

TECHNICAL MANUAL



HELKA® Column Shoe

Robust and Optimized Bolted Column Connections

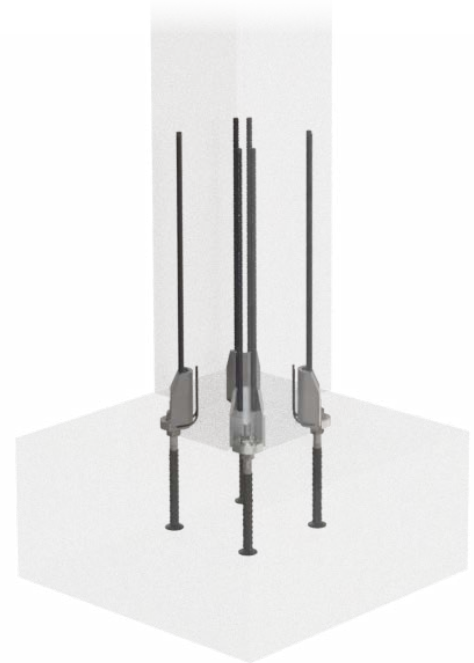
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HELKA® Column Shoe

Robust and Optimized Bolted Column Connections

- Full-scale tested and approved connection – stiffness, resistance against bending and shear, and performance in fire.
- Safe, simple, and quick erection of precast column with no bracing and welding.
- Fast and cost-efficient column assembly with a reduced man- and crane-hours.
- Design efficiency using Peikko Designer® BOLTED CONNECTION software.
- Advanced casting process with the help of standard accessories.
- Fast and easy column assembly.
- Covered and verified by European Technical Assessment (ETA).
- High-performance Column Shoe with right of access to CE marking.



HELKA® Column Shoes are construction products to form fast and safe connections between precast concrete columns and foundations, or between precast concrete columns. HELKA® Column Shoes are used with HPM® Rebar Anchor Bolts or COPRA® Anchoring Couplers to create moment-resisting column connections under heavy loading conditions.

The standard bolted column connection is made using column shoes and anchor bolts. The column shoes are cast into a precast concrete column, while anchor bolts are cast into the foundation or another column. On the construction site, the columns are erected onto the anchor bolts and adjusted to the correct level and vertical position. Fastening is achieved by tightening nuts on the anchor bolts. The joint between the column and the structure below should be grouted before the column is loaded. The connection acts as a reinforced concrete structure after the grout has reached the designed strength.

The main advantage of using bolted connections is that an immediate connection is made with a small crew. The column is installed without temporary bracing only by leveling and tightening the nuts.

With a help of standard accessories casting process is quick and easy both at the precast factory and construction site. The solution is cost-efficient by final savings coming from reduced excavation depth of the foundation, simplified supplementary reinforcement frame, and less man- and crane-hours.



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About HELKA® Column Shoe

1. Product properties

HELKA® Column Shoes are available in several standard models to solve most of precast concrete column connections. The original Peikko Column Connection system consists of:

- Column shoes
- Anchor bolts
- Accessories: recess formers and installation templates

Column Shoes are cast into the bottom part of the column together with main and supplementary reinforcement, detailed in Annex A of this manual. HPM® Rebar Anchor Bolts are either cast into the foundation (column to foundation connection) or in the top part of the lower column (column to column connection). The column shoe has a round hole that fits with the corresponding anchor bolt. The column connection is achieved by fastening the anchor bolts to column shoes by using nuts and washers. The bolted connection offers sufficient assembly tolerances to adjust the column at the correct level and vertical position. To finalize the connection, the joint underneath the column and recesses are grouted with non-shrink grout material, whose strength must be at least equal to the strength of the concrete of the column above the joint.

