

DELTABEAM® Composite Beam installation instructions

These instructions are valid in the following countries: Czech Republic, Denmark, Finland, France, Hungary, Italy, Lithuania, Netherlands, Norway, Poland, Russia, Slovakia, Spain, Sweden, Switzerland and United Kingdom.

These DELTABEAM® installation instructions are intended to complement the project's erection method statement. Peikko's technical support is available to assist with the erection method statement if required. If there are differences between the erection method statement and this document, the differences should be approved by the structural engineer.

NOTE: IF THE INSTALLATION TOLERANCES OF DELTABEAM® ARE EXCEEDED, PEIKKO MUST BE CONTACTED. DELTABEAM® OR CONNECTIONS BETWEEN DELTABEAM® COMPOSITE BEAMS CAN NOT BE MODIFIED WITHOUT PERMISSION FROM PEIKKO.

Deliveries

DELTABEAM® Composite Beams are delivered to the site in accordance with the agreed project schedule. The delivery of each shipment should be confirmed with Peikko two weeks before shipping. At the factory, DELTABEAM® Composite Beams of different lengths are not loaded in the order of installation because that would not be economical or practical. The beams are marked with identification codes in accordance with the drawings.

Storage on-site

The visible bottom parts of DELTABEAM®, web plates from the edge of the bottom surface to height 50 – 100mm, end plates, all connections, formworks, and downstands are primed to a minimum 80 µm of anticorrosive primer. Other surfaces are primed to 40 µm. The customer does the final painting on-site and it is not a standard part of DELTABEAM® delivery.

For long-term storage, the beams must be covered. Piling strips are used under the beams to protect surface treatment. Piling strips should be free from grease or other substances that may damage surface treatment. When storing beams in piles, the bearing capacity and the level of the surface should be verified.



Lifting and moving

DELTABEAM® can be lifted and moved using ordinary lifting equipment, such as cranes or forklifts. The weight of each DELTABEAM® is displayed on the product sticker on the beam and in the fabrication drawings. The CE marking sticker, QR-Code sticker which will link to these installation instructions, and DELTABEAM® trademark can also be found on the beam.

DELTABEAM® must be lifted using the lifting holes on the top plate symmetrically to the axis of the center of mass. The maximum allowed lifting angle of the chains must be observed. In special cases, when there are no lifting holes,

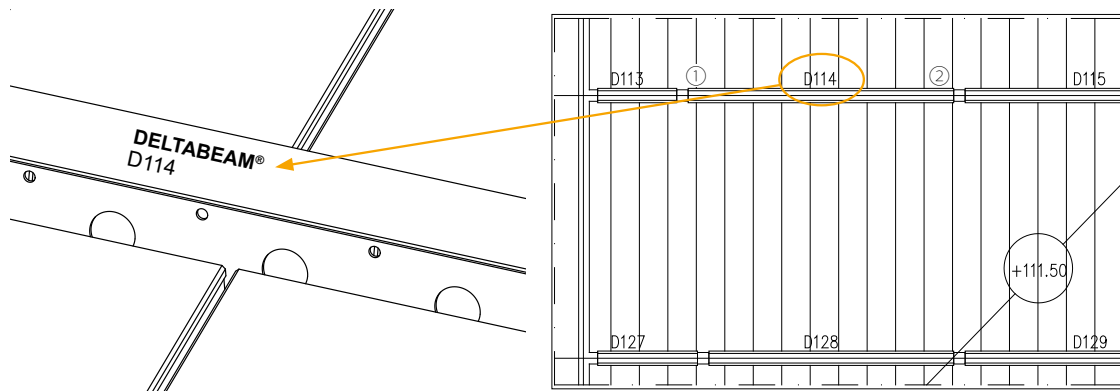
DELTABEAM® can be lifted with chains attached to the web holes. In some cases, a third chain is needed to lift DELTABEAM® and maintain its balance. For example, DELTABEAM® with wide formwork sheets should be lifted using the lifting holes and a third chain should be attached to the formwork structure.



NOTE: ALWAYS USE APPROVED LIFTING CHAINS AND LOCK THE CHAIN HOOKS. NO LIFTING STRAPS OR CHAINS AROUND DELTABEAM® AS THIS WILL INVOLVE A RISK TO HEALTH AND SAFETY!.

