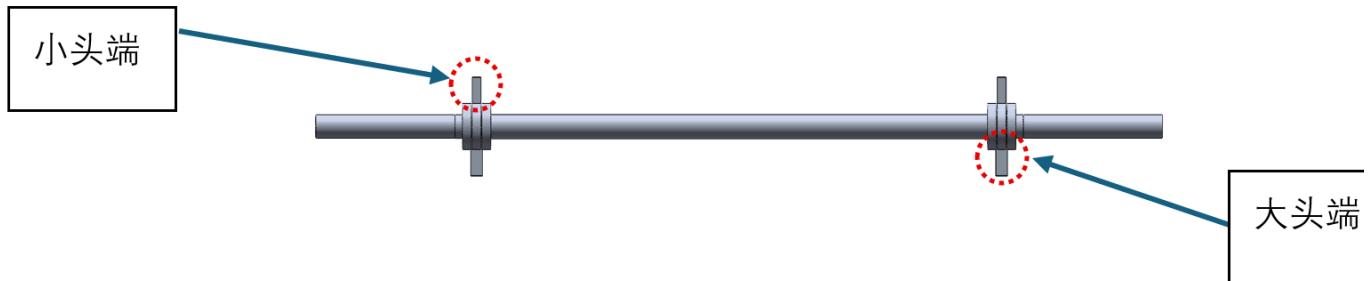


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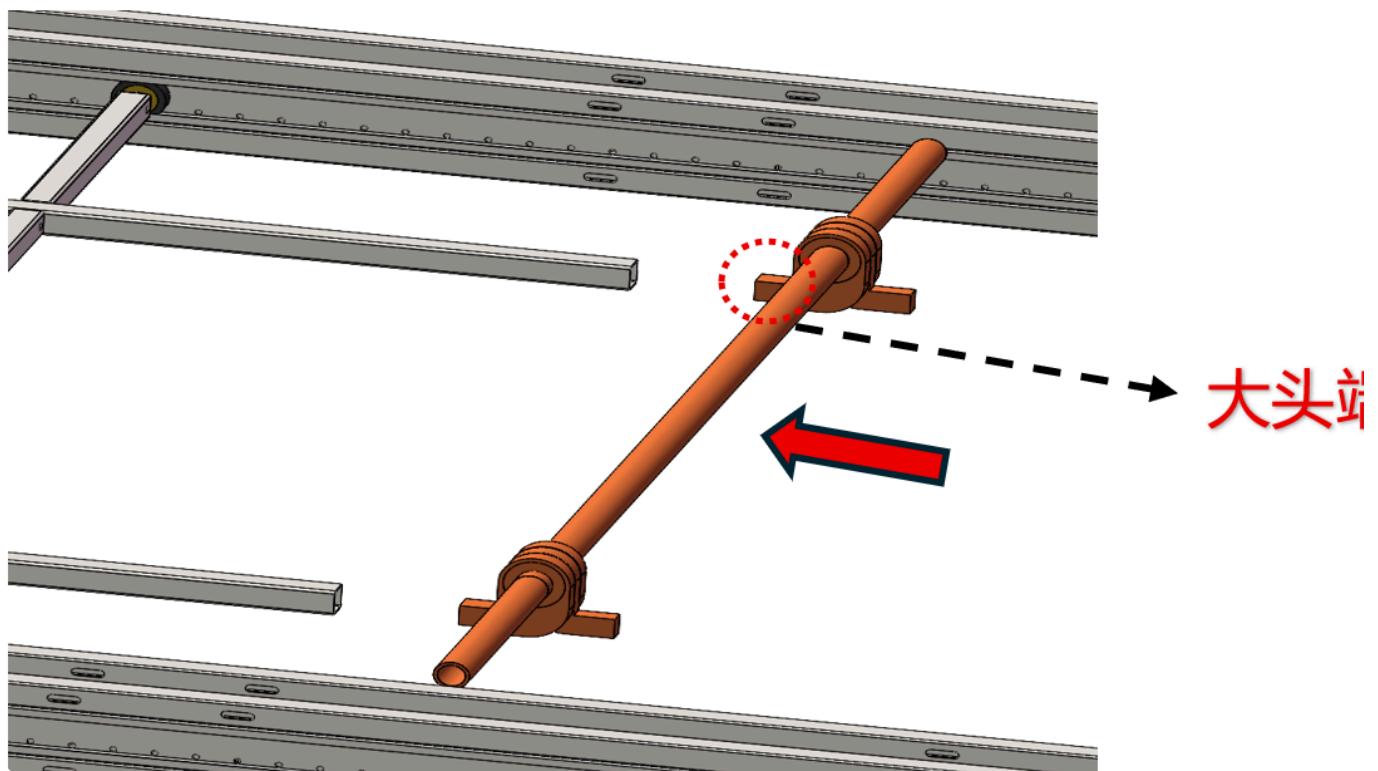
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- After the upper shaft rod combination, connect the lower shaft rod combination C (distinguish between large and small ends, connect the large end first)



- Align the large end hole position of lower shaft rod combination C with the installation hole position of the component beam frame

Note: Regarding the orientation of lower shaft rod combination C connection, the large end with threaded hole surface direction needs to face down.

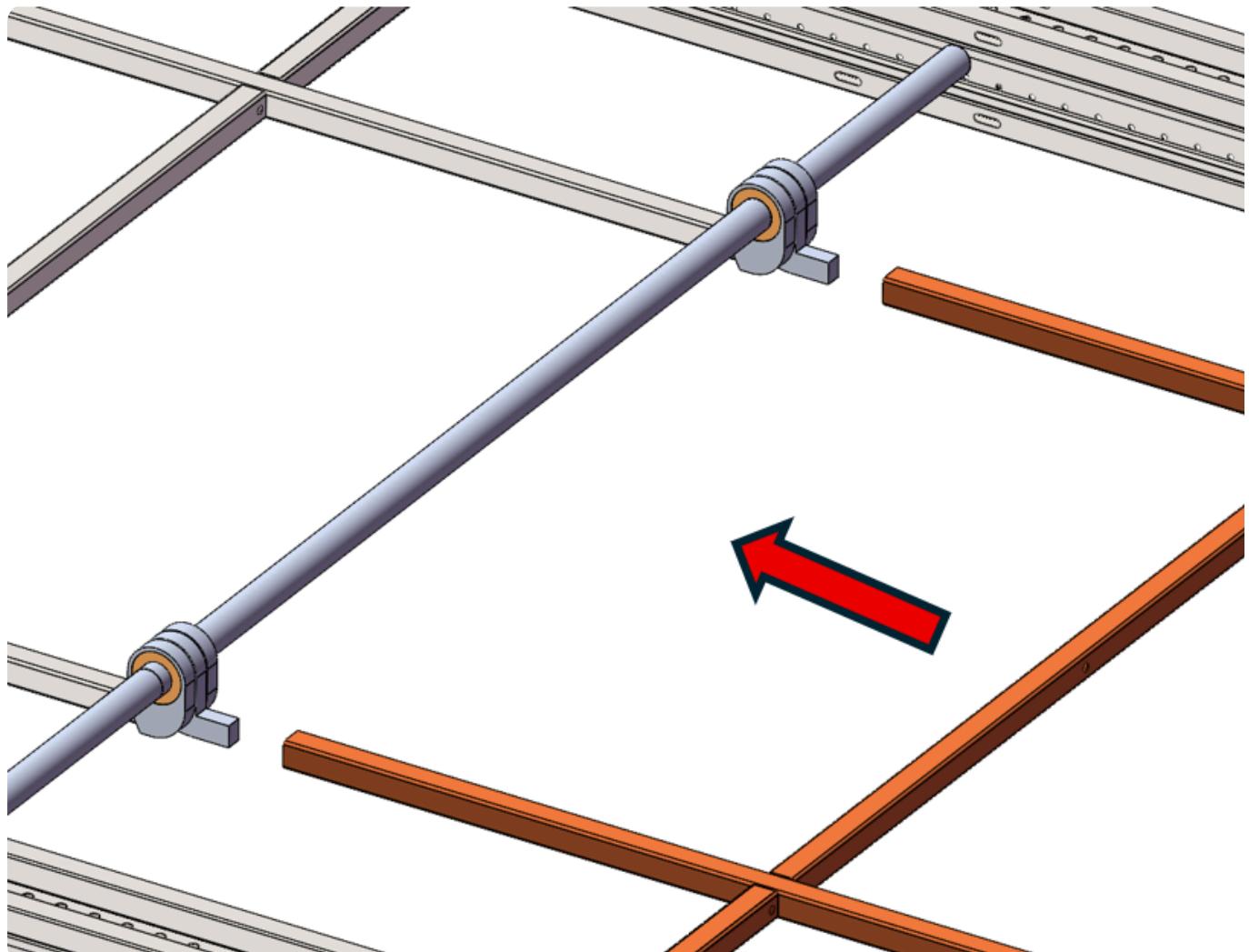


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3. Align the small end hole position of lower shaft rod combination C with the installation hole position of the component beam frame

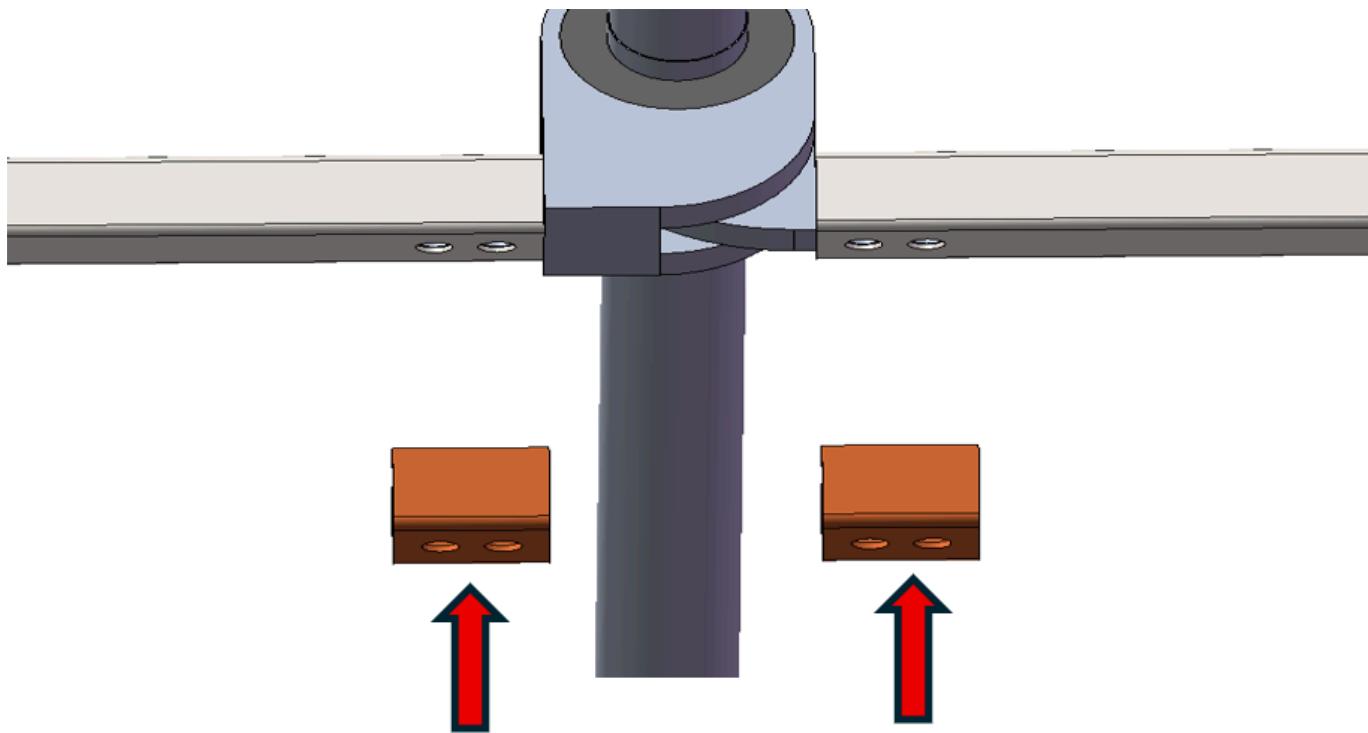


4. Place node reinforcement pieces at both ends

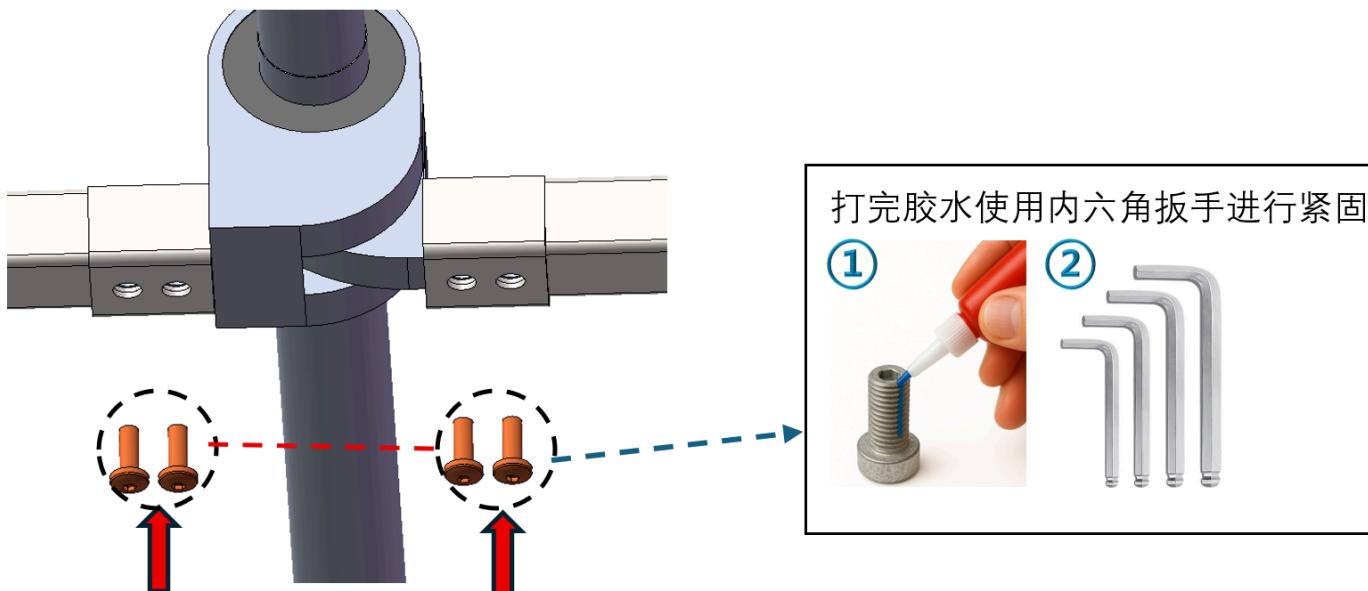


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5. Apply thread lock to M10X25 hex bolts and then tighten them



6. Clamp clamp pieces on both ends of lower shaft rod combination C according to the rail hole positions (pay attention to the installation direction of the clamp pieces, install according to the diagram, both ends need to be installed)



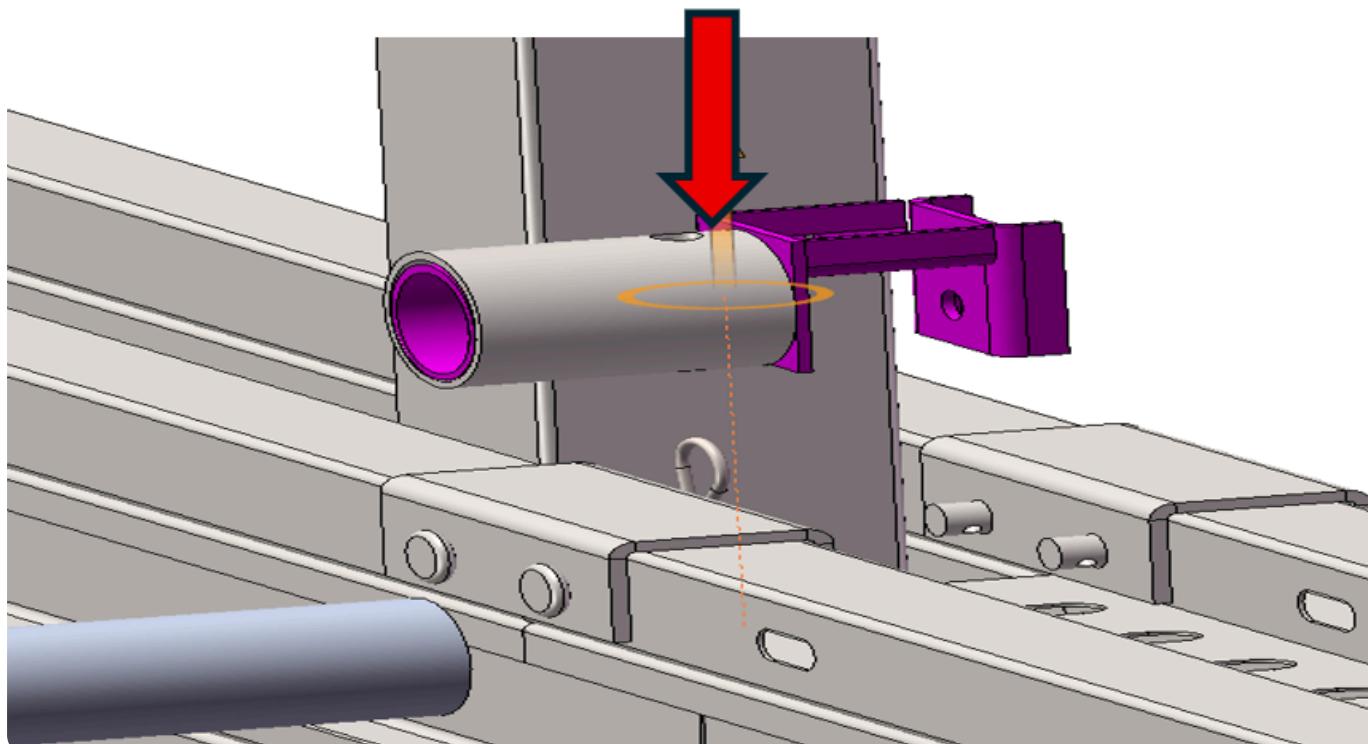
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Scan QR code to watch video: Clamp Installation

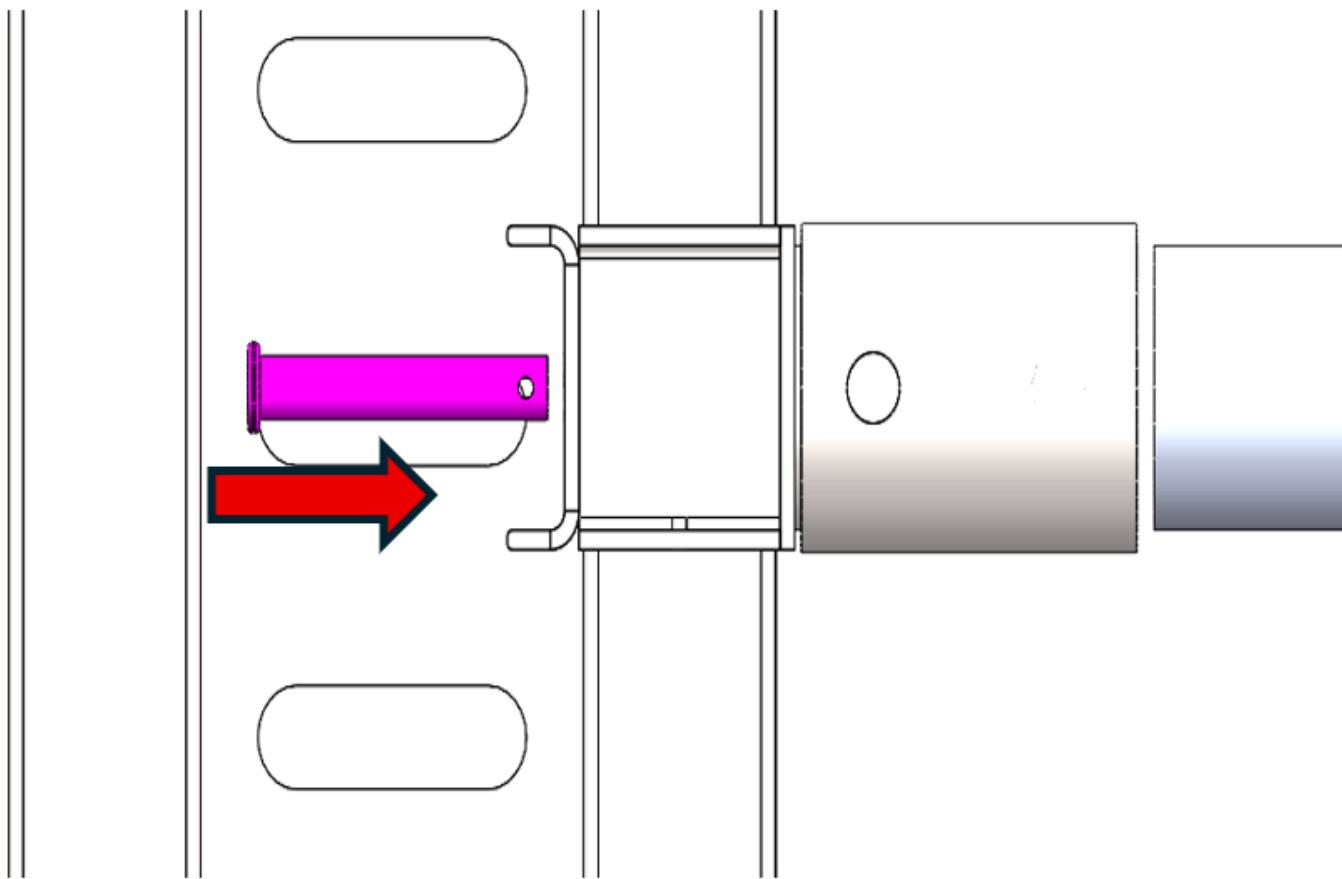


7. Insert steel ball pins to fix the clamp pieces



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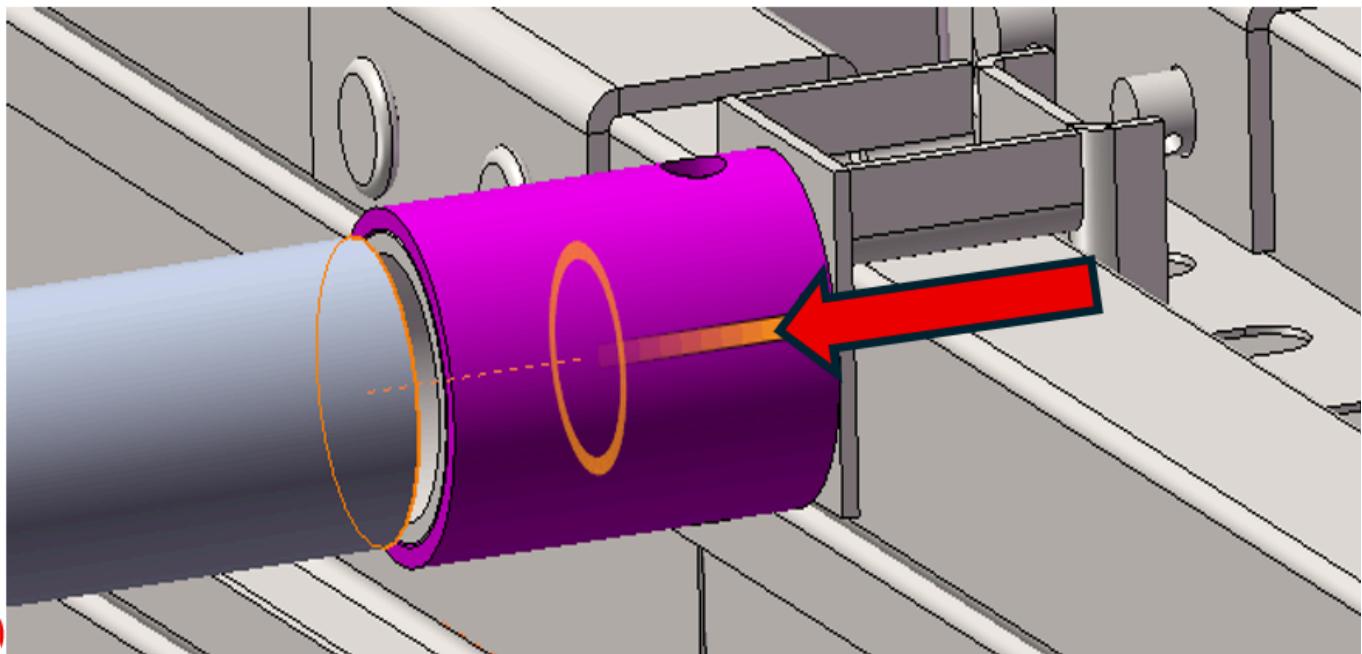