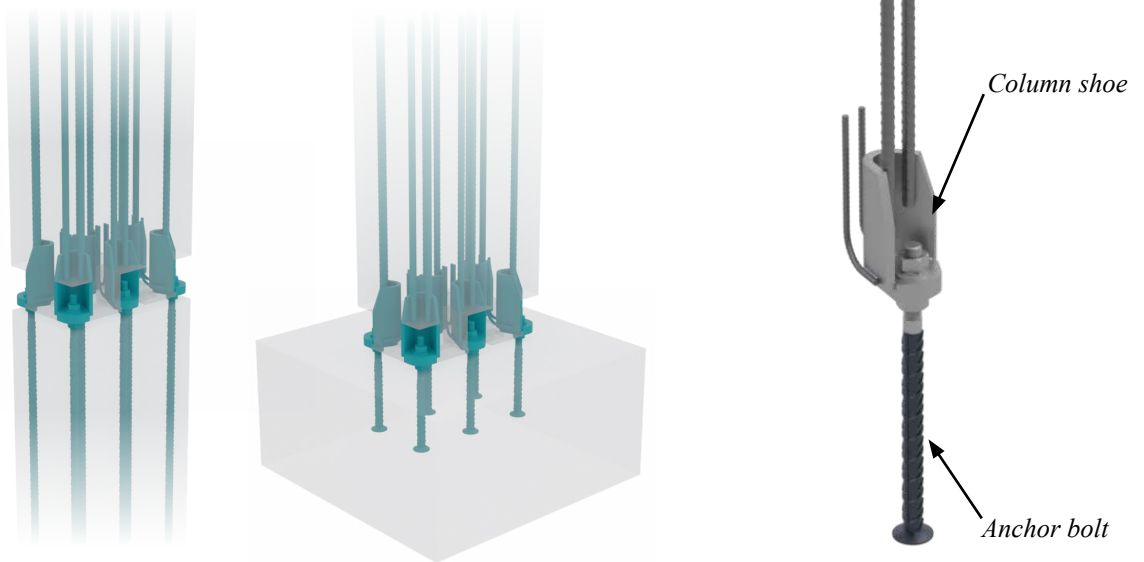


Figure 1. HELKA® Column Shoes and HPM® Rebar Anchor Bolts in column connection.

Resistances of single HELKA® Column Shoes are equal to the resistances of corresponding HPM® Rebar Anchor Bolts or COPRA® Anchoring Couplers. For more information about anchor bolts and couplers, see the Technical Manual of HPM® Rebar Anchor Bolts or COPRA® Anchoring Couplers.

Peikko column connection can be designed to resist axial forces, bending moments, shear forces and their combinations, and fire exposure. The appropriate column shoe and anchor bolt for the connection can be selected, and the connection's resistance can be verified using Peikko Designer® BOLTED CONNECTION software (access online tool <https://boltedconnection.peikkodesigner.com/>). It is possible to use four or more column shoes in one column cross-section depending on the dimensions of the column and the magnitude of forces to be transmitted.