Assembling DELTABEAM®

The project's erection method statement must be followed. Every DELTABEAM® has the DELTABEAM® trademark and identification code on the top plate near the beam end ①. The beams are installed in such a way that the identification code on the top plate of DELTABEAM® can be read in the same direction as marked in the element layout drawing.



Connecting DELTABEAM®

DELTABEAM® Composite Beams are connected in accordance with the project's erection method statement, the installation plans, and the connection details. The connection details are specified in the construction plan for each project. Shim plates and steel packs should be placed in accordance with the project related erection method statement. The DELTABEAM® delivery only includes installation material for the connections between DELTABEAM® (Gerber and Side connections).

Important

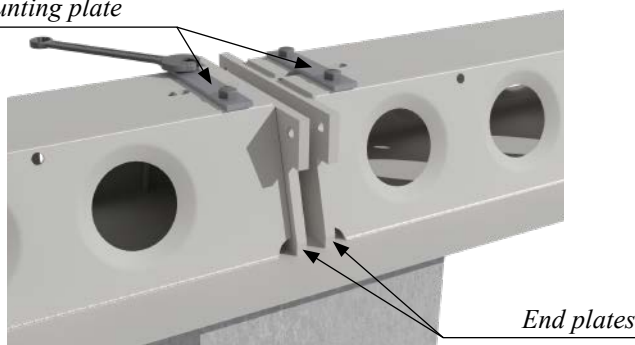
During the installation of the slabs, maintaining the frame stability requires connecting DELTABEAM® before assembling the props and floor units. This prevents the beams from moving. If on-site welding is required, the process and the qualification of the welders should be in accordance with the erection method statement.

Shim plates in Gerber and side connections are used by default to allow installation tolerance. Installation tolerance is +5 mm / -10 mm, and the maximum thickness of the shim plates is 15 mm. DELTABEAM® lengths have been designed including a shim plate; a 5 mm shim plate is set to every connection after DELTABEAM® is installed and before the bolts are tightened. Any variations to the designed total length of the beam line are taken into account by adding or removing the number of shim plates from other connections within the allowed tolerances.

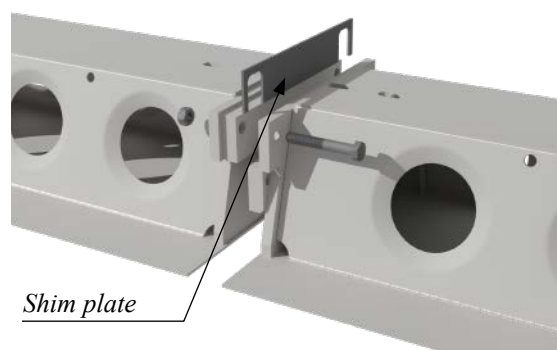


Connection with HPM® anchor bolts

Mounting plate



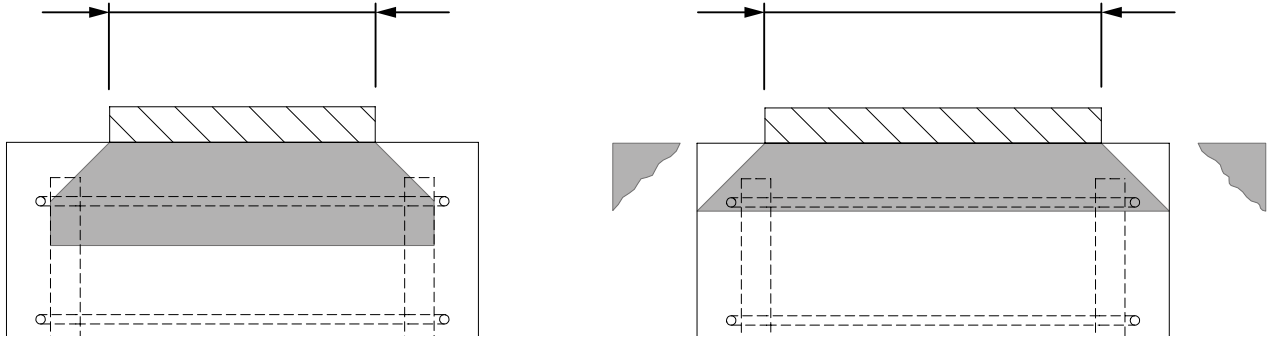
Gerber connection



INSTALLING

When assembling continuous DELTABEAM® Composite Beams, the location of each DELTABEAM® and the total length of the beam line should be confirmed before tightening the bolts in the Gerber connections and other connections. The ends of the continuous beam lines must be prevented from uplifting during installation.