8. Push the clamp piece matching round tube onto the shaft rod, align the pin holes of the clamp piece matching round tube with the pin holes on the clamp piece round tube



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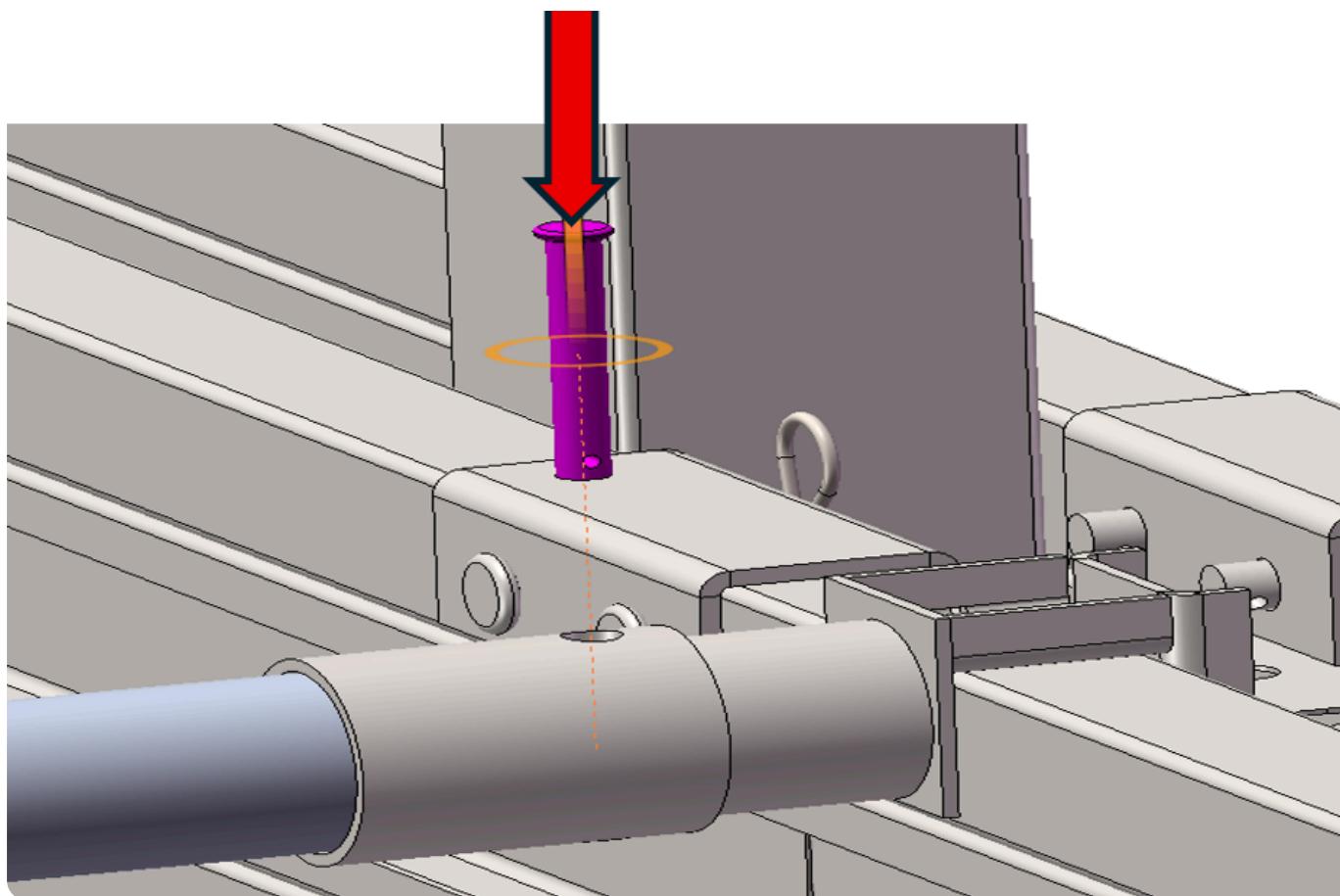
9. Use 10X60 pins to fix



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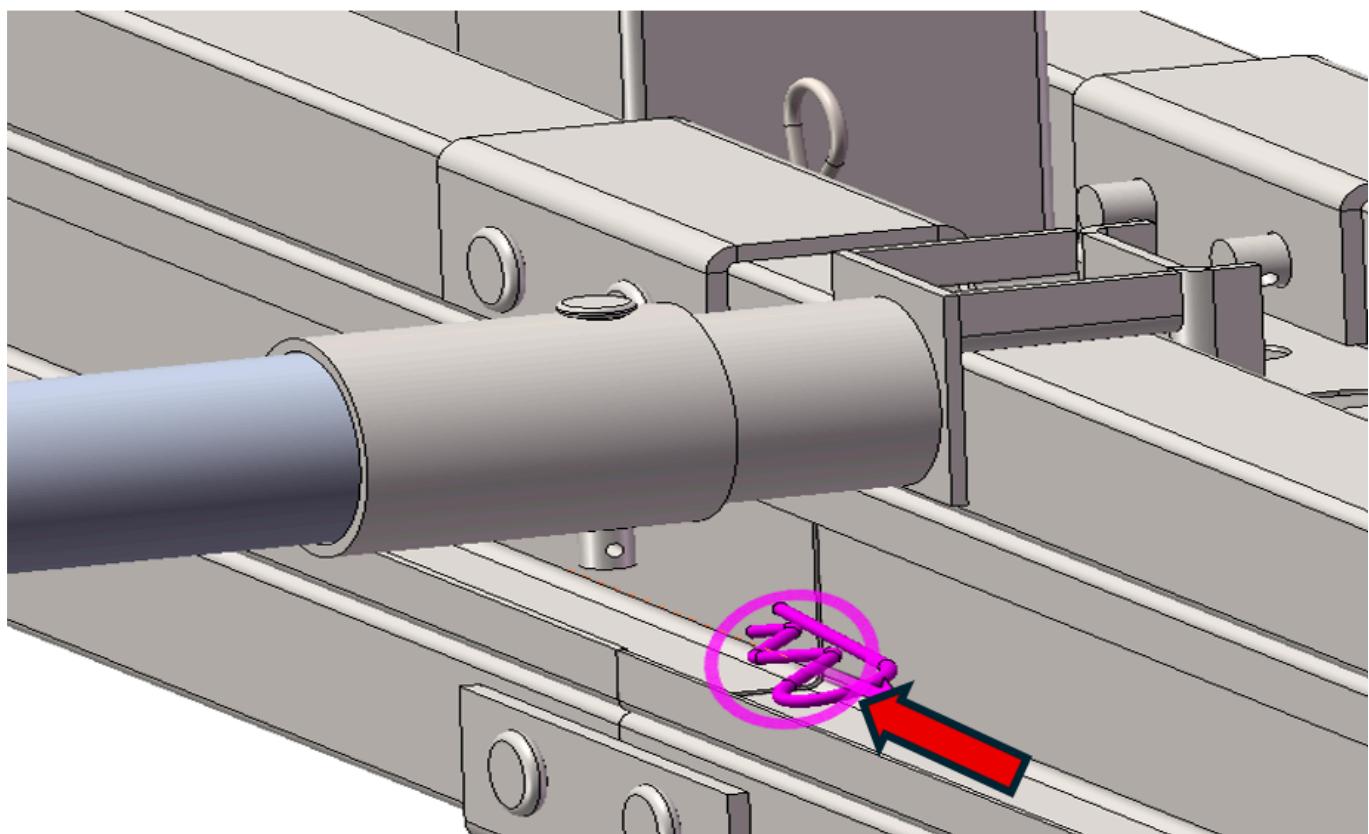
10. Finally use Type B cotter pins to fix



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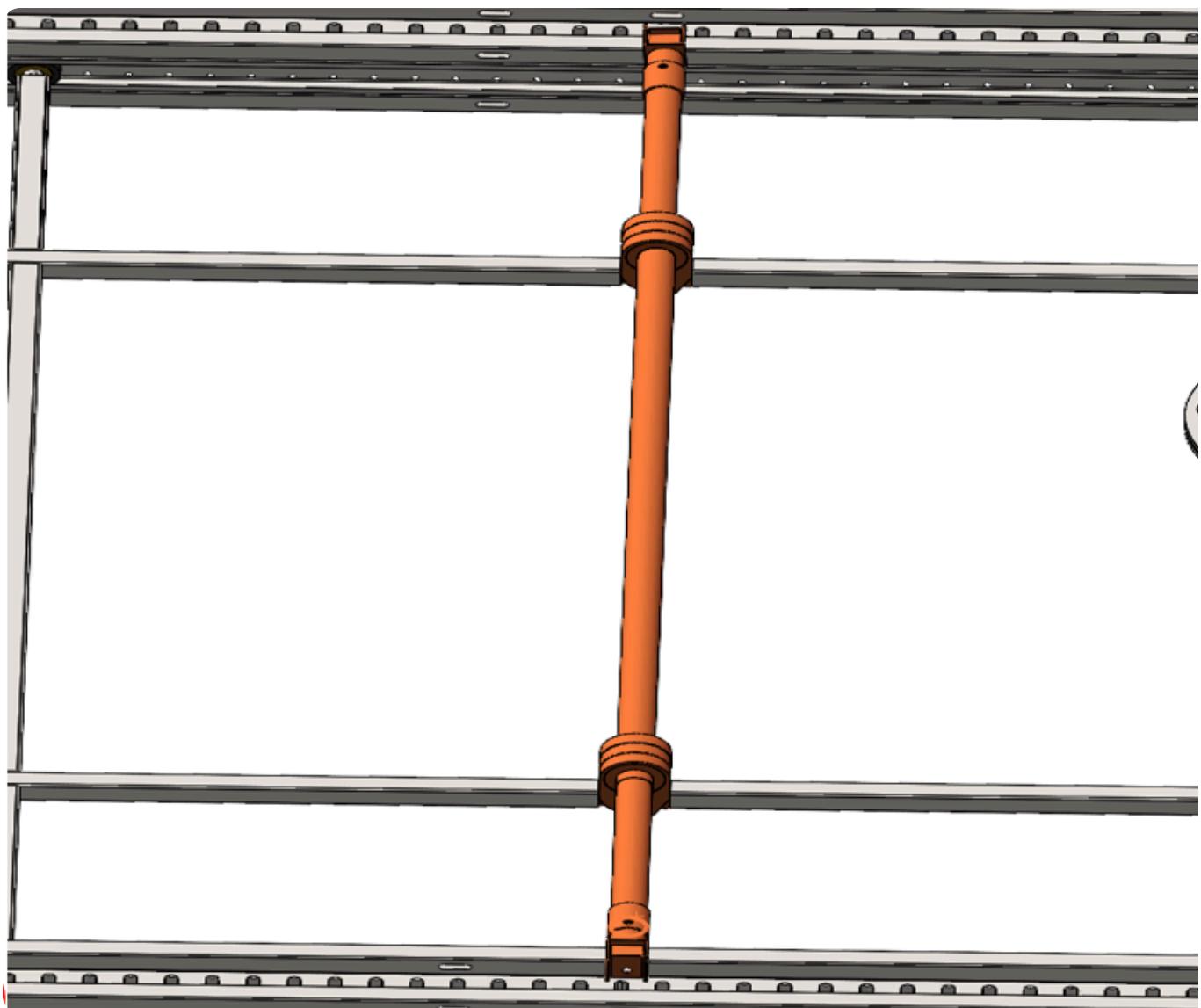


11. Lower shaft rod combination C connection effect diagram



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5. Connect Lower Shaft Rod Combination B (Last installation of each group)



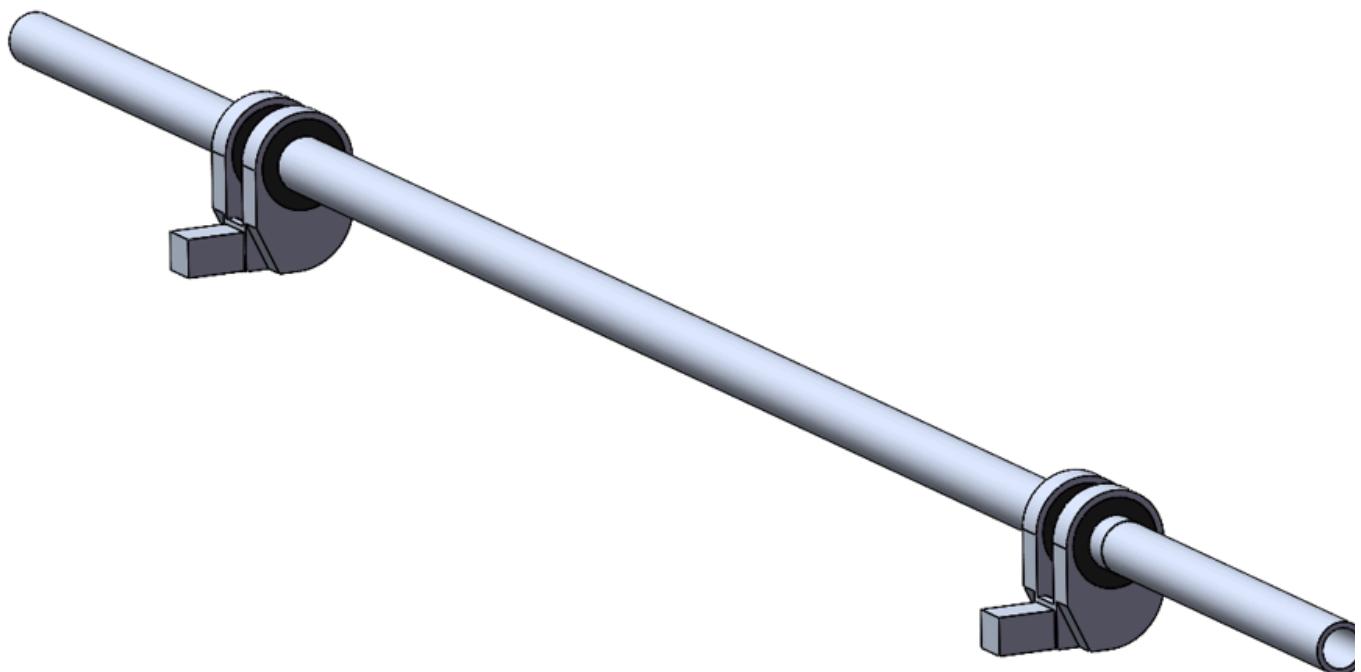
Scan QR code to watch video: Lower Rod B Installation

1. Lower shaft rod combination B



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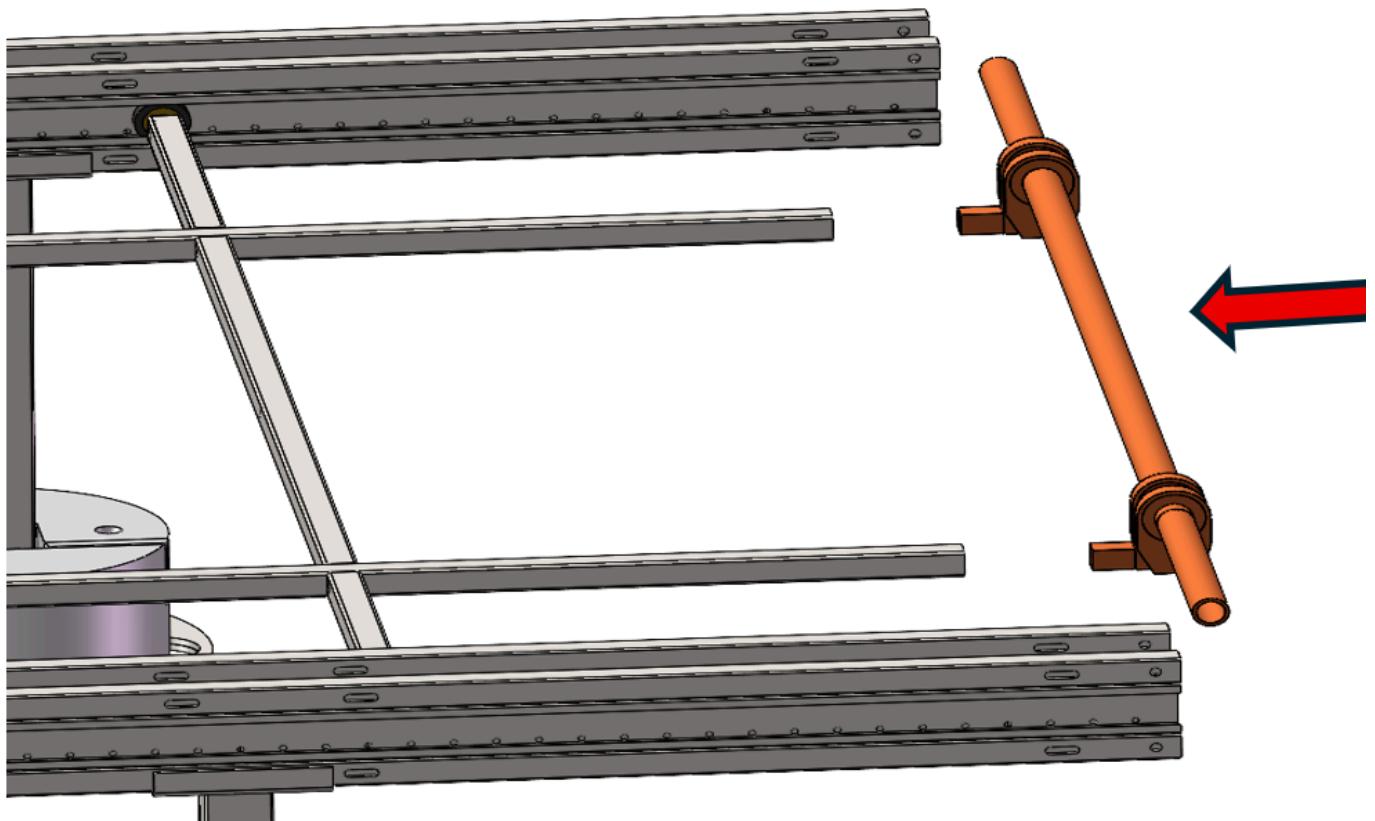


2. Align the end hole position of lower shaft rod combination B with the installation hole position on the component beam frame