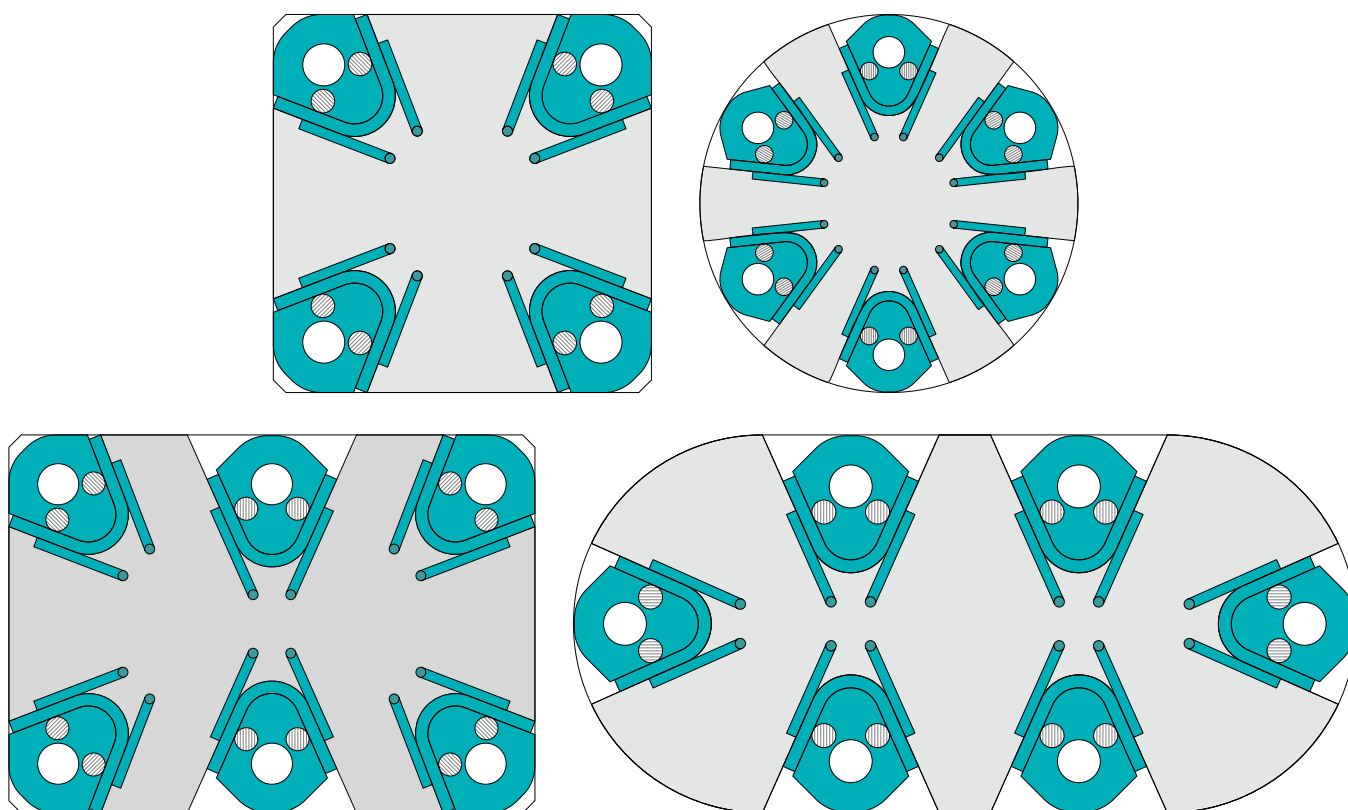


Figure 2. Arrangement of HELKA® Colum Shoes in different column cross-sections.

1.1 Structural behavior

HELKA® Column Shoes are pre-designed so that they have sufficient resistance against maximal design values of tensile, compressive, and shear forces from the corresponding HPM® Rebar Anchor Bolts or COPRA® Anchoring Couplers.

1.1.1 Temporary conditions

At the erection stage, the forces loading column shoes are caused principally by self-weight of the column and bending moment and shear force due to wind load. Since the joint between the column and the base structure is not grouted, all the forces from the column shoes are carried solely by anchor bolts. The bolts must be designed for buckling and bending. If the size of the bolt is not sufficient for the load, the size or number of bolts and column shoes should be increased. The open joint beneath the column and recesses shall be filled with non-shrink grout. The grout should be allowed to develop sufficient strength, as specified in the execution guidelines, before the column is subjected to any additional structural loads.

1.1.2 Final conditions

In the final stage, after the grout has reached the designed strength, the connection acts as a reinforced-concrete structure. Column shoes in interaction with anchor bolts and grout can resist actions designed for final conditions. The behavior of the connection has been verified to fulfill the requirements of cast-in-situ reinforced columns when designing according to ETA assessment of these products.