Steel packs are placed on the reinforced concrete structure so that the effect of the contact stress remains inside the perimeter of the stirrup reinforcement. The risk of spalling can be reduced by applying chamfers to the edges of the concrete structure. The usage of neoprene is not recommended between DELTABEAM® and the support.



NOTE: DELTABEAM® CUTTING, OPENING OUT BOLT HOLES, ETC. REQUIRES A PERMISSION AND INSTRUCTIONS FROM PEIKKO.

Propping DELTABEAM®

Propping needs to be carried out in accordance with the project's erection method statement before assembling the floor units. DELTABEAM® must be connected in accordance with the erection method statement, the installation plans, and the connection details before propping. Only certified props are to be used. Their quantity and placing must be in accordance with the propping plan made by a structural engineer.

The stability of the props must be confirmed when they are assembled. The foundation for the props must also be secure and solid. The props shall be assembled as close to the beam support as possible. The props are placed at the loaded side of the beam, below the web. The props may be removed only when the joint concrete and the infill concrete of DELTABEAM® have reached the required strength.

With hollow-core slabs, DELTABEAM® propping is only used to prevent the rotation of the beam at the supports. The function of DELTABEAM® propping is not to prevent deflection. Hollow-core slabs cannot be propped without permission from the hollow-core units manufacturer.

The role of propping is crucial when DELTABEAM® is bearing on the end of a wall running parallel with the beam. The propping plan prepared by a structural engineer shall be followed.

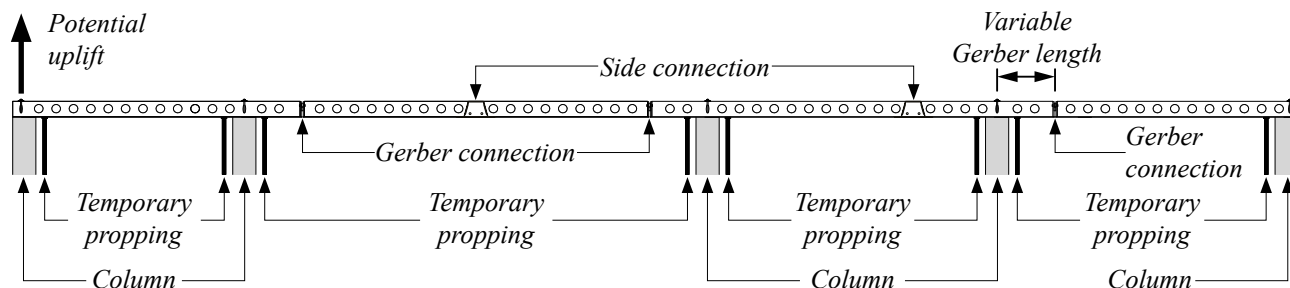


Support for PCs® console connection



Wall support

Propping of continuous DELTABEAM® line and potential uplift.



- Propping in the position of Gerber and Side connection is not required.
- Both Gerber and Side connections are designed to take the torsion from loads acting in the erection stage.
- The possible uplift effects of loads during the erection or final stage must be considered when designing the connection details and supporting structures of DELTABEAM® by the structural engineer responsible for the project. E.g. Peikko's PCs® LOCK Corbel is designed to uplift. See PCs® Corbels technical manual for more information.

The DELTABEAM® wide formwork sheet must always be supported. If this is not possible – special agreement with Peikko technical support is needed. The continuous support is placed along the edge of under the corner of the wide formwork sheet. The continuous support is supported with props, and it shall be the same length as the supported formwork sheet.



Special attention should be paid to asymmetrically support beams, long beam spans, or tall propping heights. When the propping heights are tall, traditional methods such as temporary columns or towers are used. Peikko's technical support helps with demanding propping issues.