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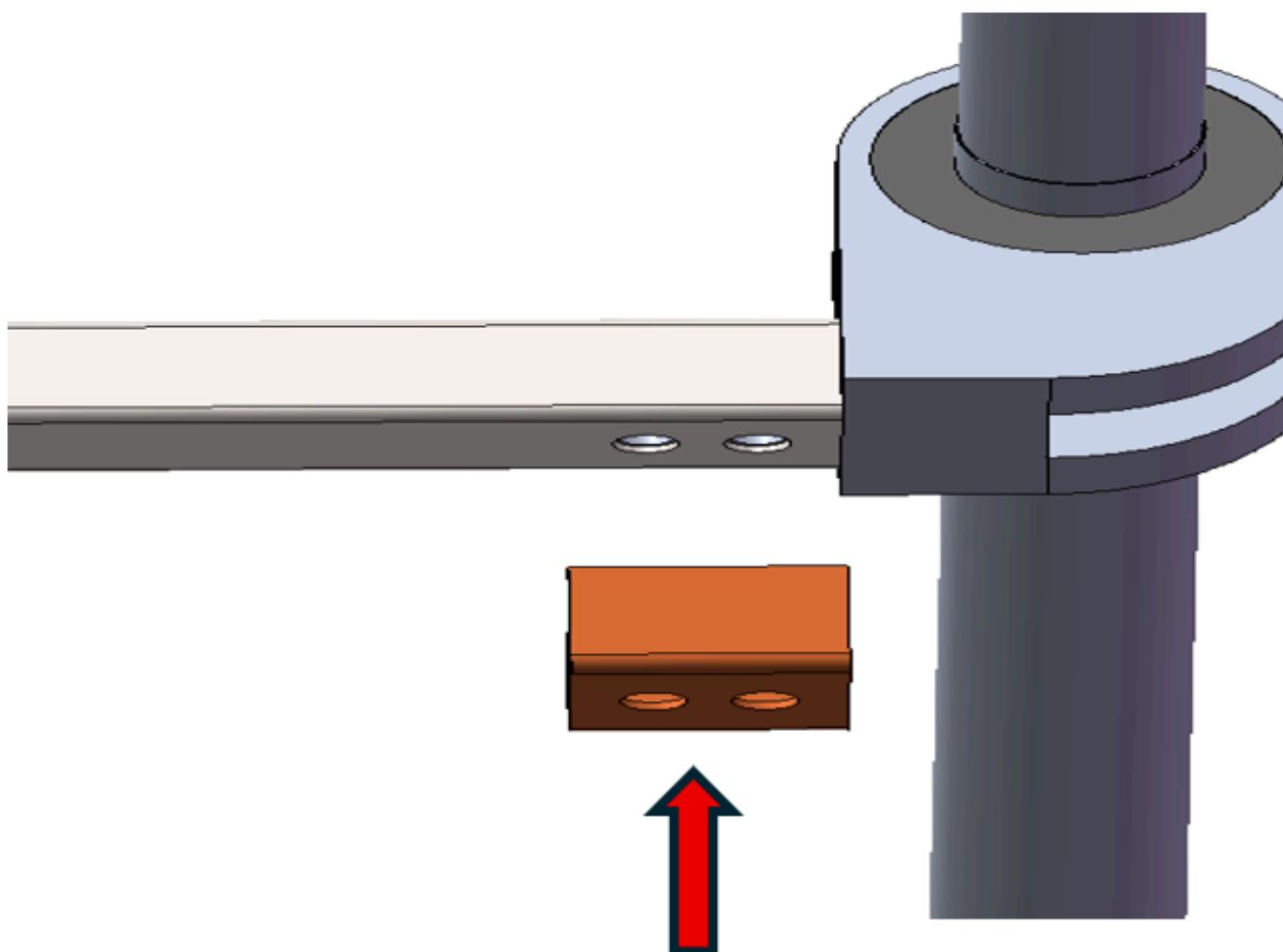


3. Place node reinforcement pieces



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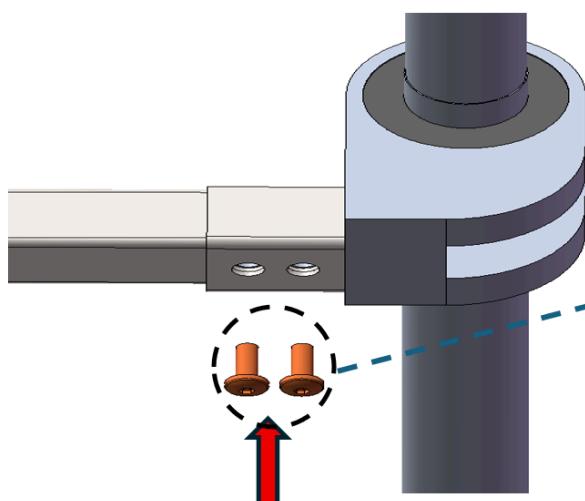
4. Apply thread lock to M10X25 hex bolts and then tighten them

After applying the lock, use a hex wrench to tighten.



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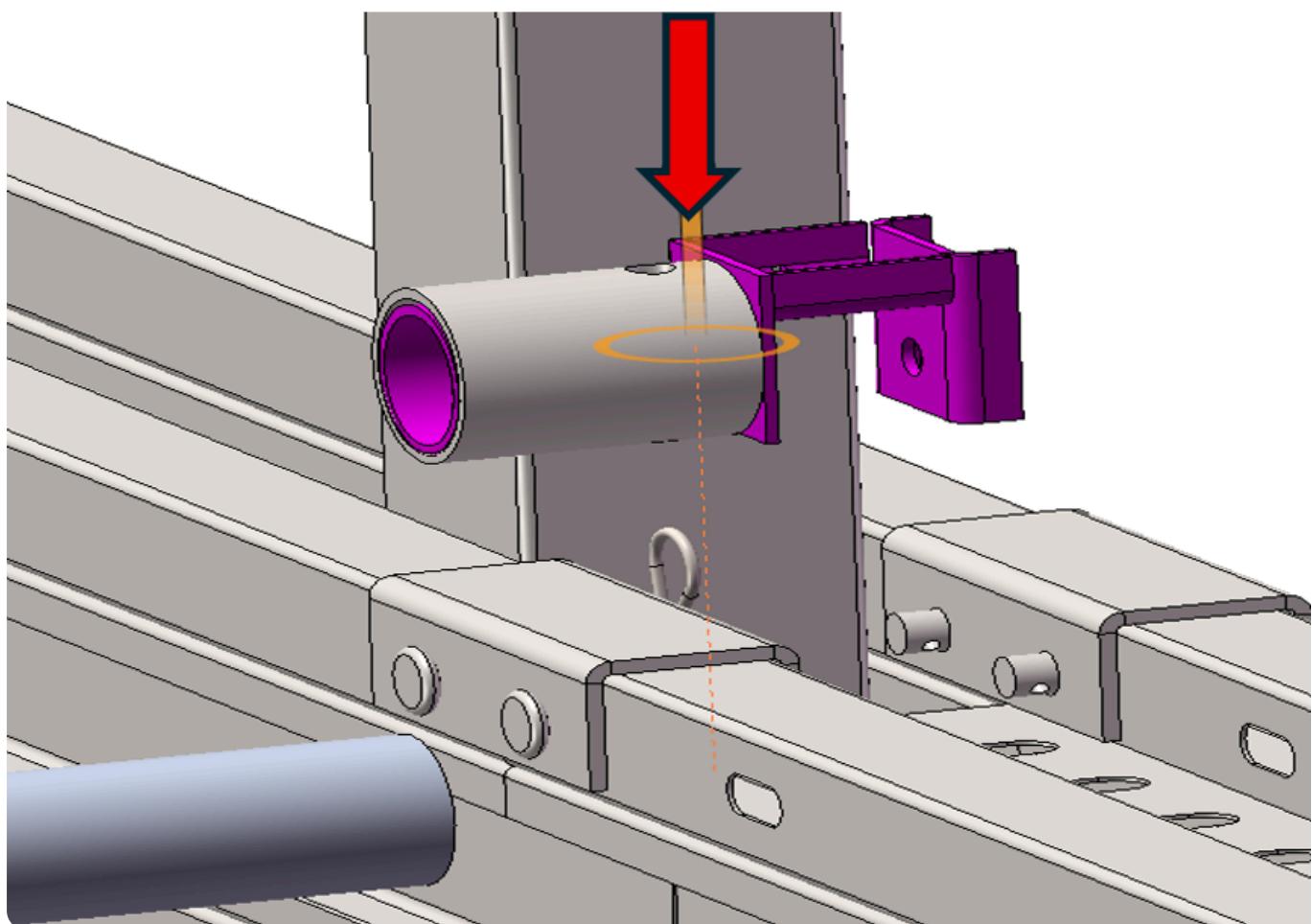


5. Clamp clamp pieces on both ends of lower shaft rod combination B according to the rail hole positions (pay attention to the installation direction of the clamp pieces, install according to the diagram, both ends need to be installed)



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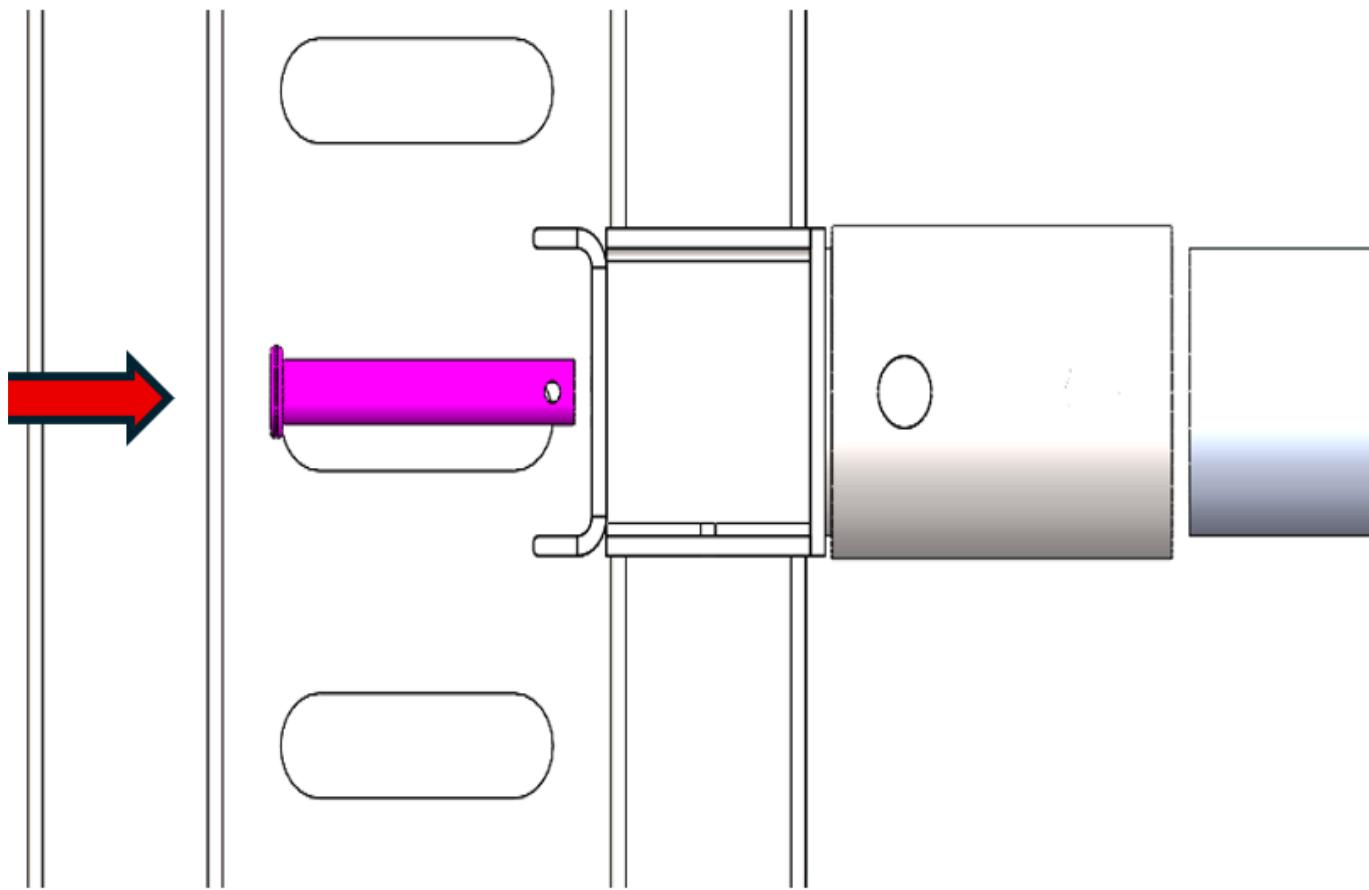
6. Insert steel ball pins to fix the clamp pieces



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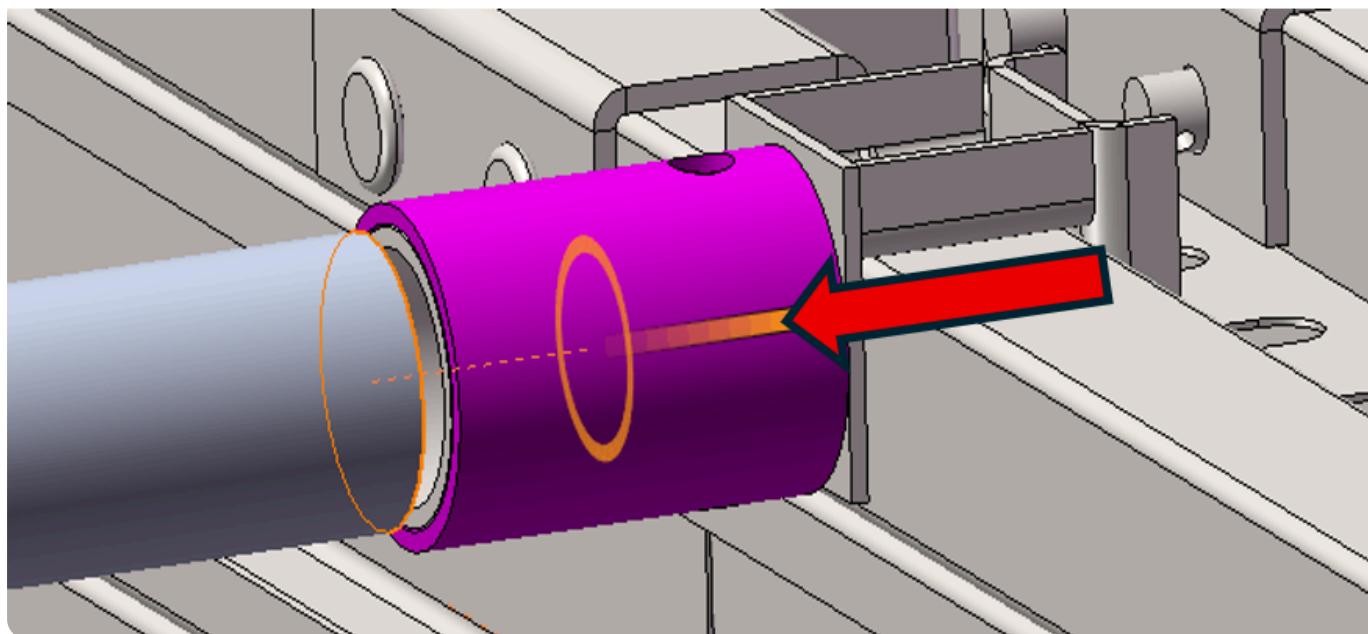


7. Push the clamp piece matching round tube onto the shaft rod, align the pin holes of the clamp piece matching round tube with the pin holes on the clamp piece round tube

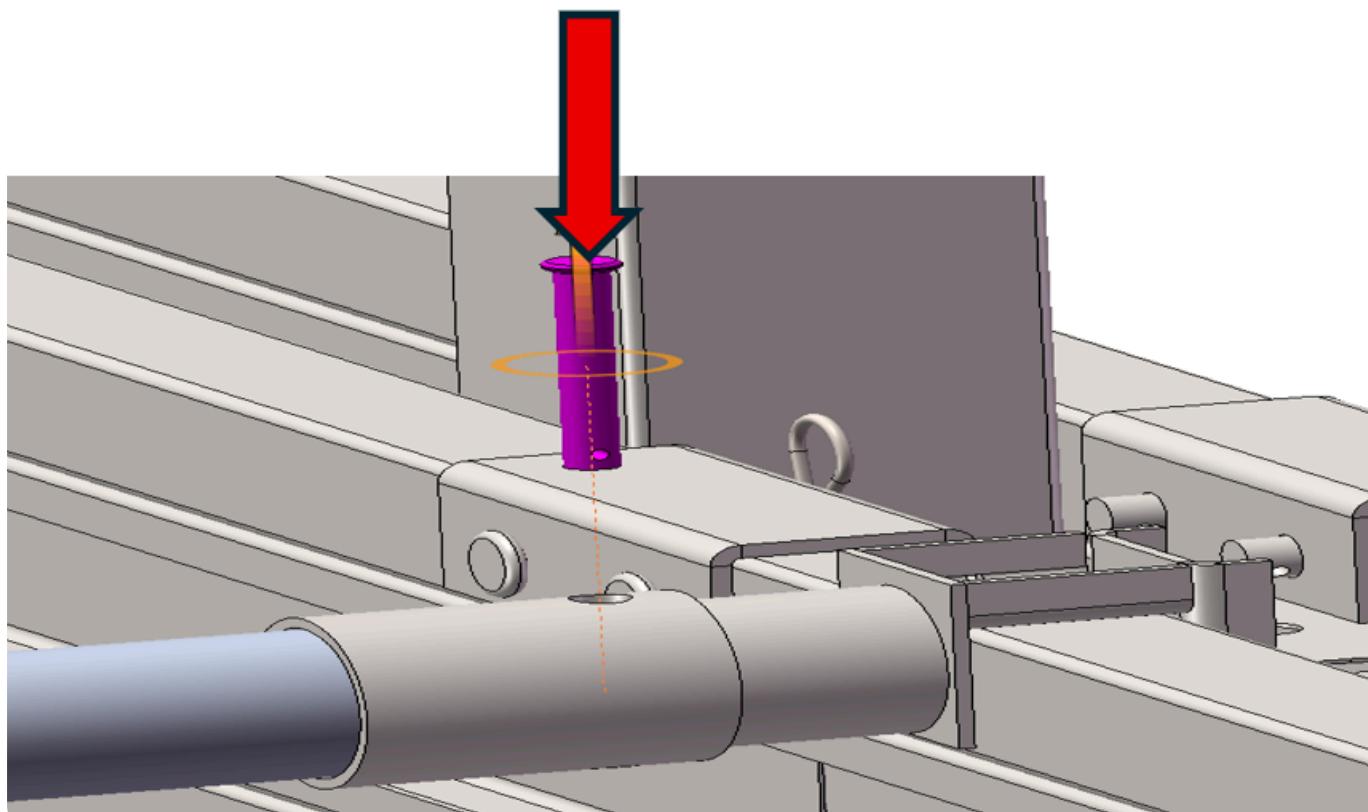


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8. Use 10X60 pins to fix

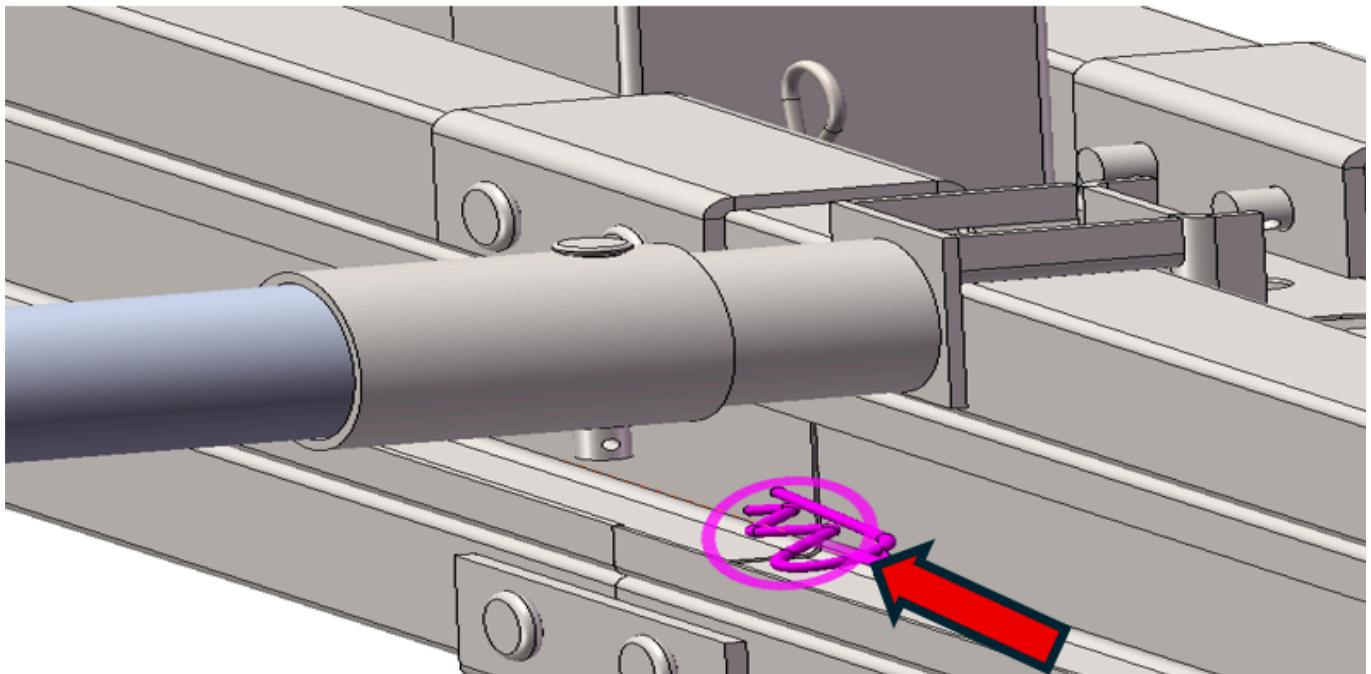


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9. Finally use Type B cotter pins to fix