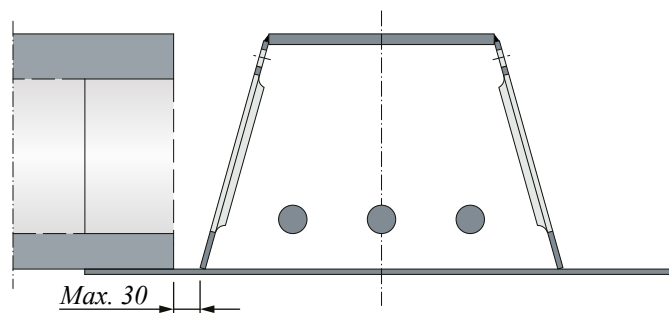
NOTE: DELTABEAM® PROPPING IS USED WITH HOLLOW-CORE FLOORS ONLY TO PREVENT THE BEAM FROM ROTATING AT ITS SUPPORTS.

Assembling floor units

The DELTABEAM® connections and the props must be securely installed, tightened, or welded before assembling the floor units. To minimize the rotation of the beam, the floor units should be assembled alternately on different sides of the beam. If one side is loaded, erection props must be designed accordingly. After the slabs are installed the necessary formwork, edge forming, and slab reinforcement will be carried out.



Floor units should be assembled directly on the beam ledge. The use of neoprene is not recommended. Floor units should be assembled so that there is a gap of a maximum of 30 mm between the web of the DELTABEAM® and the end of the floor unit. If this gap is exceeded, contact Peikko or the structural engineer. Finally, all holes on the bottom side of DELTABEAM® (locations of consoles, Side connections, and Gerber connections) should be blocked. The joint and ring reinforcement are also assembled.

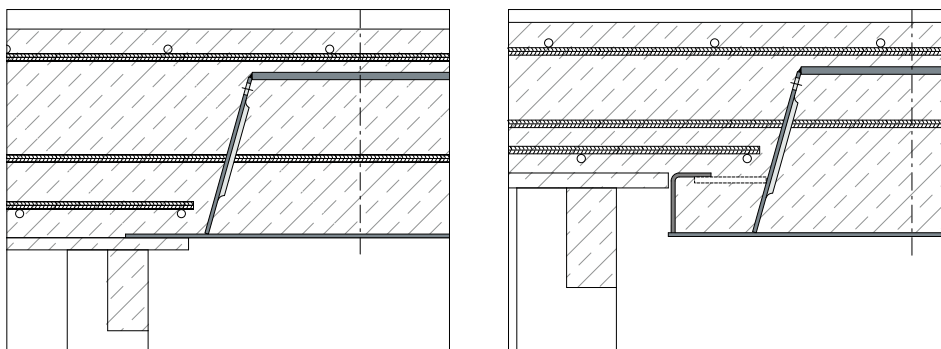


Metal decking and filigran type slabs are installed to the nominal elevation according to the plans. DELTABEAM® precamber is designed so that it will deflect horizontally due to the weight of the floor.

NOTE: MATERIAL MUST NOT BE STORED ON THE FLOOR BEFORE THE INFILL CONCRETE HAS HARDENED. THE FLOOR ABOVE MUST NOT BE BUILT UNTIL THE INFILL CONCRETE HAS HARDENED.

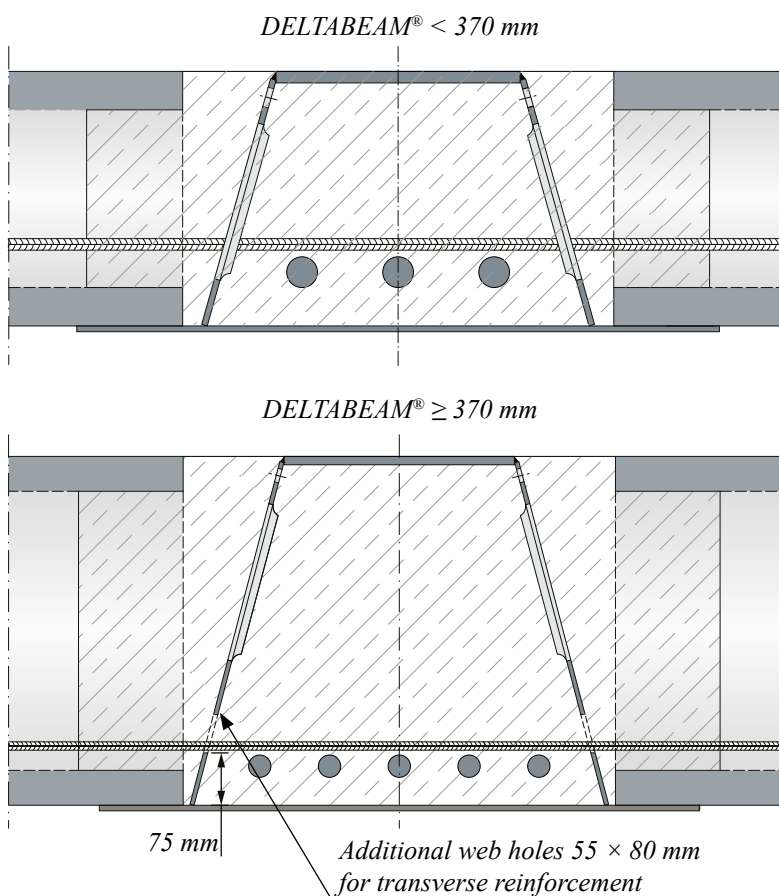
In-situ concrete slab

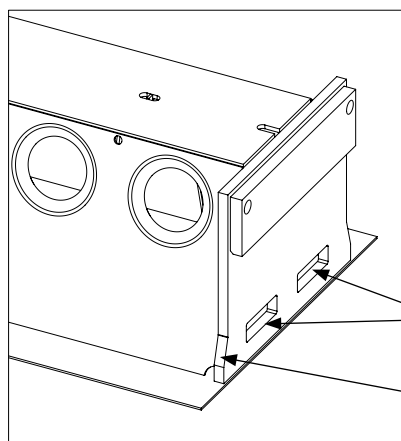
In-situ concrete slabs are built to the nominal level. To achieve a flush bottom surface with an in-situ slab, it is recommended that the formwork be built under the bottom plate. With the downstand on the beam ledge, the formwork is built against the web of the downstand.



Reinforcement

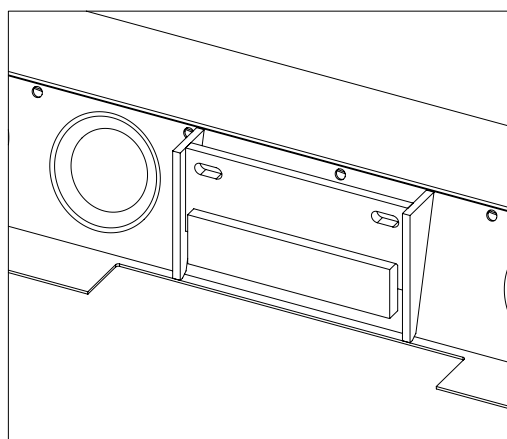
Reinforcement is installed in accordance with the erection method statement. The minimum transverse reinforcement of the DELTABEAM® is $94 \text{ mm}^2/\text{m}$. The transverse reinforcement must be installed even if rebars are being bent over DELTABEAM®. The transverse reinforcement should pass through the web holes ($h < 370 \text{ mm}$) or additional web holes ($h \geq 370 \text{ mm}$) of the DELTABEAM®. Gerber end plate has a modified shape that allows installing ring reinforcement between DELTABEAM® ($h \geq 300 \text{ mm}$) and Hollow-core unit. Cut-outs in Gerber plate serves for purpose of concreting of joint. There are two cut-outs in DELTABEAM® with width $b \geq 600 \text{ mm}$ (see Figures below).



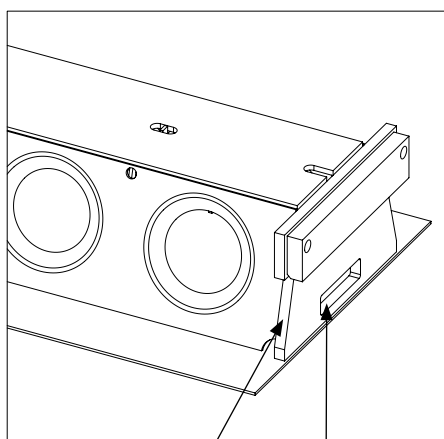


Two cut-outs for DELTABEAM® $b \geq 600$ mm

End plate shape for DELTABEAM® $h \geq 300$ mm



*End plate shape for DELTABEAM®
 $h < 300$ mm*



Cut-out for DELTABEAM® $b < 600$ mm

Casting the concrete

DELTABEAM® is cast with concrete simultaneously with the slab or the joints of the Hollow-core slabs. DELTABEAM® must be filled with concrete in one run. DELTABEAM® must be cast completely for it to secure the properties of a composite beam. DELTABEAM® is designed for temporary live load according to EN 1991-1-6 and its National Annex.