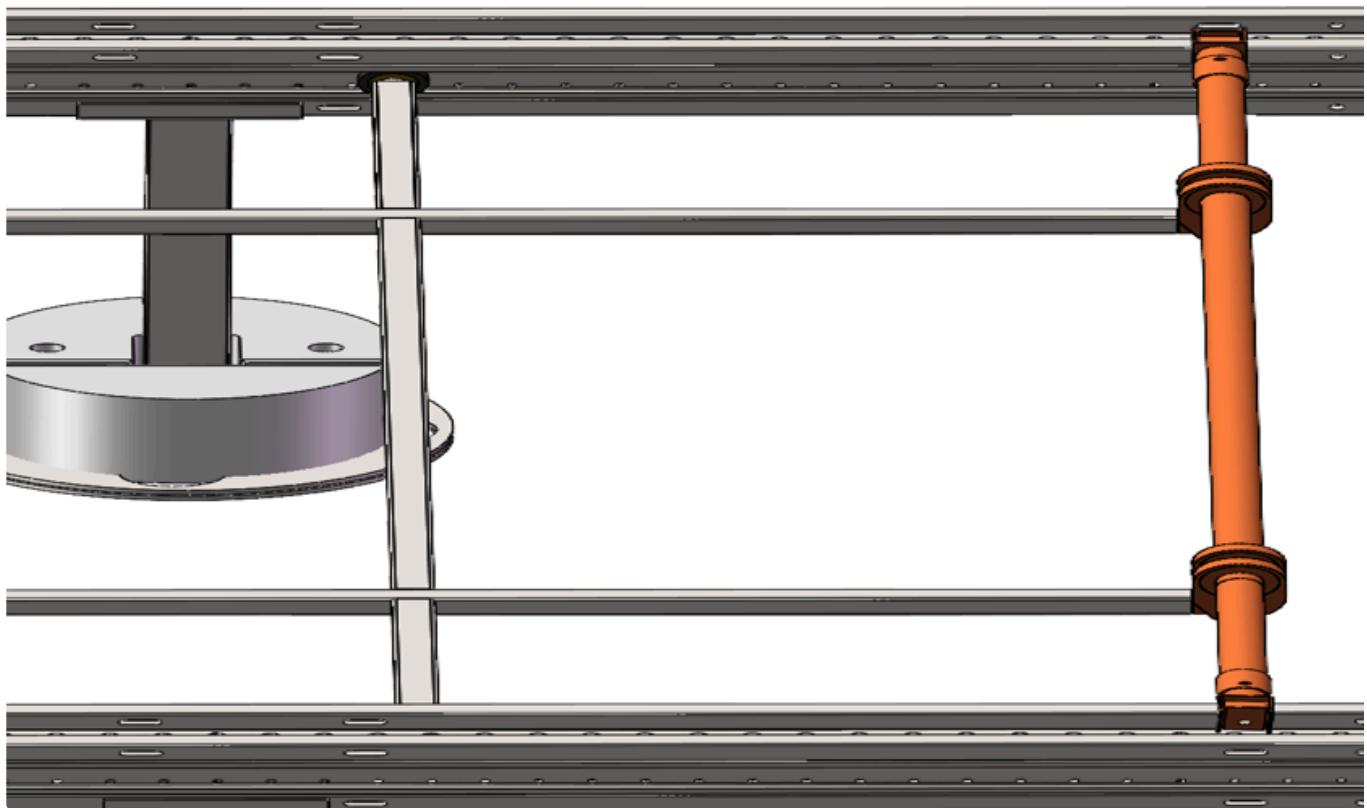


10. Lower shaft rod combination B connection effect diagram

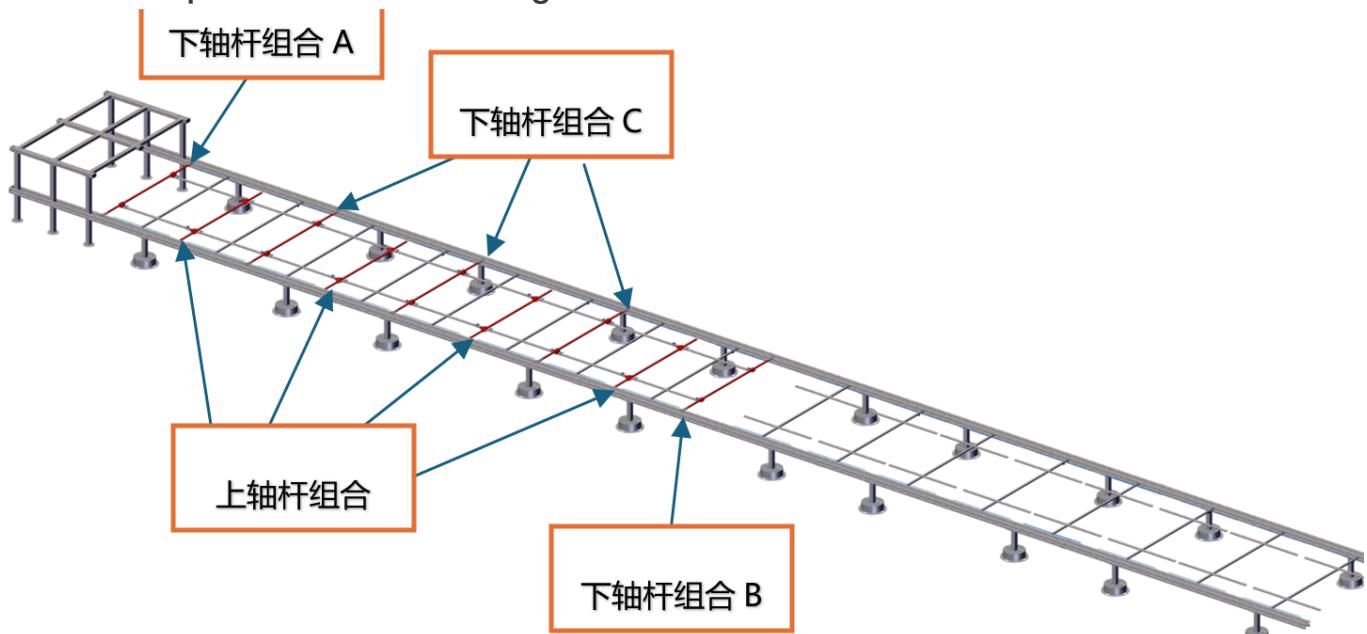


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6. First Group Installation Effect Diagram



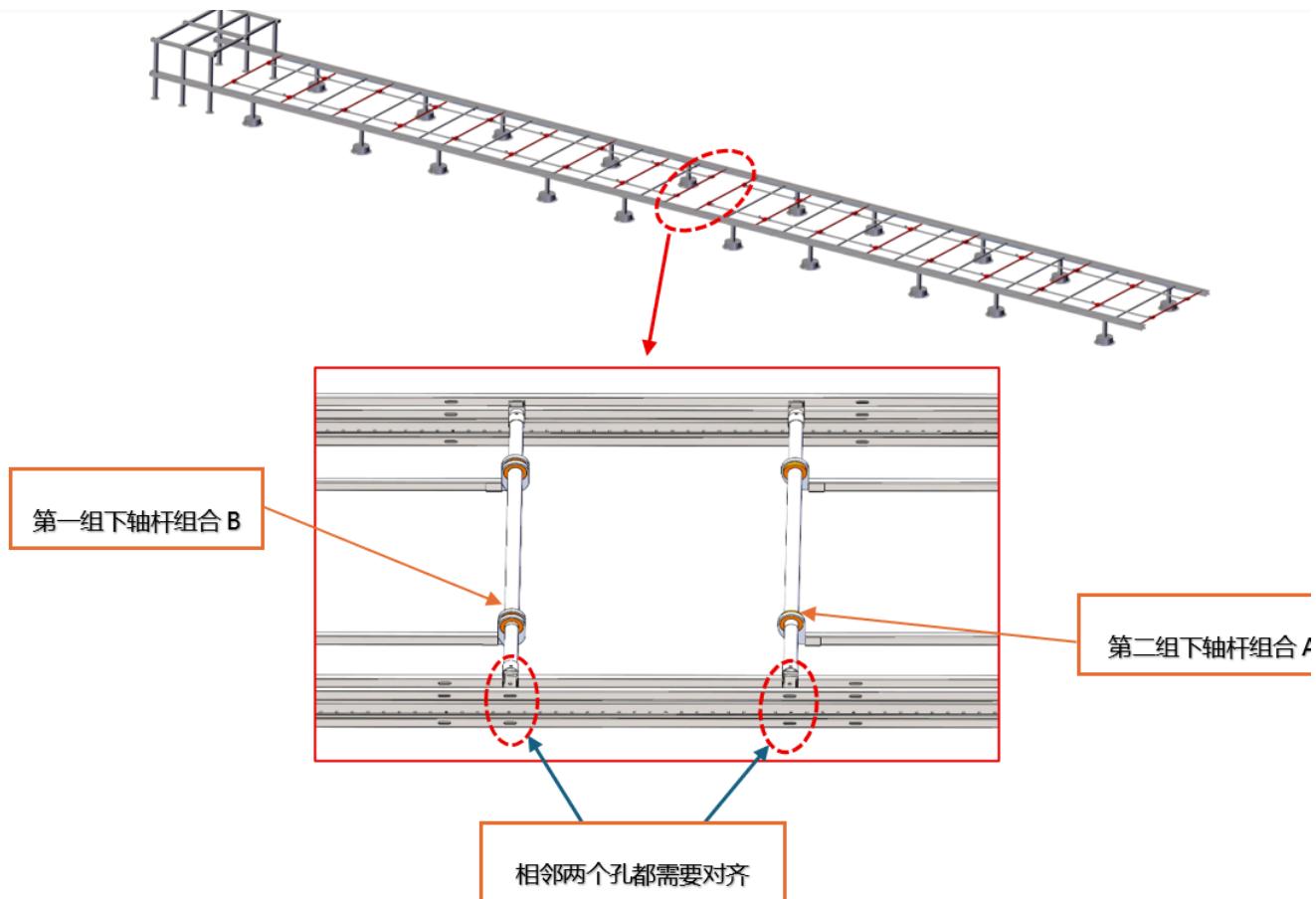
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7. Second Group Installation Effect Diagram (Second group installation steps are the same as first group installation steps; second group lower shaft rod combination A continues from the first hole after the first group lower shaft rod combination B)

Adjacent holes need to be aligned.



Step 5—Install Photovoltaic Modules

Photovoltaic Module Materials List

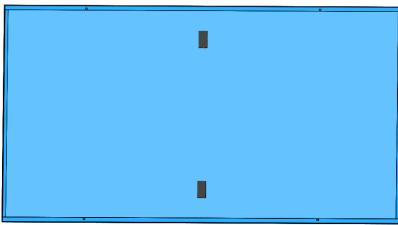
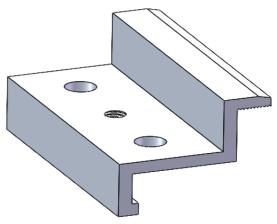
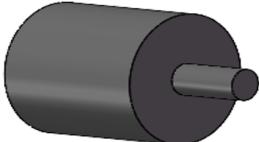
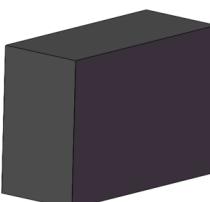
Image	Name	Quantity



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	Photovoltaic Module	16
	Clamping Block	64
	U-Bolt Set	64
	Clamping Block Anti-collision Block	64
	Module Installation Positioning Block	2 blocks
	Torque Wrench	2 sets



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Step Details

1. Module Wiring (Same for each group)

Note: If there are only two columns of rails, all wiring terminals just need to face the same direction. If there are more than two columns, all wiring terminals should face the outermost column of rails.

1. First positive wire harness layout diagram: Wire harness runs inside the module aluminum frame and is fixed with metal cable ties



Scan QR code to watch video: First Positive Wire Harness Layout



2. Other positive wire harness layout diagram: Wire harnesses are twisted together and bundled with ordinary cable ties, positive male terminals are placed inside the module aluminum frame and fixed with metal cable ties (leave wire length approximately 100mm)



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Scan QR code to watch video: Remaining Positive Wire Harness Layout



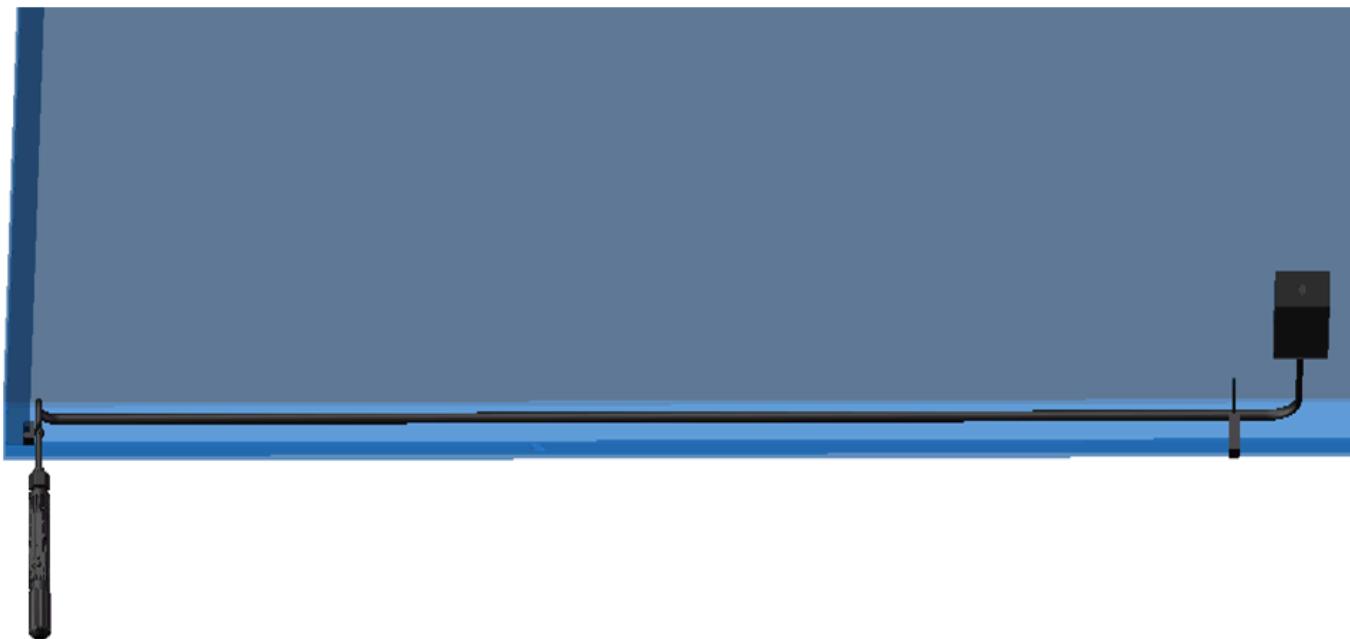
3. End negative wire harness layout diagram: Wire harness runs inside the module aluminum frame and is fixed with metal cable ties



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Scan QR code to watch video: End Negative Wire Harness Layout



4. Other negative wire harness layout diagram: Wire harnesses are twisted together and bundled with ordinary cable ties, terminal wires are fixed on the aluminum frame with metal cable ties, negative female terminals connect to another module's positive male terminals (leave length approximately 600mm)

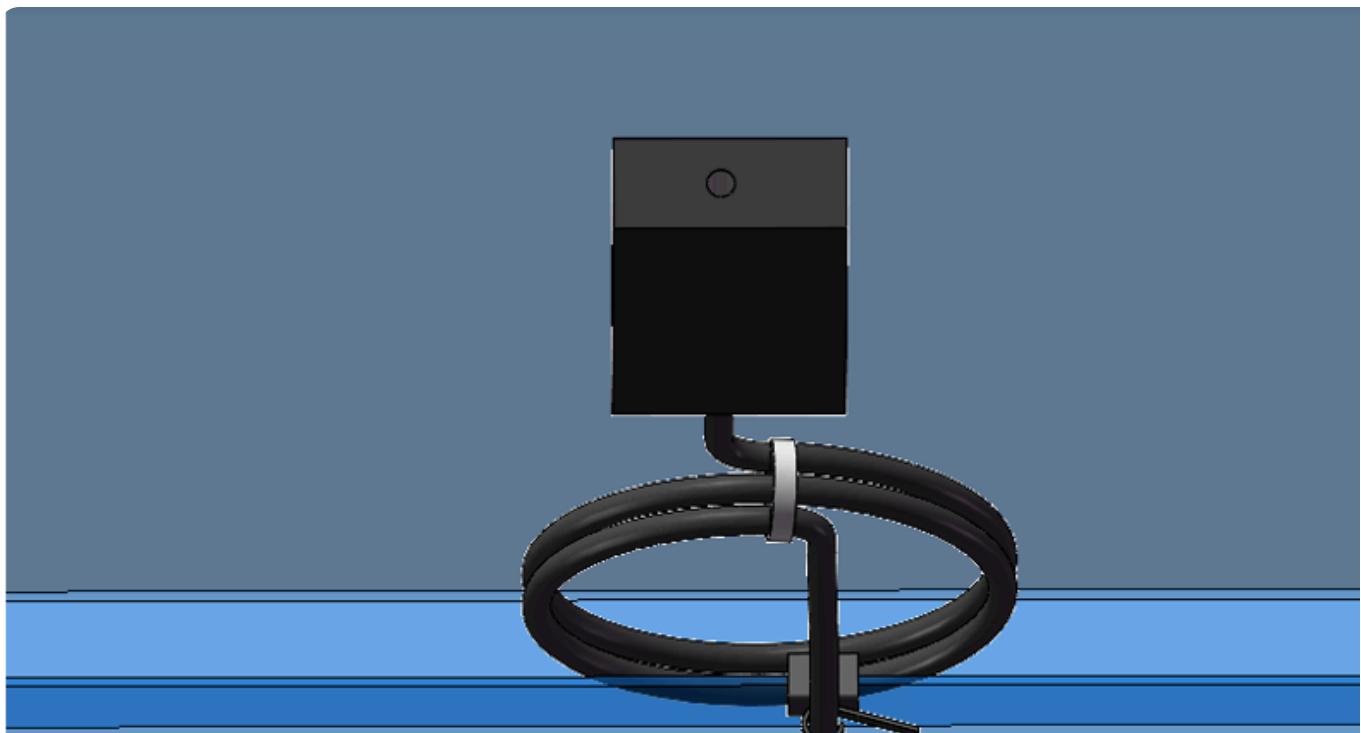


Scan QR code to watch video: Remaining Negative Wire Harness Layout



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2. Assemble Photovoltaic Module



Scan QR code to watch video: PV Module Installation

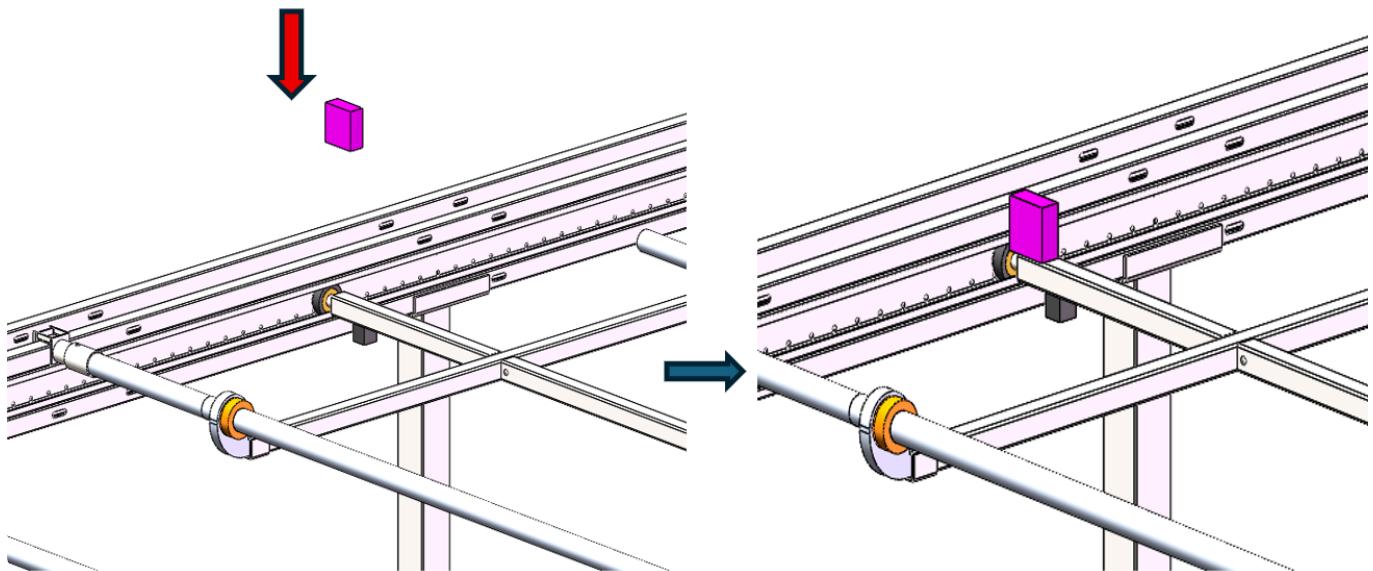


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- When installing photovoltaic modules, use module installation positioning blocks to center the photovoltaic modules (when using module installation positioning blocks, place them uniformly on one side)

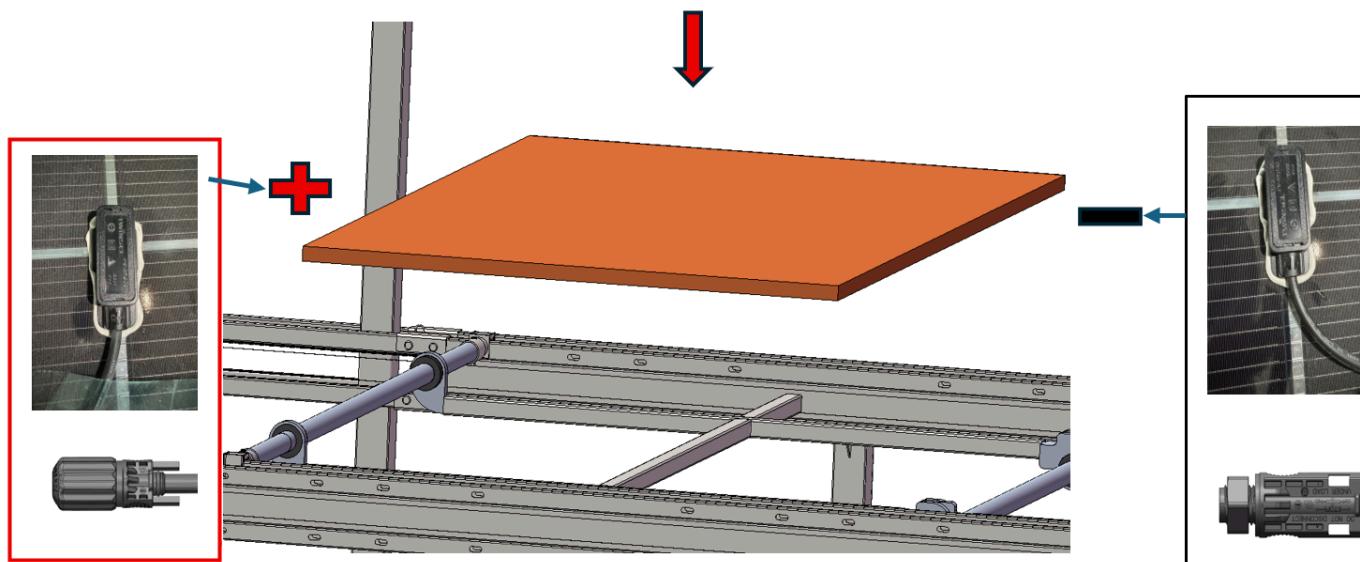


- Place one side of the photovoltaic panel tightly against one side of the module installation positioning block on the component beam frame (place the photovoltaic panel positive wire board on the lower shaft rod combination A side, negative on the upper shaft rod combination side, the positive and negative orientation of 16 photovoltaic panels in two groups should be placed uniformly according to the first panel of the first group)

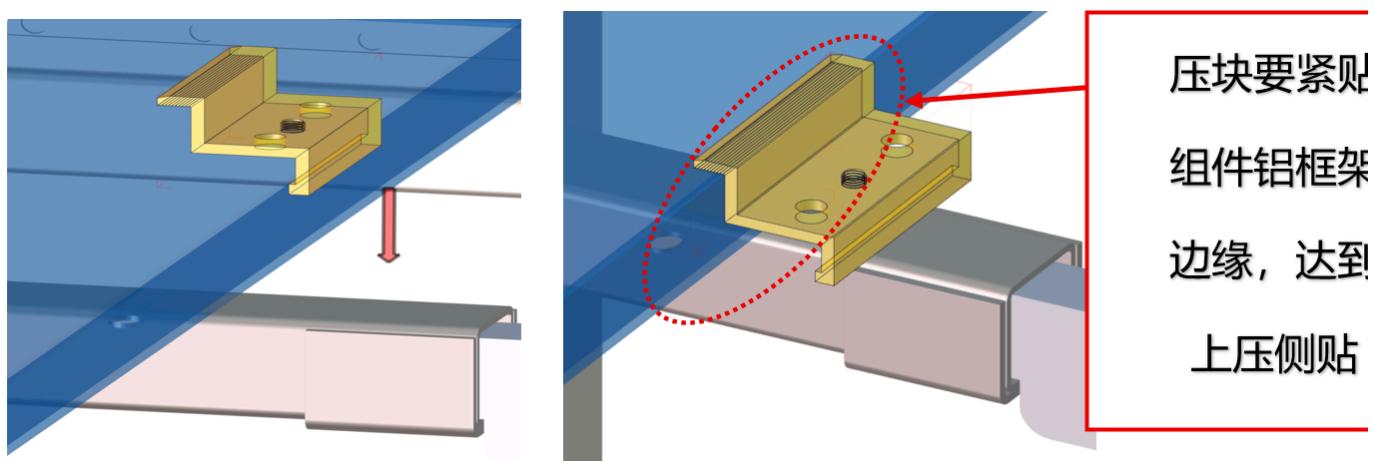


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3. Then use 4 clamping blocks to press the photovoltaic module, the clamping blocks should be tight against the module aluminum frame edge



4. Use a torque wrench with 20N.m force to connect the U-bolts and clamping blocks to press the photovoltaic panel (all U-bolts in the lower shaft rod direction should be tightened tight against the node reinforcement piece edge)

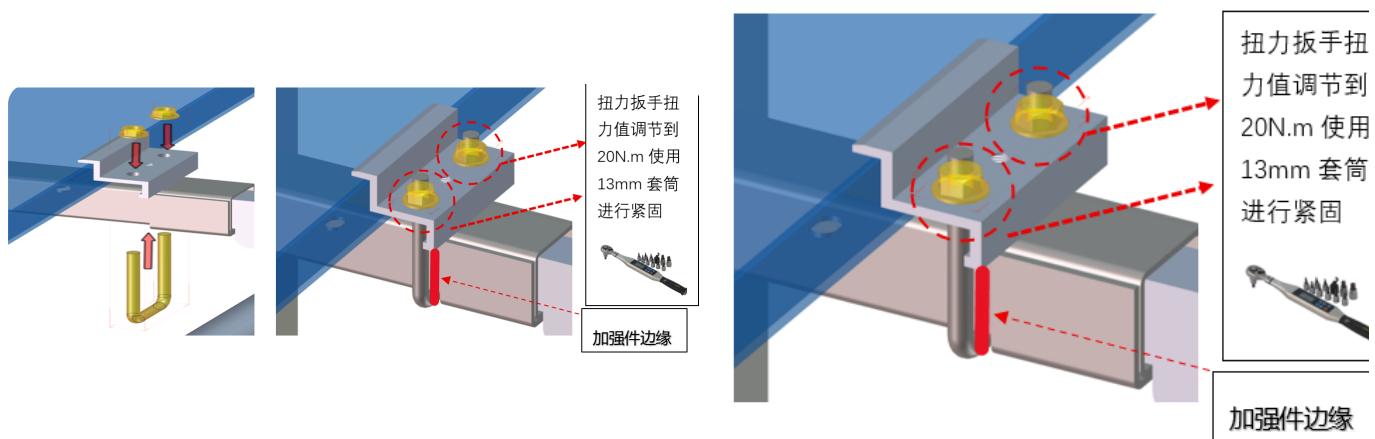
Adjust the torque wrench torque value to 20N.m and use a 13mm socket to tighten.



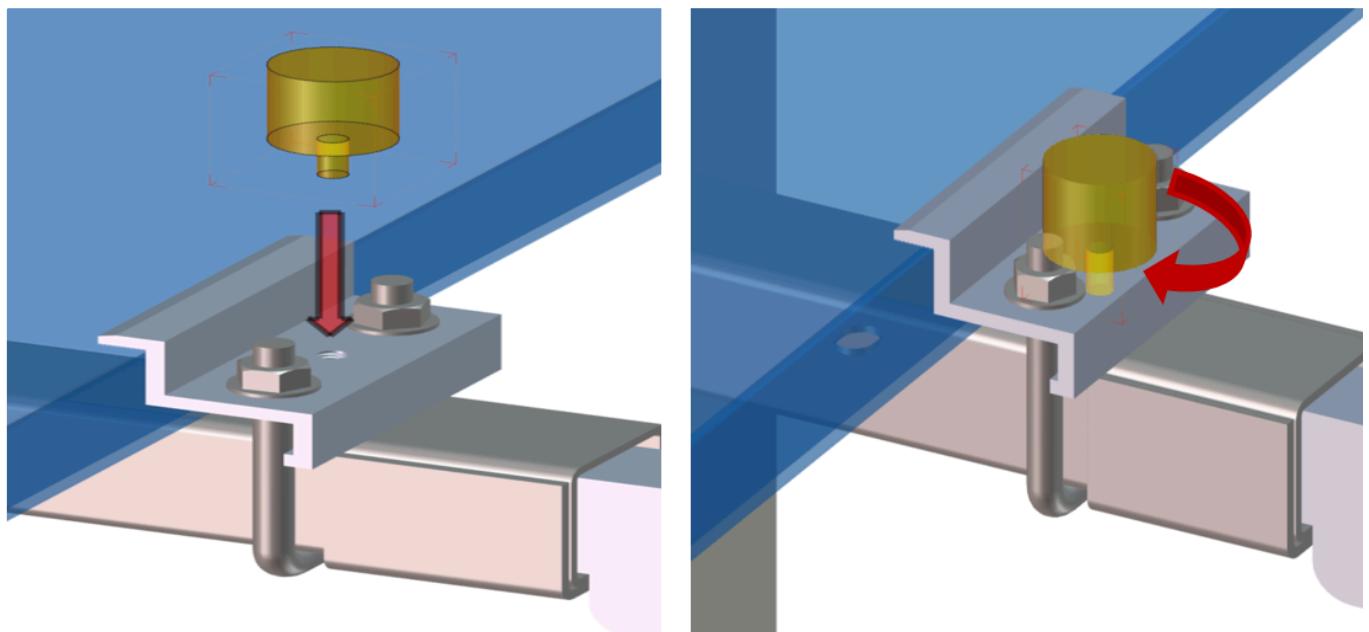
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5. Hand-tighten the clamping block anti-collision blocks onto the threaded holes on the clamping blocks



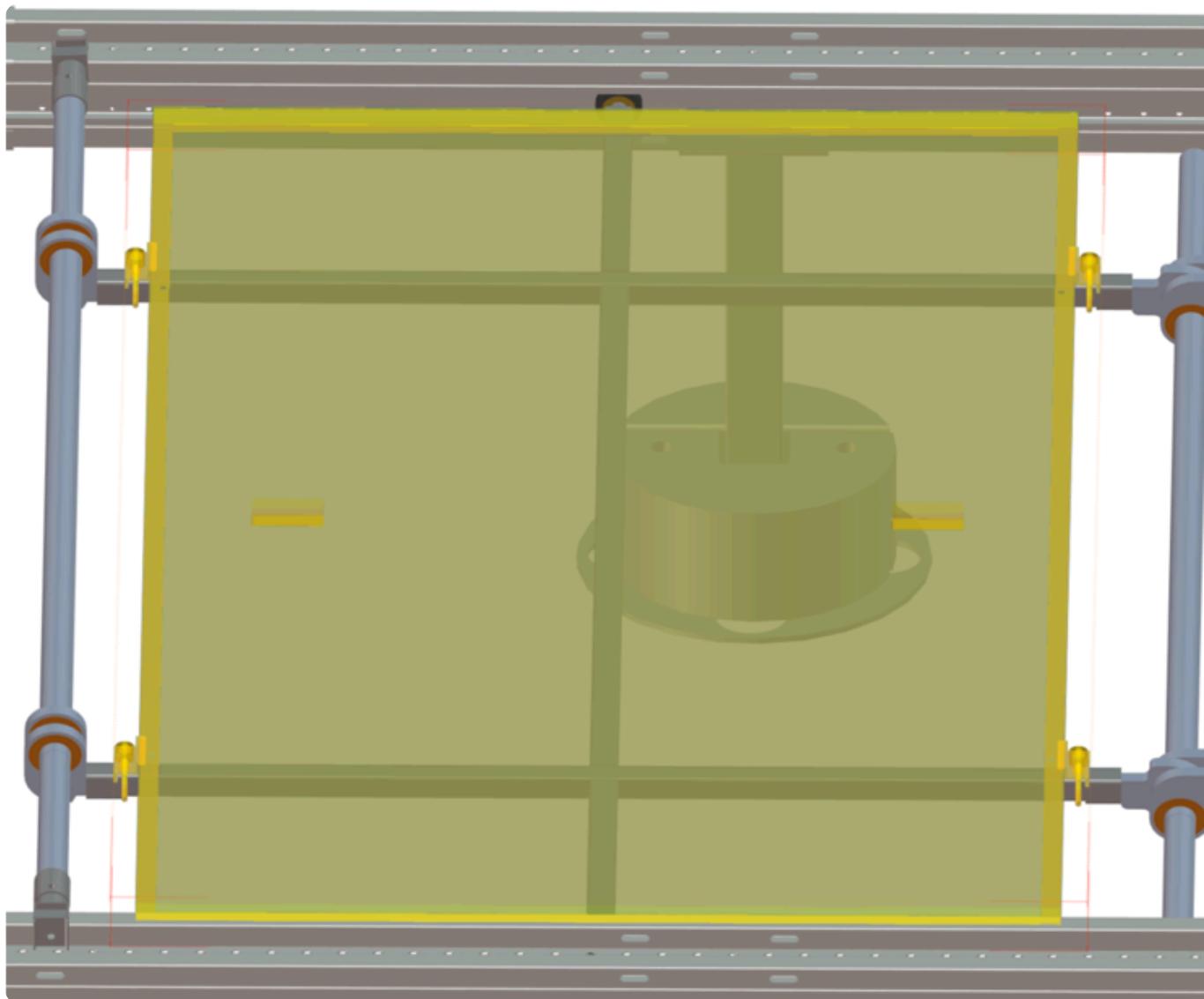
6. Overall effect diagram of one photovoltaic panel module (continue installing subsequent photovoltaic modules according to the above operations)



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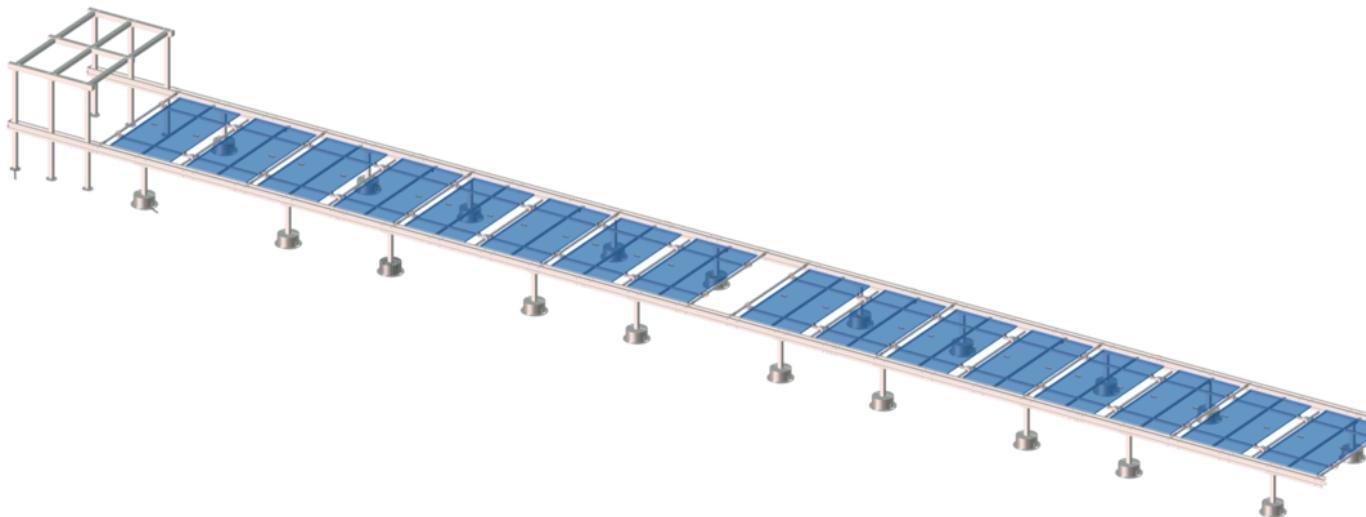
7. Overall installation effect diagram of one column with two groups



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Step 6—Install Photovoltaic Module Series Wiring



Scan QR code to watch video: Positive and Negative Terminal Wiring

This step is used to guide on-site construction personnel to correctly complete the installation of series wiring for multiple photovoltaic modules, ensuring safe and reliable electrical connections and that system performance meets design requirements.

Required Materials List for Installation

Name	Image	Quantity



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Insulating Gloves		2 pairs
MC4 Plug Tool		2 pieces
Metal Cable Ties		≥ 64
Ordinary Cable Ties		≥ 32

Step Details

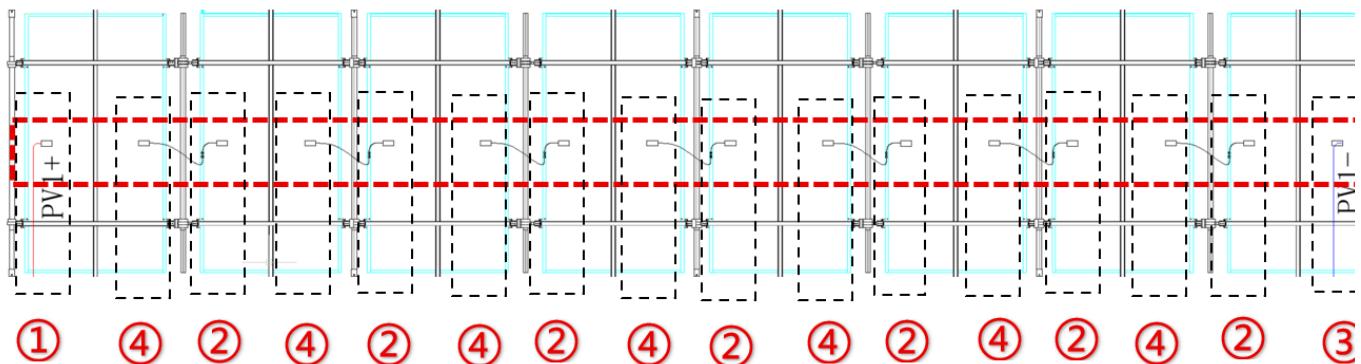
1. System Wiring Layout Schematic



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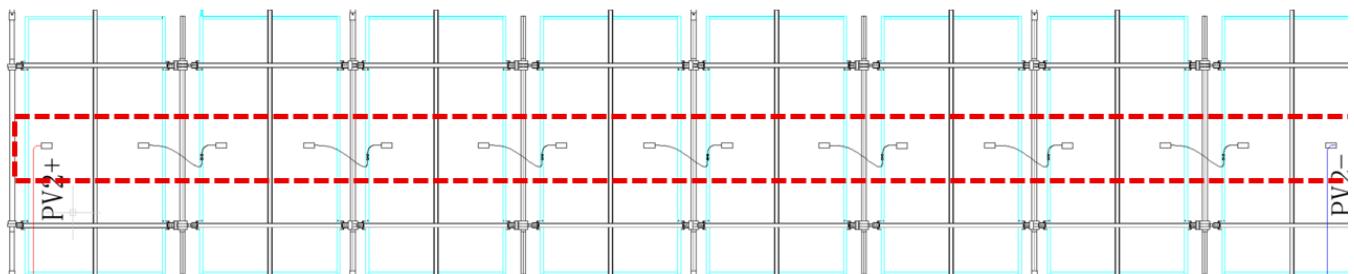
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1. First group series output (8 modules total)

The following numbers correspond to the wiring layout method of each step in "3.5 Step 5-(2) Module Wiring".



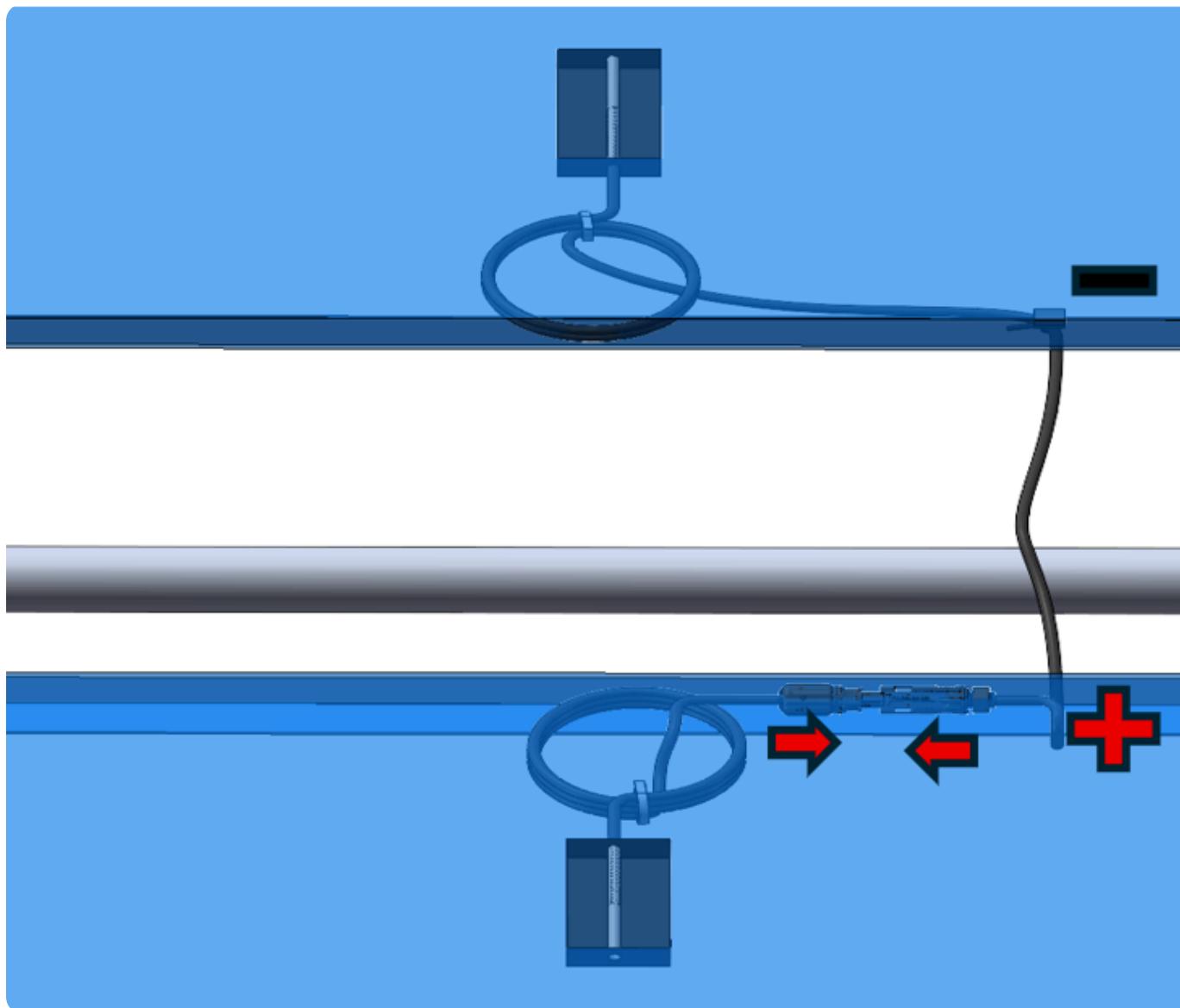
2. Second group series output (8 modules total, same principle)