Structural concrete is always used when casting concrete. The concrete grade is in accordance with the project's erection method statement. The concrete's properties are determined in accordance with the project's concreting plan.

The recommended maximum aggregate size is 8 mm (in any case, no more than 16 mm). The drying time of concrete can be reduced by reducing the amount of water required. This can be done by using concrete with low water/cement ration ($v/c < 0.5$), or stronger concrete made with water-reducing agents. It is not recommended to use water-binding coal fly in the concrete mix. On-site drying time can be influenced by following the guidelines for prevailing environmental conditions and project specific instructions.

The lower parts of Gerber and side connections must be properly filled with concrete. Topping concrete is cast in accordance with the erection method statement.

Process of casting the concrete:

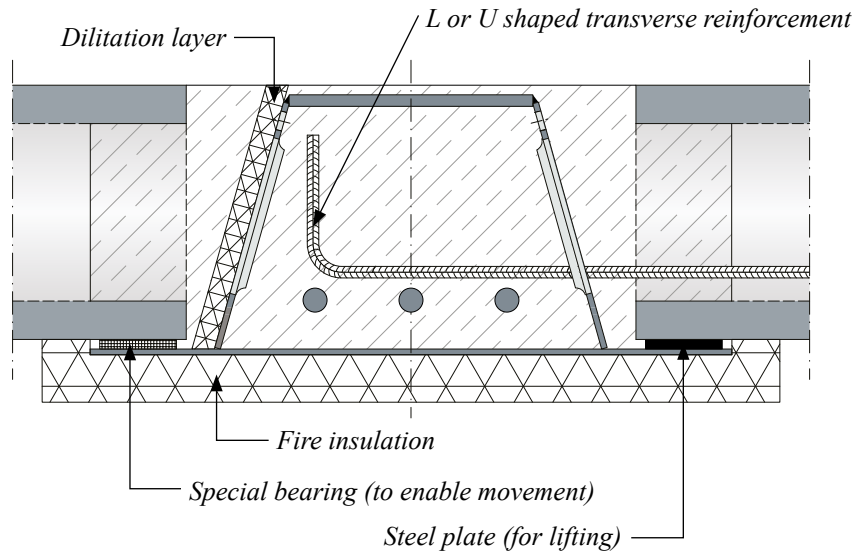
1. Use only the concrete mix defined by the structural engineer responsible for the project.
2. Ensure that there is no water in the beam and that water drainage holes are open.
3. Ensure that DELTABEAM® is clean for casting.
4. If there are pre-installed heating wires inside the DELTABEAM®, ensure that the socket of the wire is taken out of the beam before casting the concrete.
5. Ensure that the formwork and the reinforcement are in accordance with the design.
6. Initial infill may be done through the casting holes in the top plate. DELTABEAM® is filled with concrete up to the bottom edge of the web holes.
7. After the initial infill, the final concreting is done only from one side of DELTABEAM®.
8. Ensure that DELTABEAM® is filled with concrete by checking the air holes on the opposite side of DELTABEAM®. The beam is full when concrete runs through the air holes. Concrete spillage over the beam must be avoided as this will make it harder to observe whether the beam is full.
9. Compact the concrete with poker or vibrator while concreting. The entire infill process may be done through the casting holes in the top plate, but it will be slower and require more work with the poker to run the concrete. Mind the formwork plate and the vertical web when using a poker.



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Additional fire protection

Additional fire protection is done according to the project's erection method statement. The DELTABEAM® with expansion joints must be protected against fire from below. When the expansion joint is on the beam ledge the entire width and length of the beam must be protected against fire. The expansion joint can also be located at the end connection or the Side connection.



The vertical web of the DR-type DELTABEAM® must be protected against fire on-site if the vertical web is not protected against fire by permanent structures such as walls. A wall would act as permanent structural fire protection.