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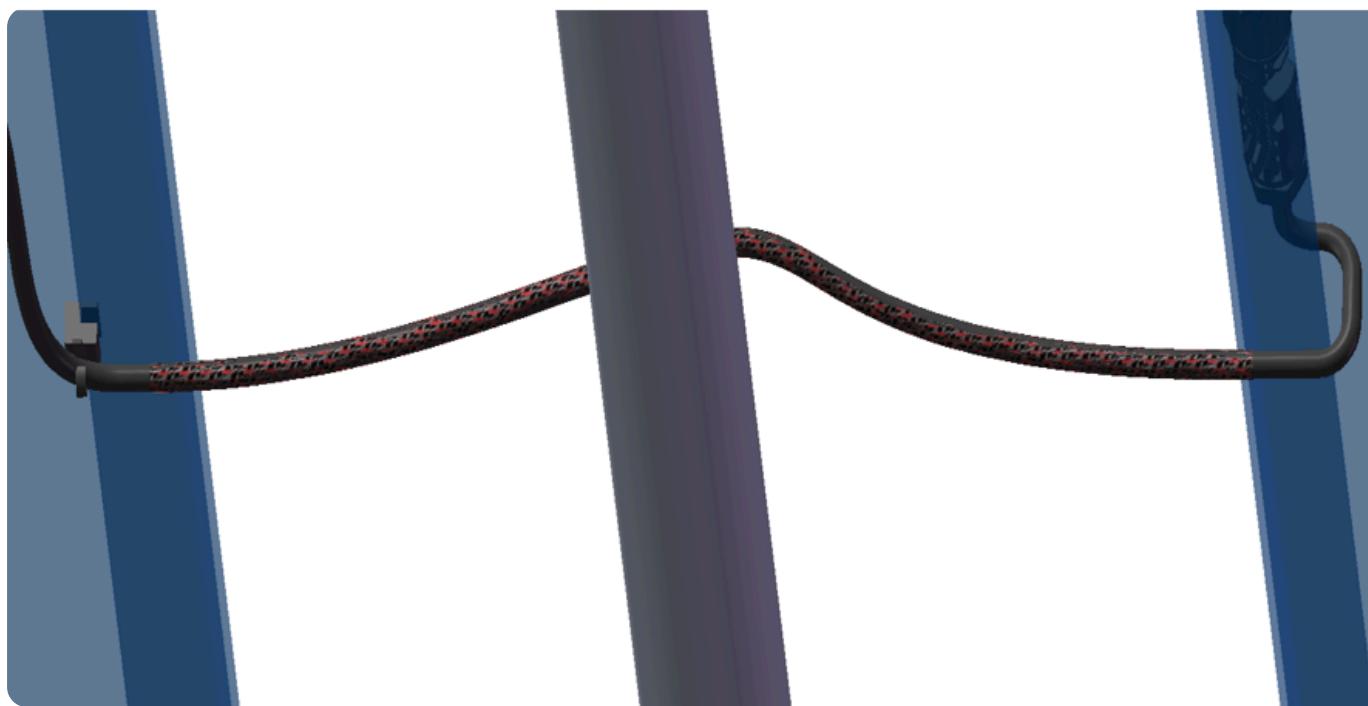
3. Positive and negative wiring diagram

The negative female terminal of one photovoltaic module connects to the positive male terminal of another photovoltaic module, connecting positive and negative terminals to achieve module series connection. (Note: If the middle shaft rod is an upper shaft rod, the wire harness runs under the shaft rod; if it is a lower shaft rod, the wire harness runs on top of the shaft rod)



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4. Use open-ended self-wrapping braided sleeves to cover exposed transition wires



Step 7—Folding and Packaging



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Scan QR code to watch video: Component Packing

Required Materials for Installing Fixing Pieces

Name	Image	Quantity
Fixing Piece		2
12X60 Pin		4
Type B Cotter Pin		4

Step Details

1. Fold Component Bracket



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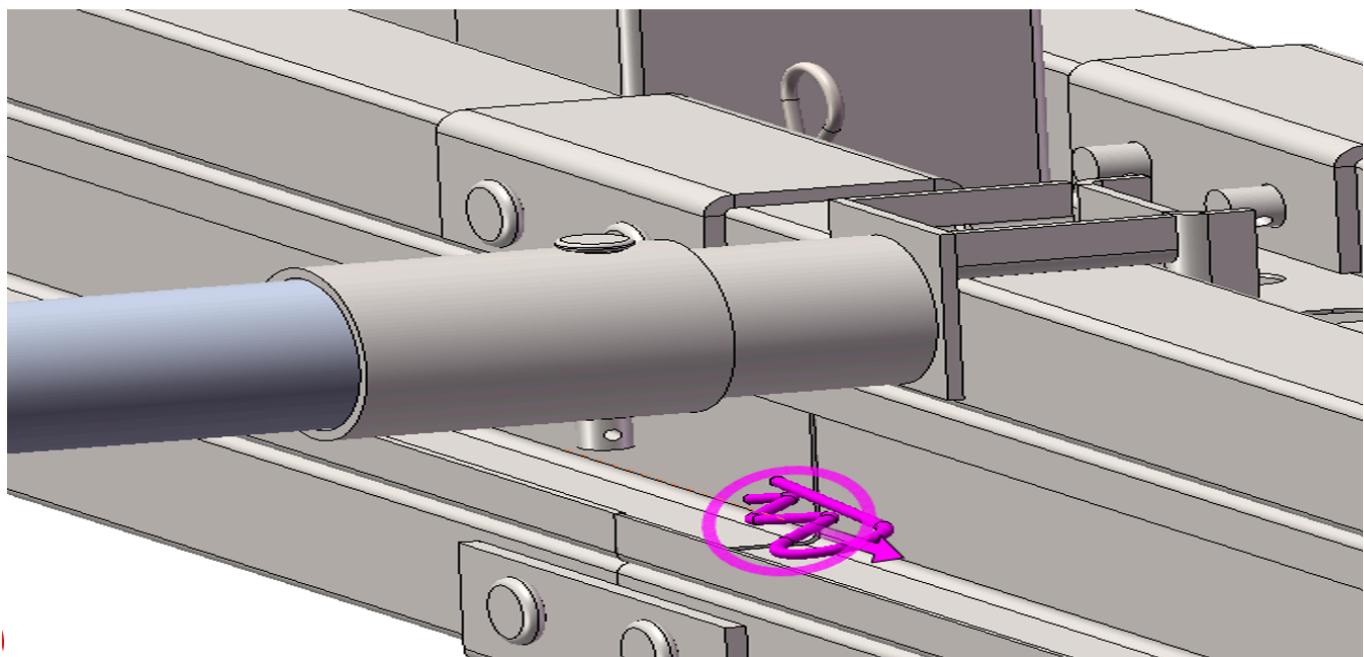
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Scan QR code to watch video: Folding and Unfolding Demonstration

1. First remove the Type B cotter pins at the clamp pieces

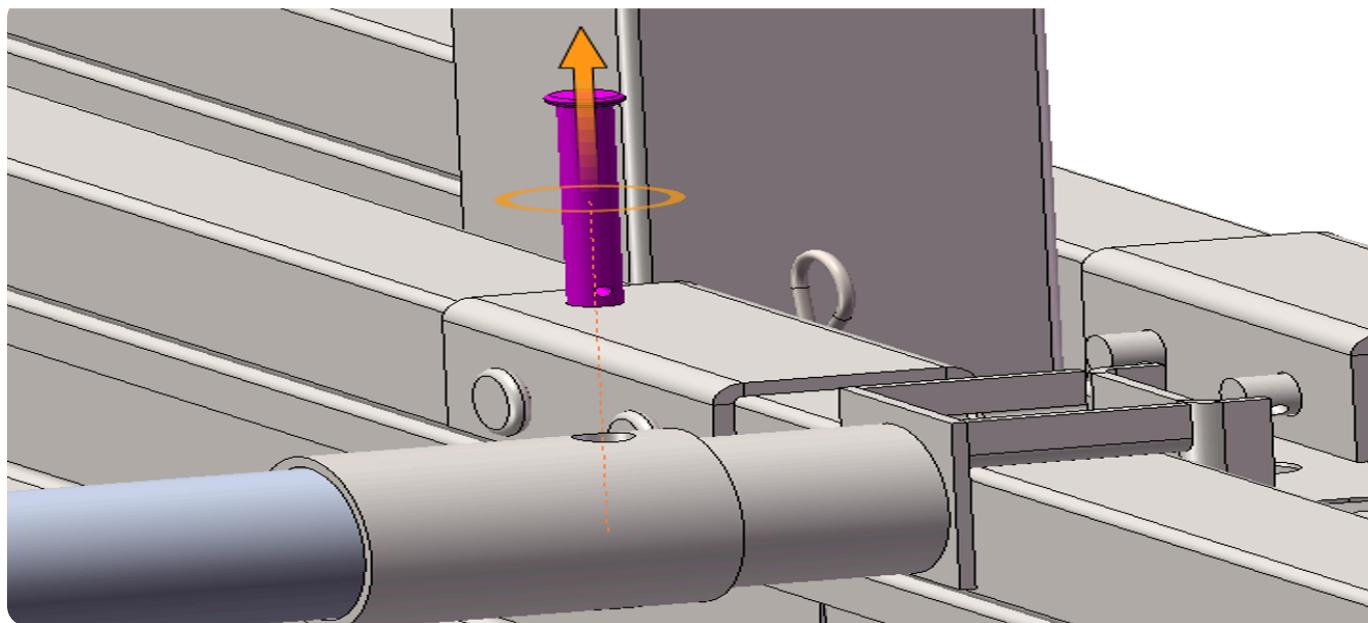


2. Then remove the pins at the clamp pieces

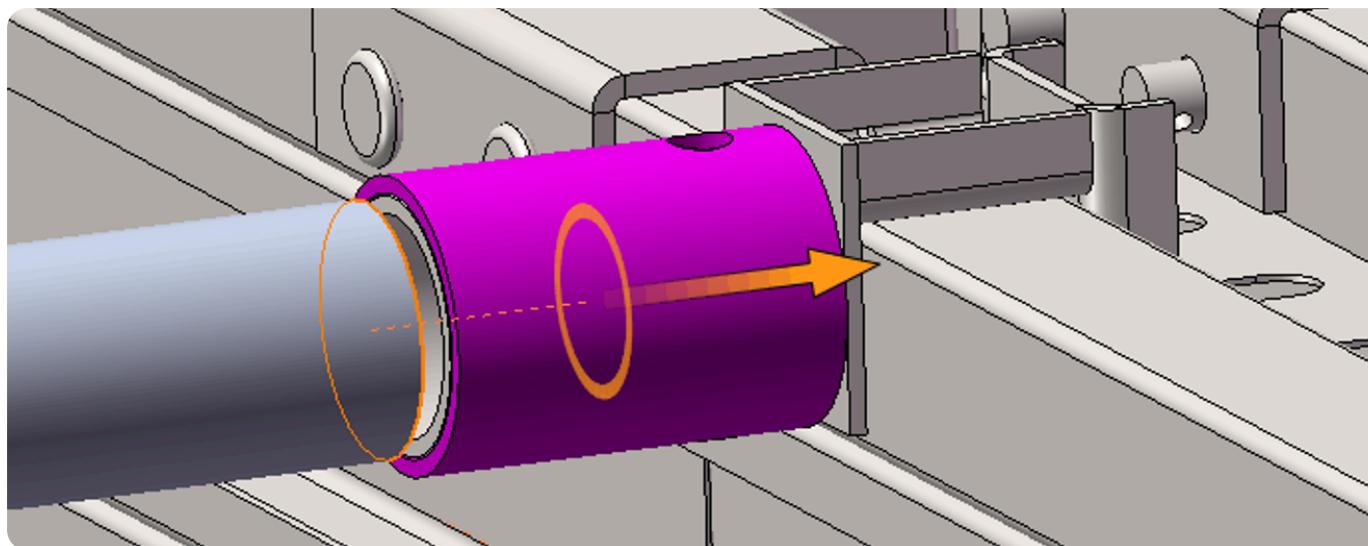


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3. Peel the round tube to one side



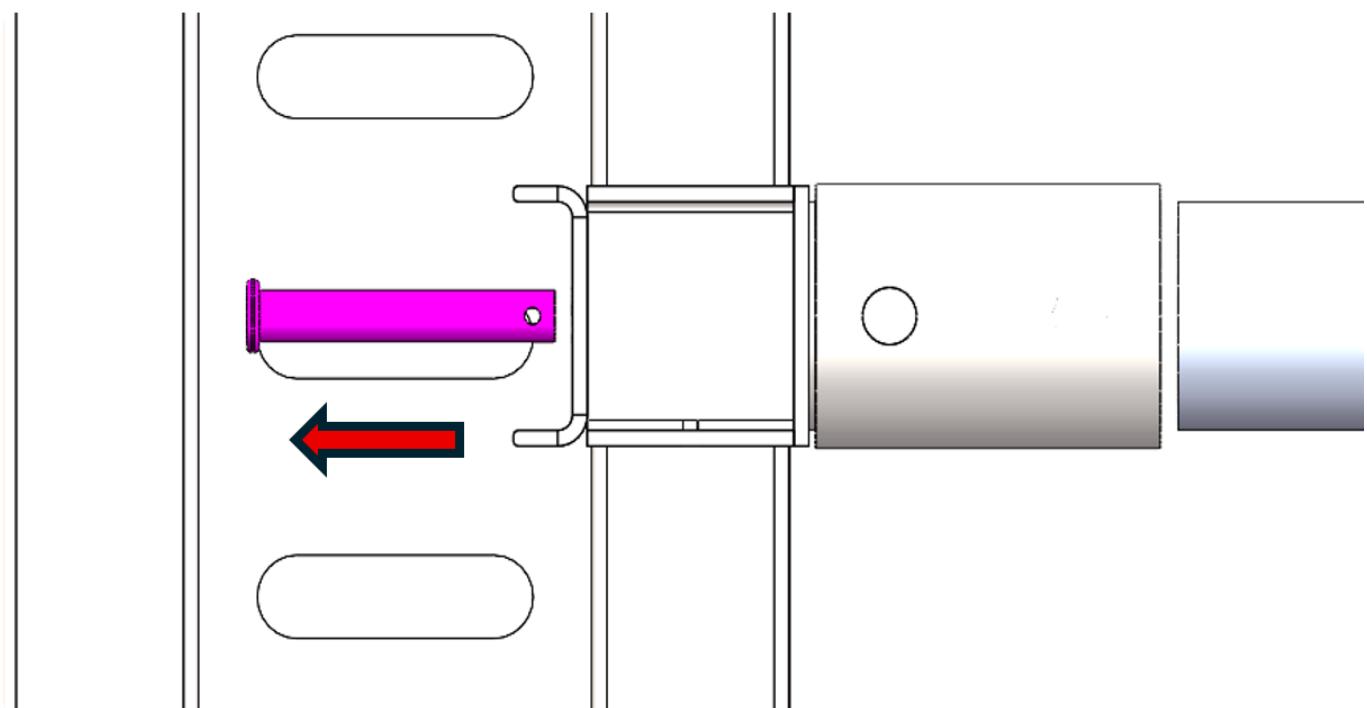
4. Remove the steel ball pins



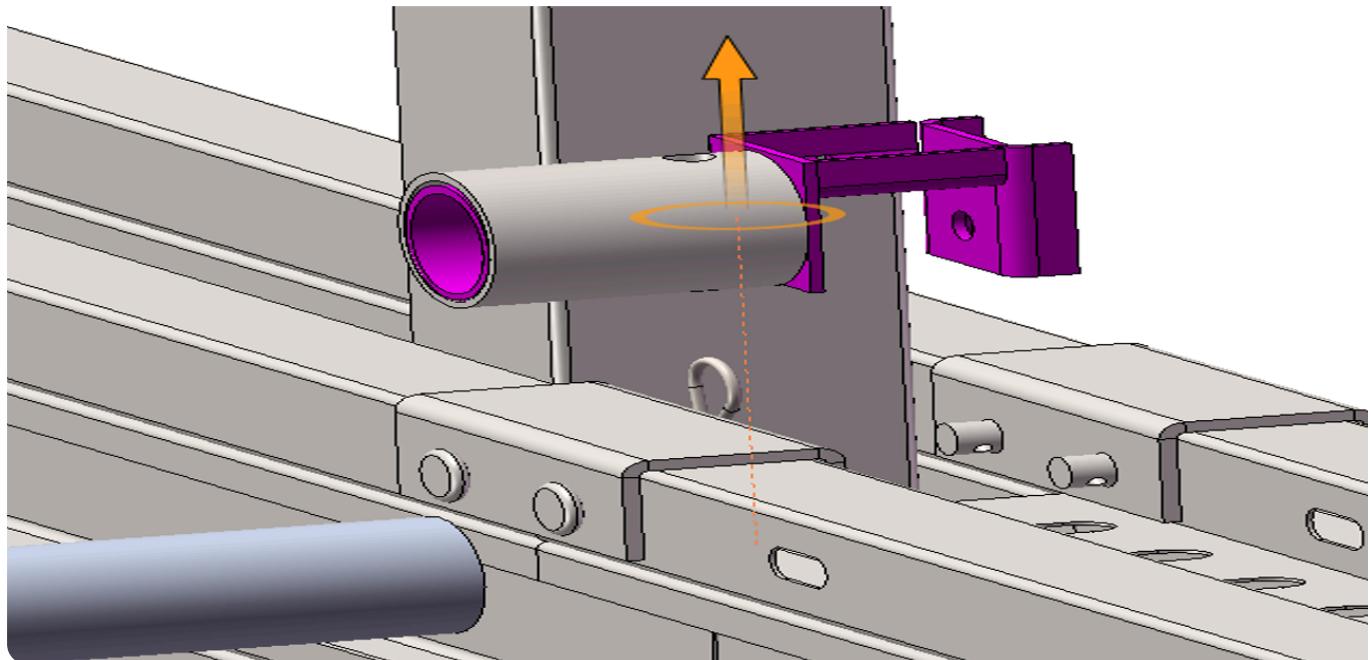
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5. Remove the clamp pieces



6. After removing all clamp pieces from the first group, simultaneously press down the lower shaft rods at both ends and lift the upper shaft rods to fold, then fold the second group in the same

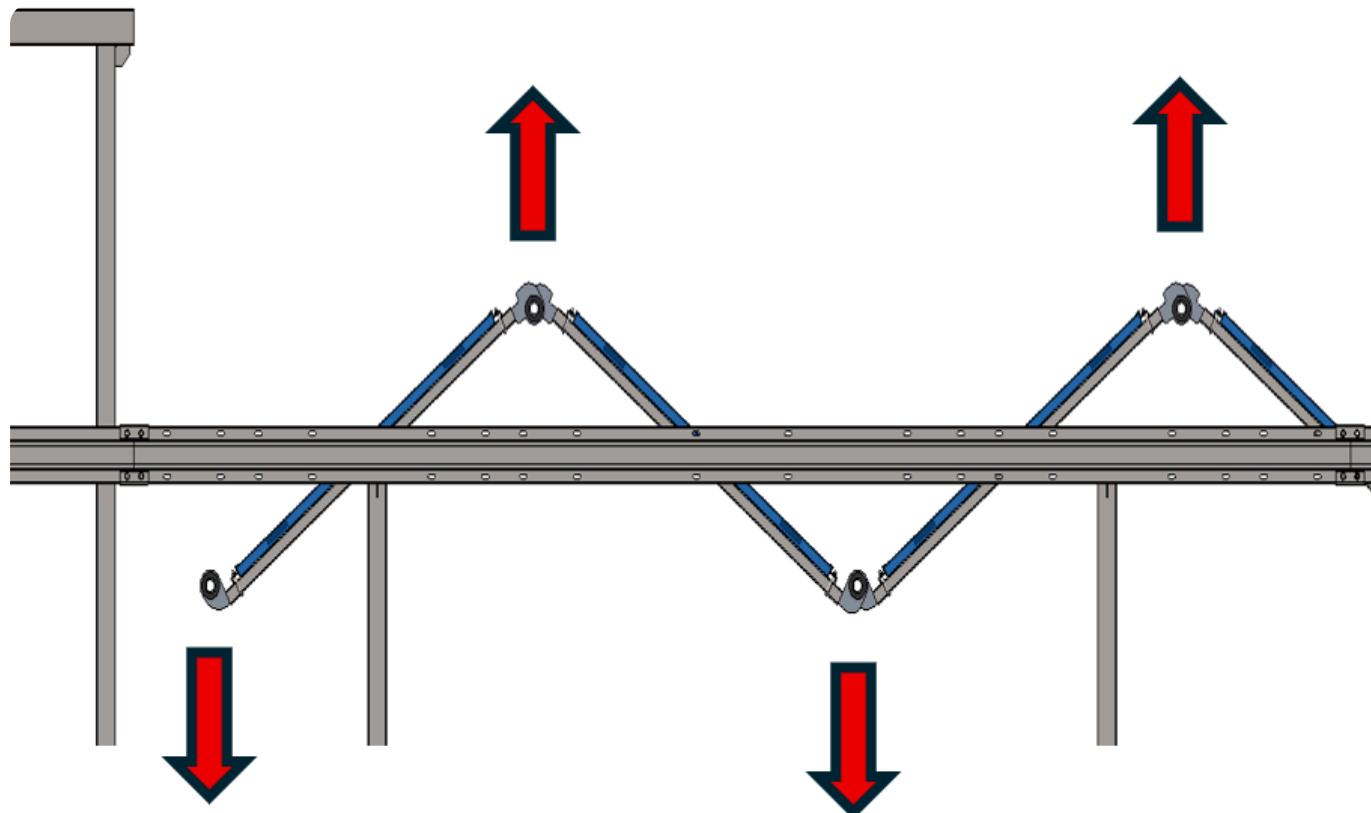


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way

Note: When removing the last clamp piece, please operate carefully to avoid hand pinching risks
 During the folding process, do not place hands near node connectors to prevent pinching injuries:

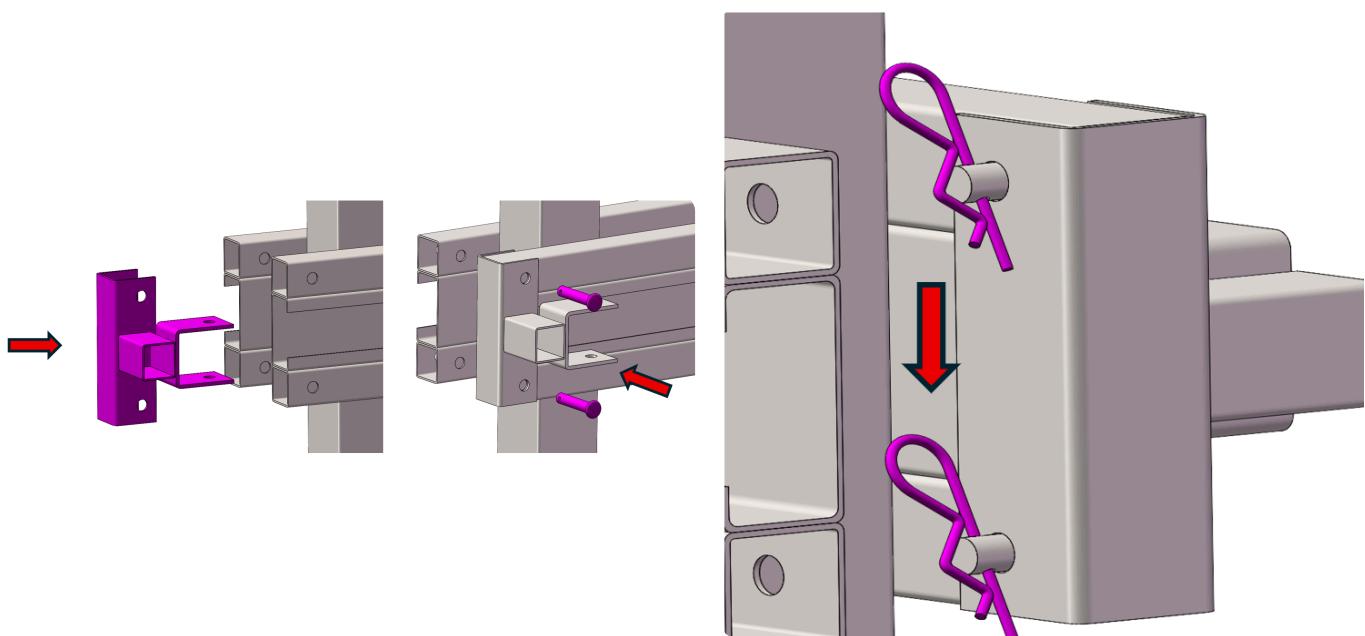


7. Install two fixing pieces on the outer periphery of the fixed frame rail



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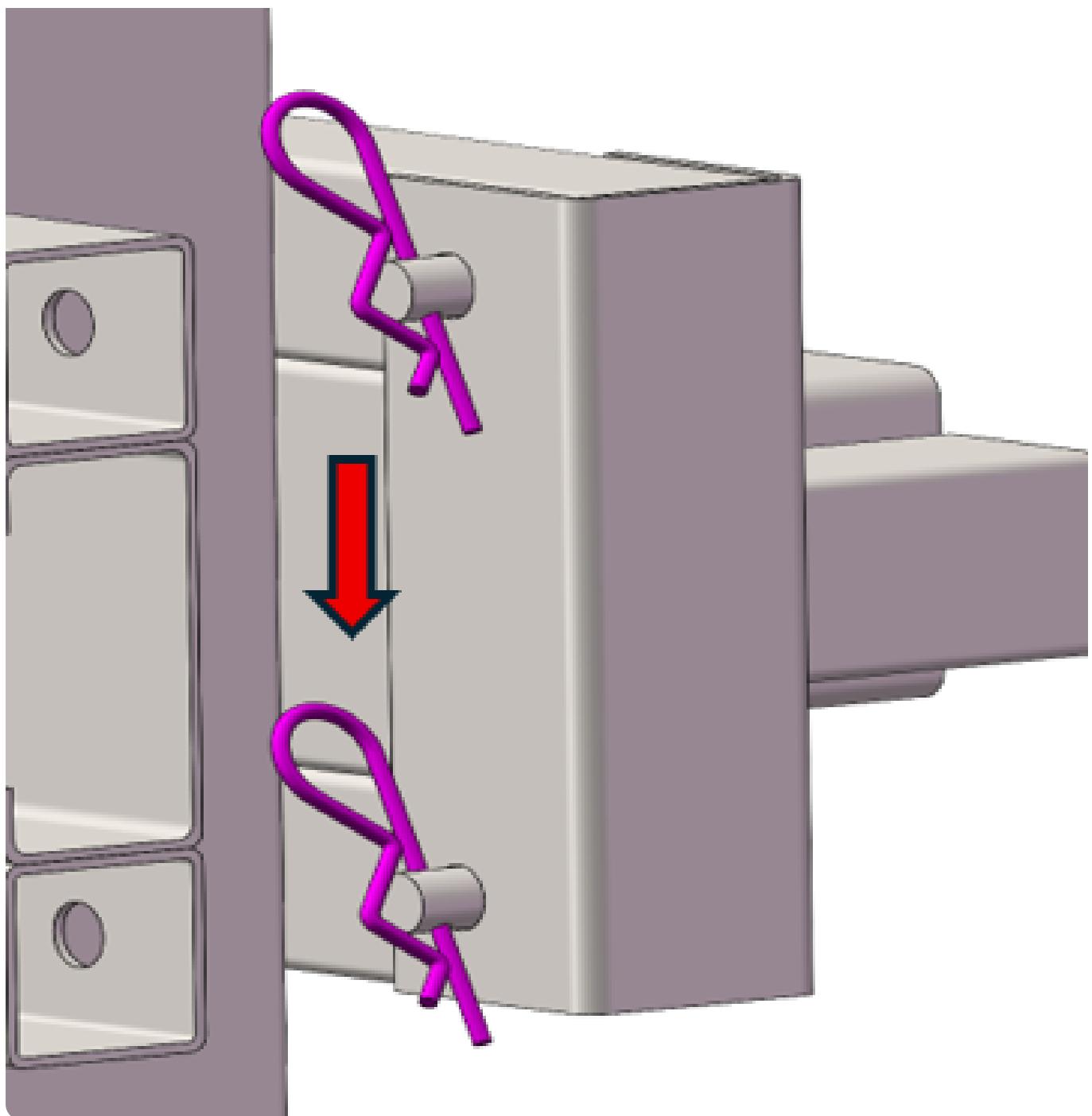
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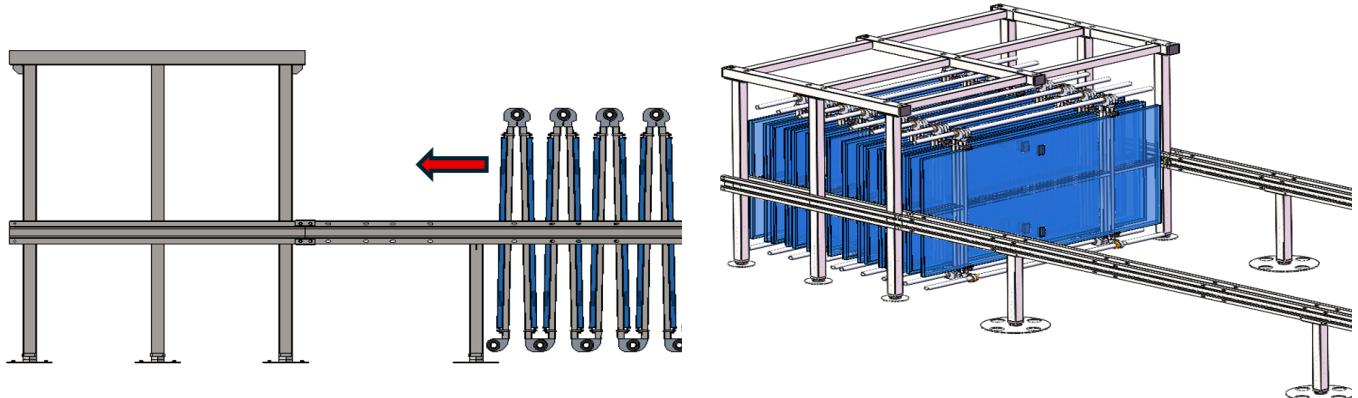


8. First move the first group of folded component brackets along the rail through rollers into the fixed frame, then push the second group into the fixed frame in the same way



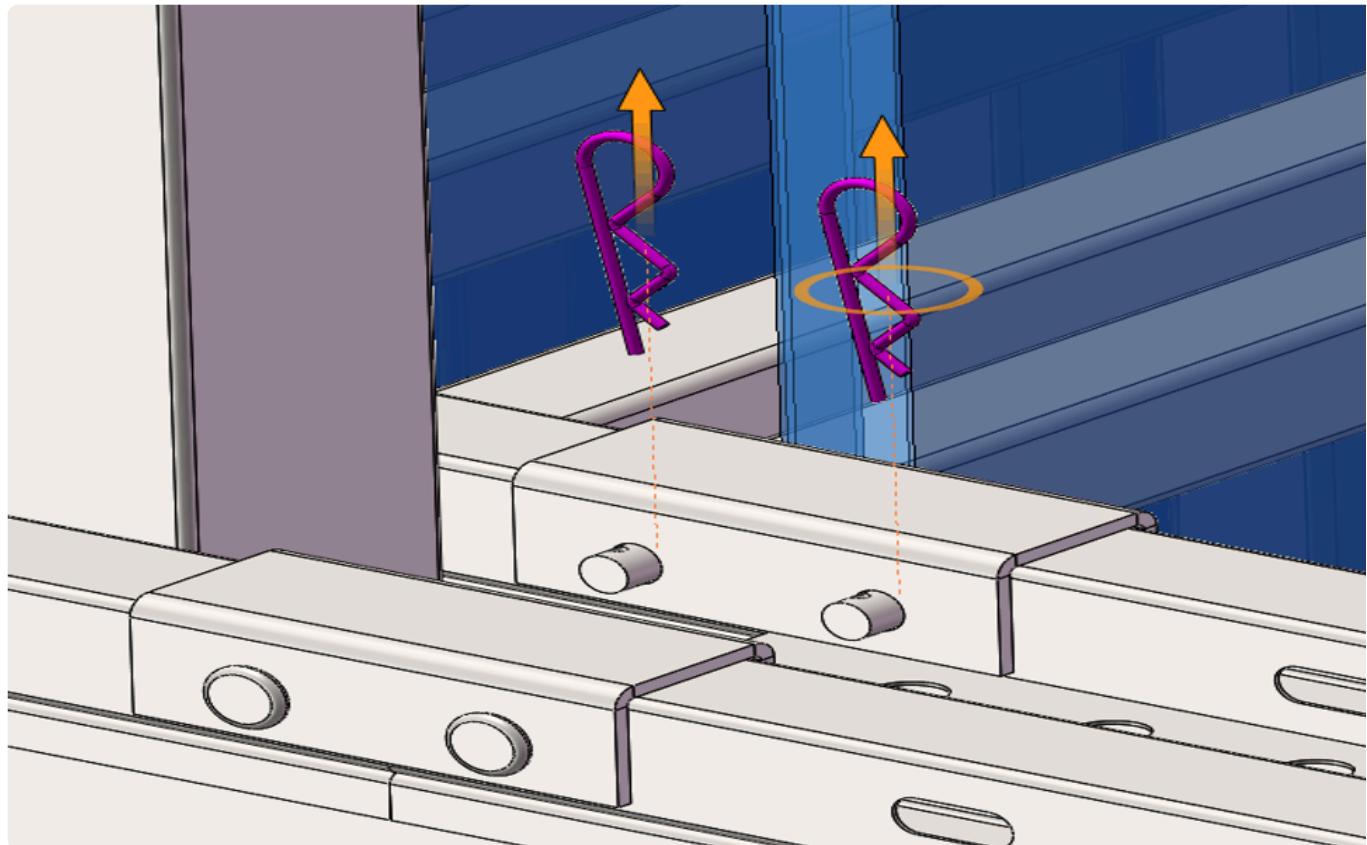
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2. Separate Fixed Frame and Combined Frame

1. First remove the Type B cotter pins at the fixed end rail and combined end frame rail



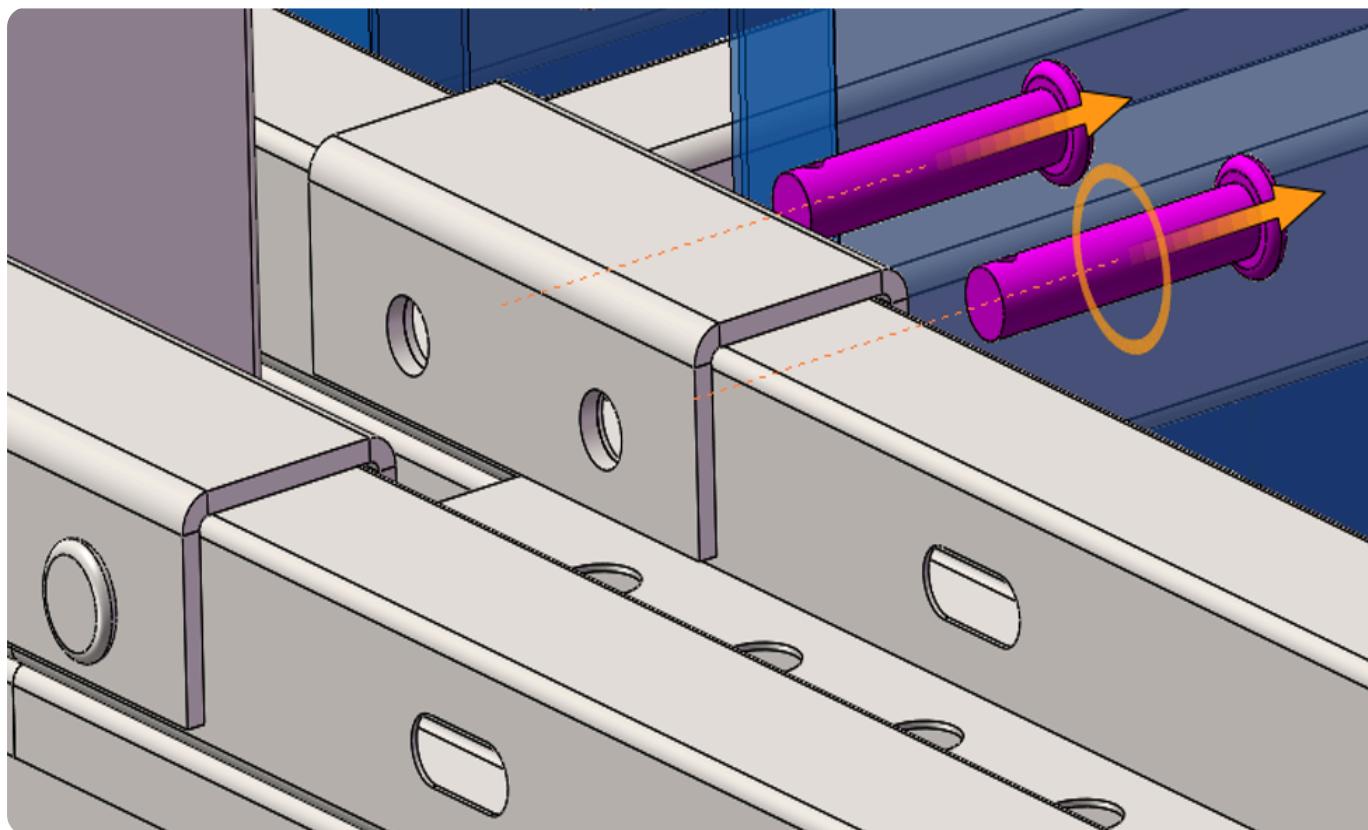
2. Remove the pins at the fixed end rail and combined end frame rail



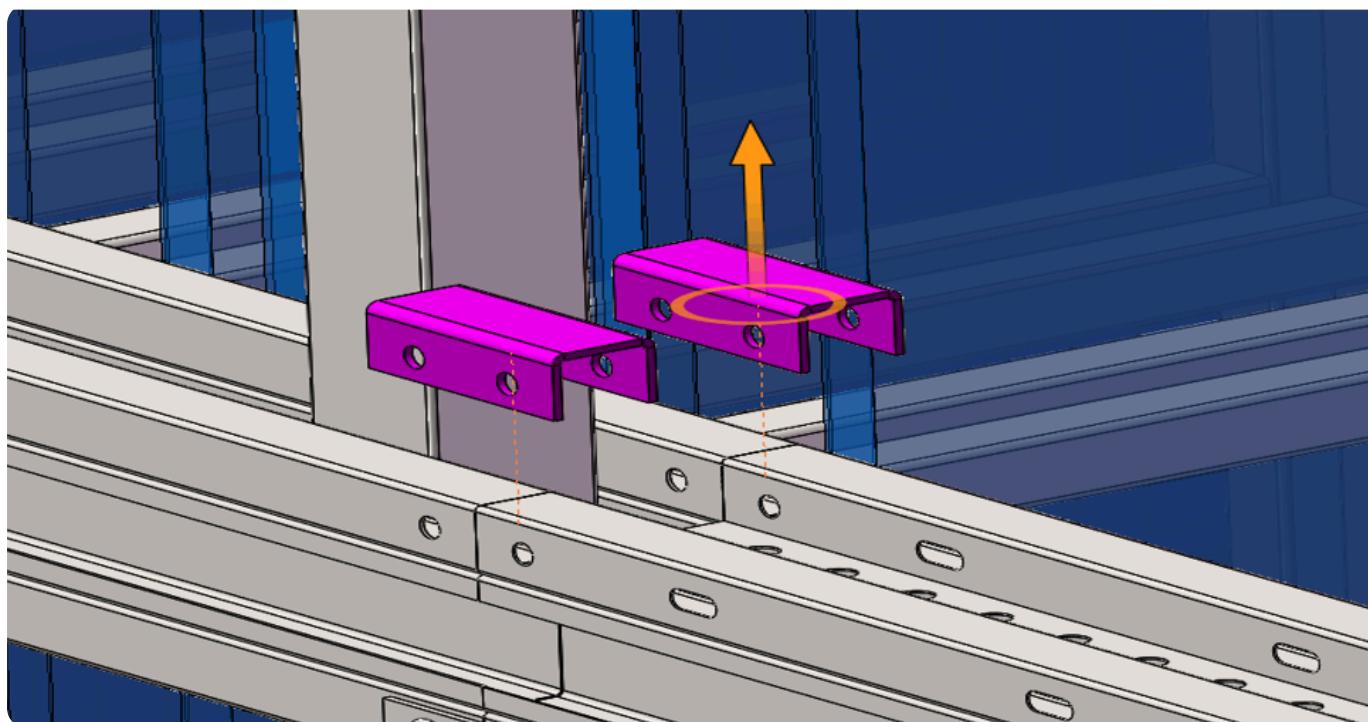
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3. Remove the rail connectors

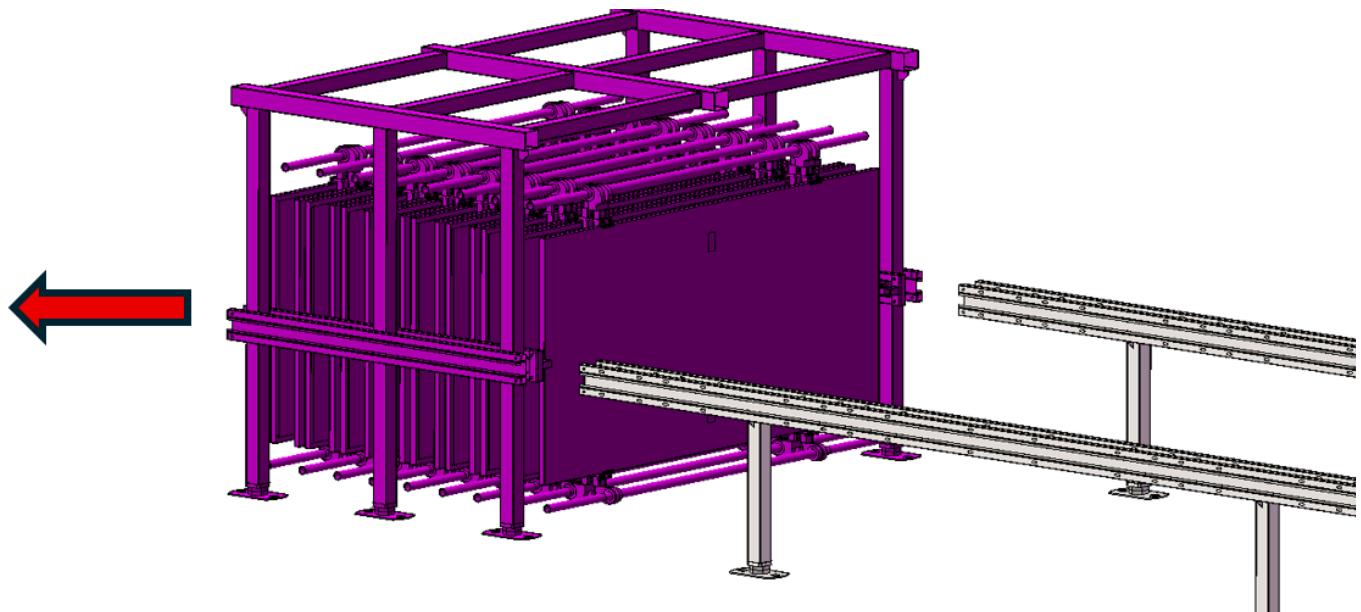


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4. Separate the fixed end frame and combined end frame (use a forklift to move the entire fixed frame away)



3. Component Bracket Packaging

Required Materials List for Packaging Fixing

Name	Image	Quantity
Fixing Piece		2
12X80 Pin		4



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12X60 Pin		4
Type B Cotter Pin		6

Use fixing pieces to fix the rails and component brackets at the four corners, restrict the movement of the folded bracket, and then package the whole unit.