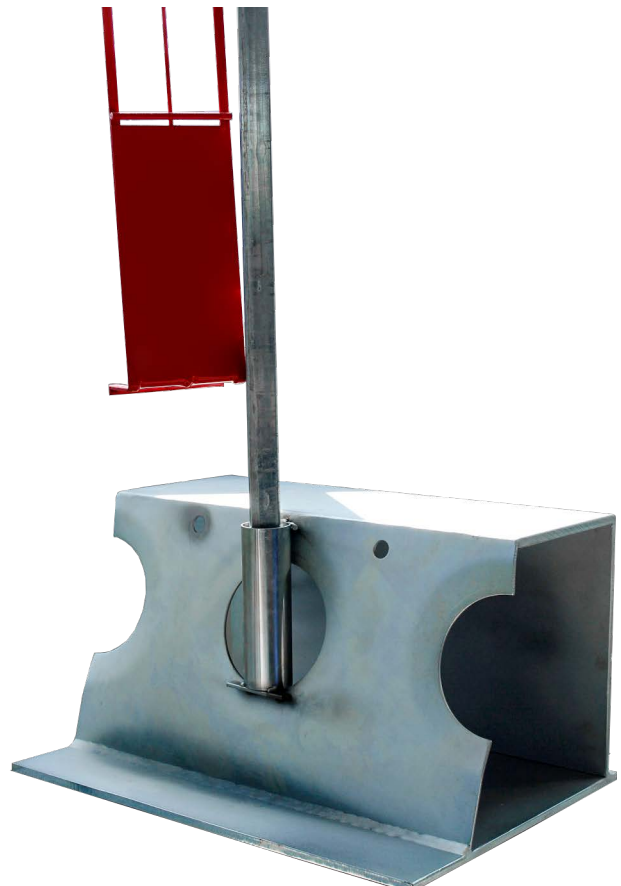
If DELTABEAM® is being connected to a fire-protected steel structure, the extent of fire protection must be done according to the erection method statement. Unprotected DELTABEAM® will conduct heat to the steel structure through the connection.

After installation

Any damage to the surface treatment should be repaired as soon as possible. The surface treatment should be completed with the top layers as soon as possible.

Safety

All valid health and safety rules must be followed during installation. Fixing points for handrails and other safety products can be ordered separately.



On-site checklist

1. Storage on-site

- Use piling strips or timber boards to protect surface treatment.
- Cover DELTABEAM® Composite Beams when long-term storage on-site.

2. Lifting and moving

- DELTABEAM® is lifted by using the lifting holes located on the top plate. Always lock the chains.
- Note the maximum allowed lifting angle of the chains.
- DELTABEAM® self-weight is given on a product sticker.

NO LIFTING STRAPS OR CHAINS AROUND DELTABEAM® AS THIS IS A HEALTH AND SAFETY RISK!

3. Assembling DELTABEAM®

- First, check the instructions and the requirements in the erection method statement.
- The direction of the identification codes of the installed beams should be the same as in the element layout drawing.
- The beams must be connected (with bolts or welds) to supports before the assembly of the floor units.
- When assembling DELTABEAM® Composite Beams on reinforced concrete columns, use either one wide steel pack or two smaller packs: one small pack in the middle is not sufficient.
- Before tightening the bolts on the Gerber connections, check the location of each DELTABEAM® and the total length of the beam line.
- Propping
- With Hollow-core slabs as close to the DELTABEAM® support as possible, at the loaded side of the beam, below the web.
- With other floor types, the erection method statement is followed.
- Remove only after the concrete has hardened.

4. Assembling floor units

- Assemble the floor units directly on the beam ledge without any layers between.
- Maximum 30 mm gap between the web of the DELTABEAM® and the end of the floor unit.
- To minimize the rotation of the beam, assemble floor units alternately on different sides of the beam.

5. Reinforcement

- The minimum transverse reinforcement through DELTABEAM® is 94 mm²/m, from slab to slab in joints or voids.
- In edge, beams use L or U-shaped rebars.

6. Casting the concrete

- Concrete fulfills the specification given in the project-related erection method statement.
- Fill in one run, fill only from one side, observe from the other side. The beam is full when concrete starts to run through the small air holes in the upper part of the web. Mind the formwork plates when using a poker/vibrator.
- Ensure that concrete fills the gap between Gerber and Side connections.

DELTABEAM® CUTTING, OPENING OUT BOLT HOLES, ETC. REQUIRES A PERMISSION AND INSTRUCTIONS FROM PEIKKO.

MATERIALS SHOULD NOT BE STORED ON THE FLOOR BEFORE THE INFILL CONCRETE HAS REACHED THE REQUIRED STRENGTH.

THE FLOOR ABOVE MUST NOT BE BUILT BEFORE THE INFILL CONCRETE HAS REACHED THE REQUIRED STRENGTH.