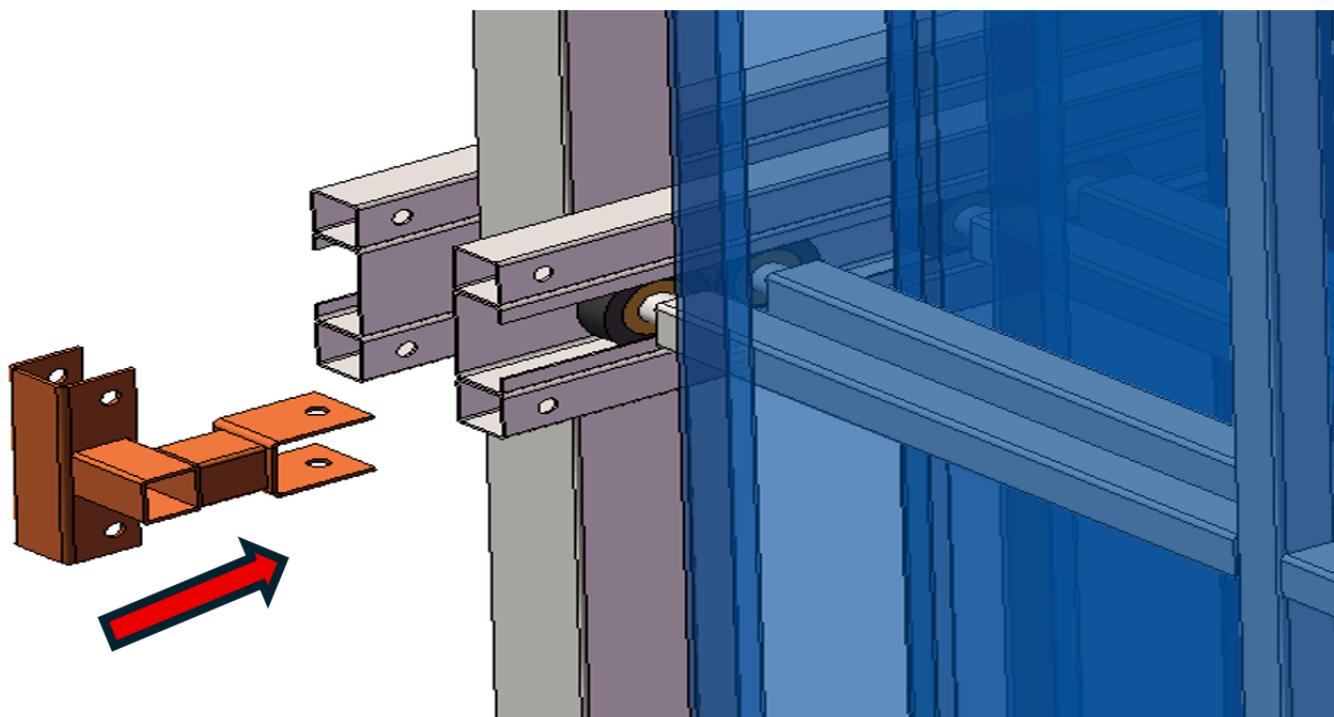
Note: When fixing with fixing pieces, ensure that the components do not have large relative movements and must play a complete limiting role.

1. First align and place the fixing pieces on the rail

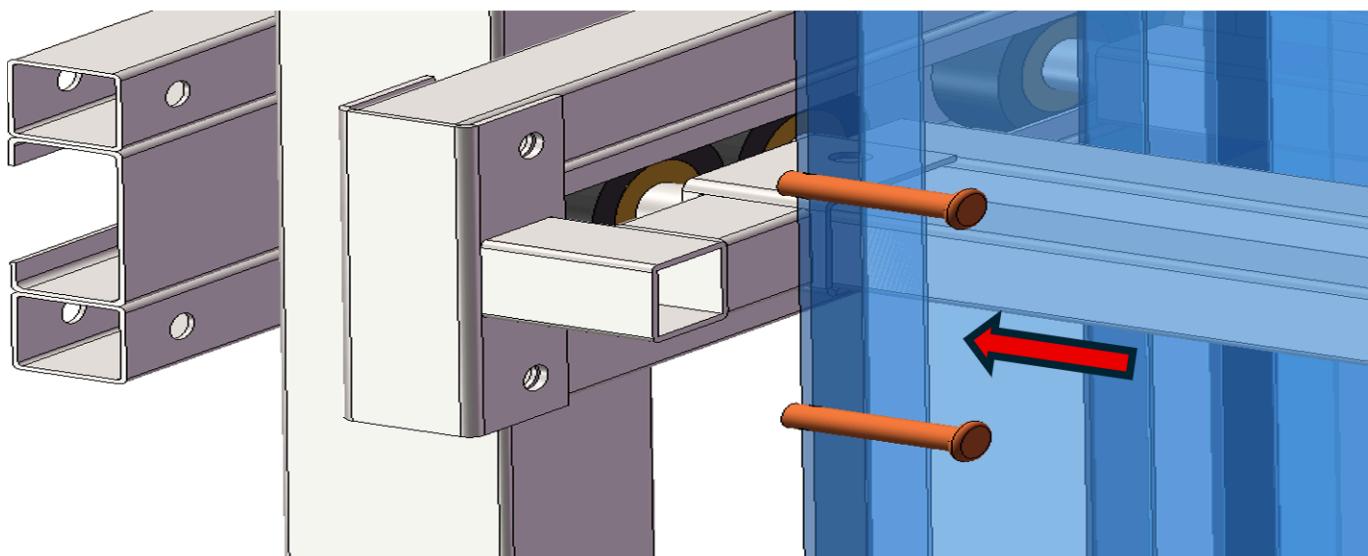


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2. Use 12X60 pins to fix the fixing pieces



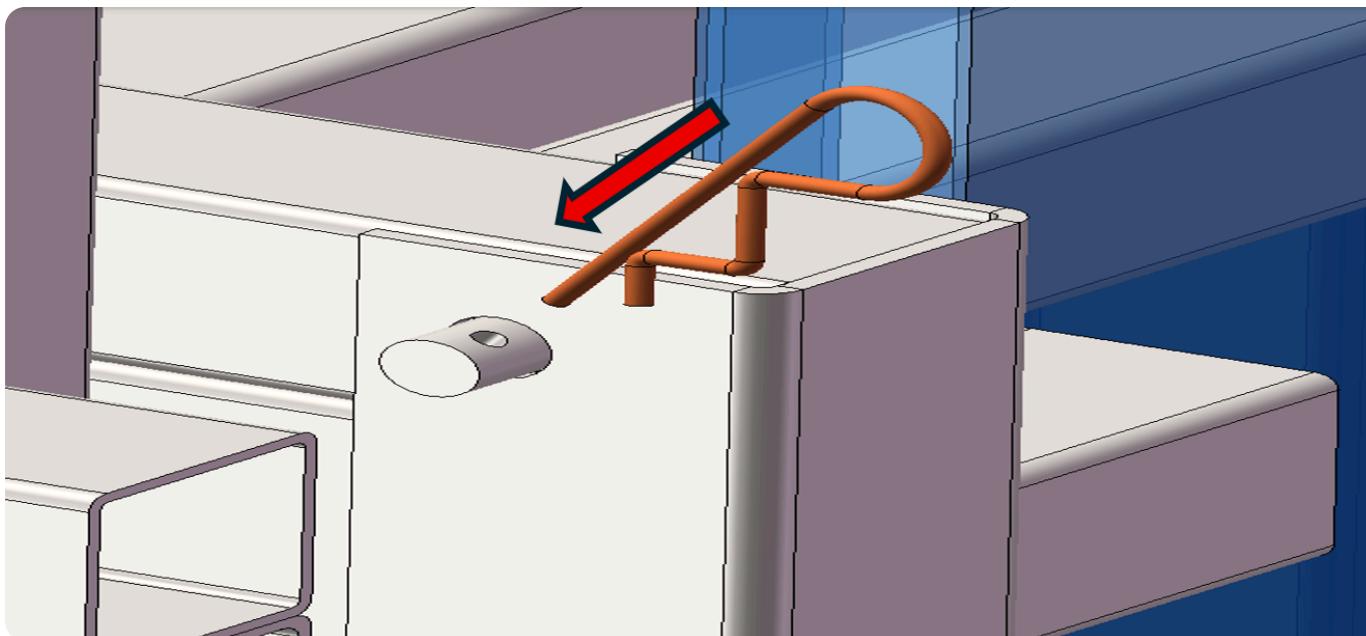
3. Insert Type B cotter pins



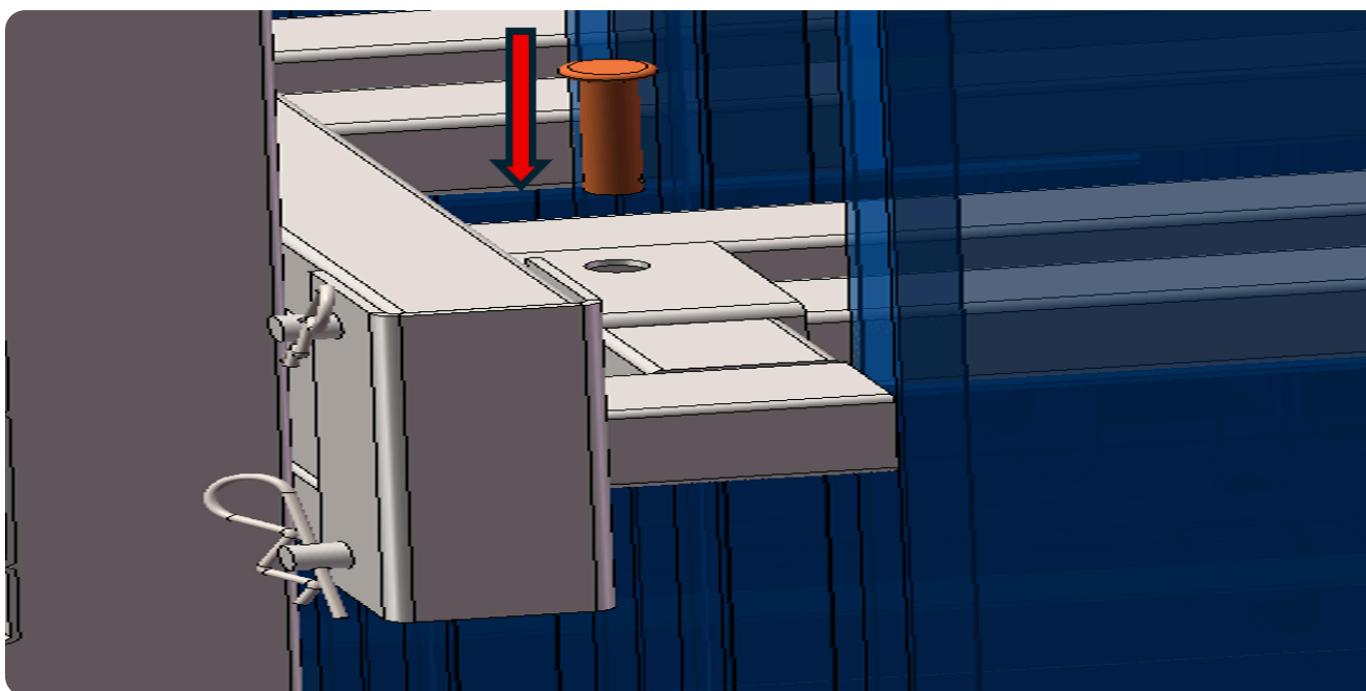
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4. Fix the beam frame end using 12X80 pins



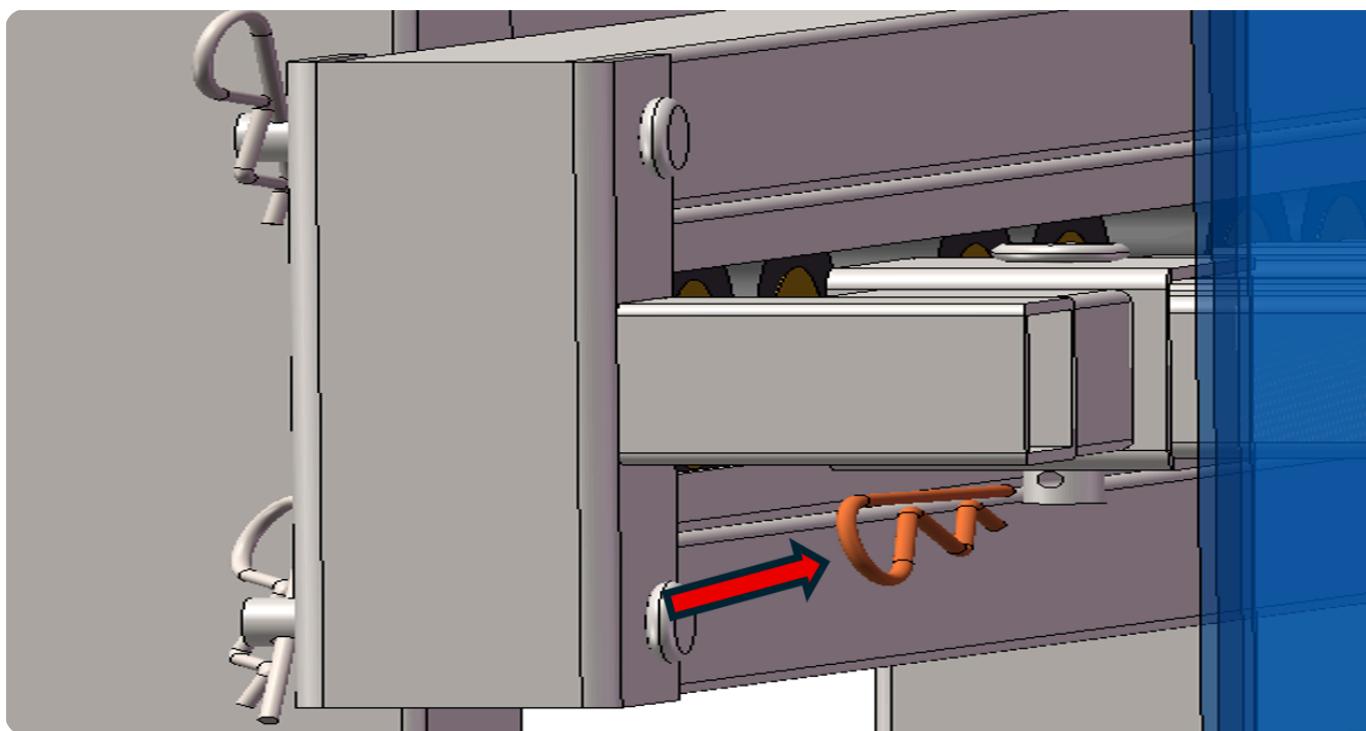
5. Insert Type B cotter pins



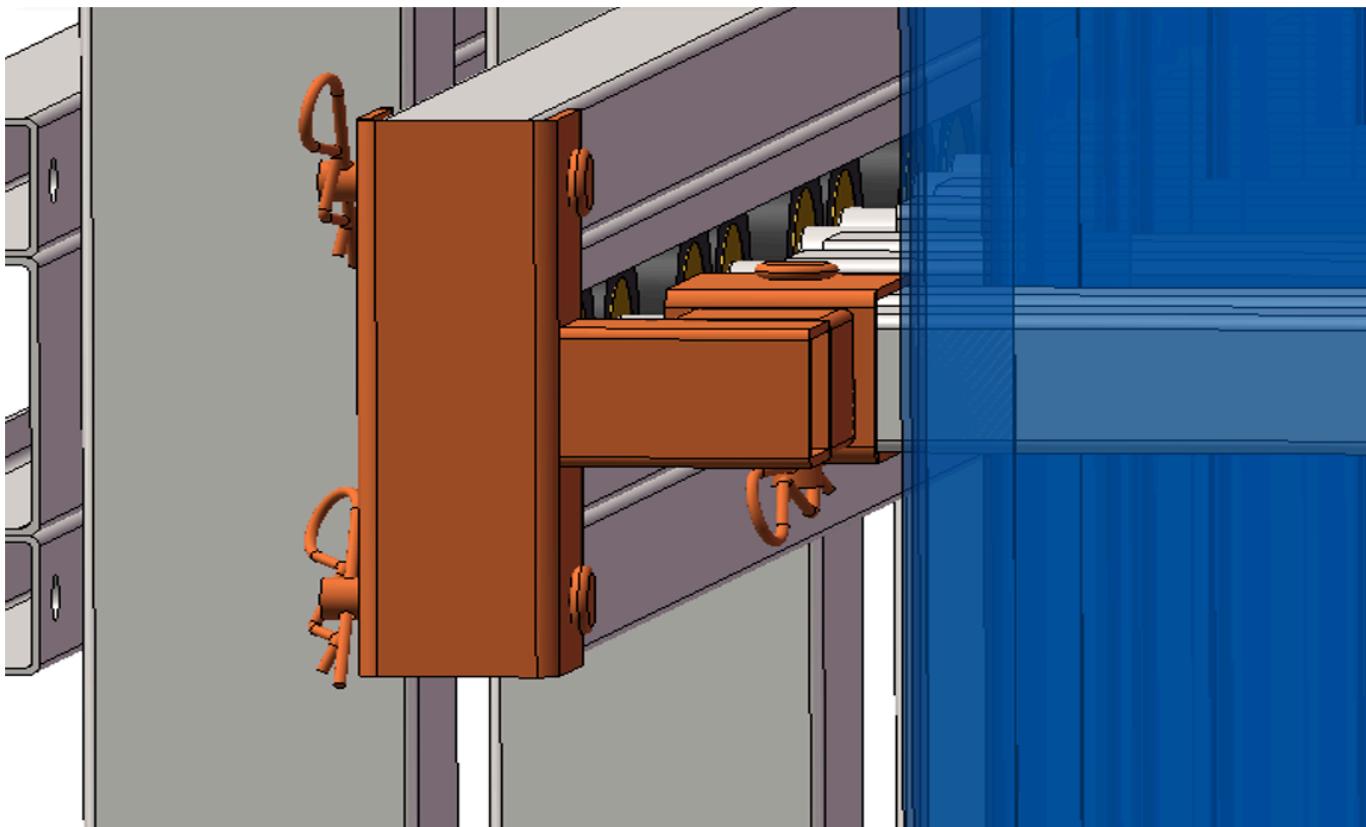
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6. Fixing piece effect diagram

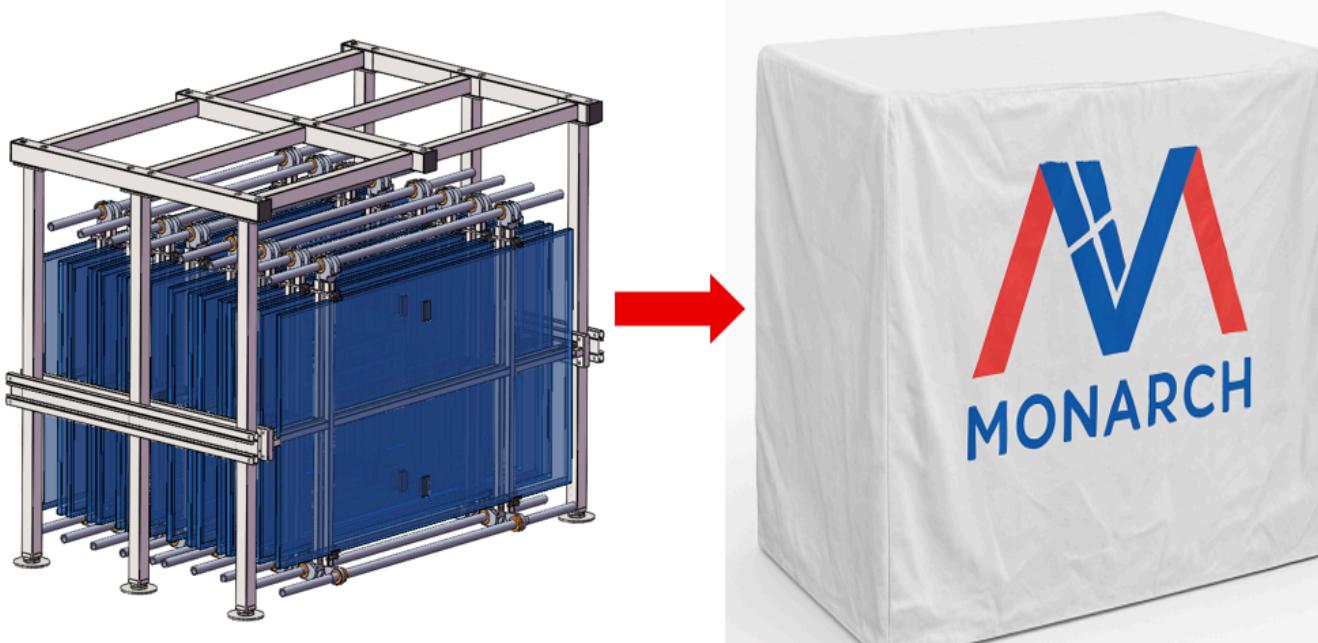


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7. Finally use waterproof tarpaulin to cover the fixed frame and components for packaging and shipping



Debugging and Acceptance

Structural Stability Check

Key points to check:

- Check whether all bolts are tightened, based on (whether lines are drawn after bolt tightening).
- Whether the rail connection parts are smooth (use a level to detect).
- Whether the folding hinge rotation direction is correct (check the shaft rod hinge installation direction).



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Motion Test

Requirements:

- Operational flexibility: During manual testing, folding and unfolding actions should be flexible and smooth, without looseness or excessive tightness.
- Operating condition: During the entire sliding process, there should be no jamming sensation or any abnormal noise (such as friction sounds, impact sounds).
- Folding positioning accuracy: In the fully folded state, the edges of all components should be aligned without obvious misalignment or uneven gaps.
- Smoothness of unfolding process: The entire process from startup to full unfolding should be smooth and continuous without hesitation.

Appendix

Prototype Assembly Pictures

Materials List



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