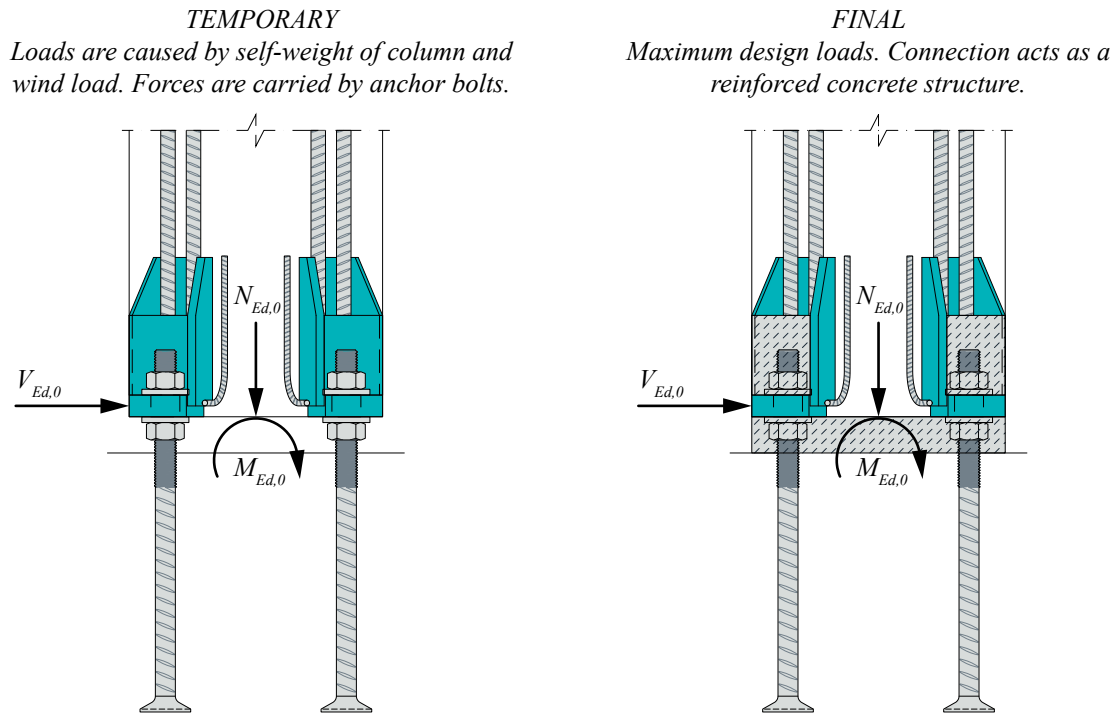


Figure 3. Structural behavior of the column connection under temporary and final conditions.

1.2 Application conditions

The standard models of HELKA® Column Shoes are pre-designed to be used under conditions mentioned hereafter in this chapter. In the case when these conditions may not be satisfied, please contact Peikko Customer Engineering Service for the individual design of HELKA® Column Shoes.

1.2.1 Loading and environmental conditions

HELKA® Column Shoes are designed to bear static loads. In the case of dynamic, fatigue, or seismic loads, the individual design shall be made.

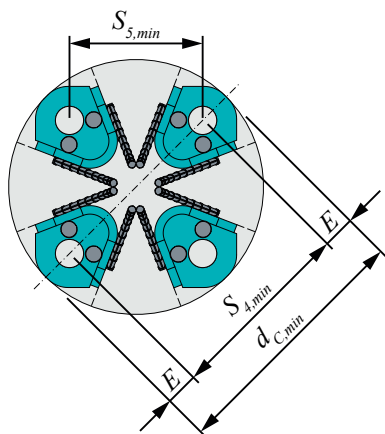
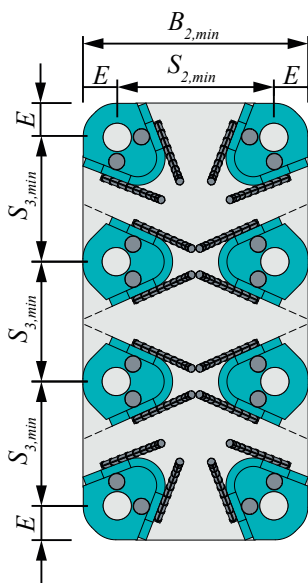
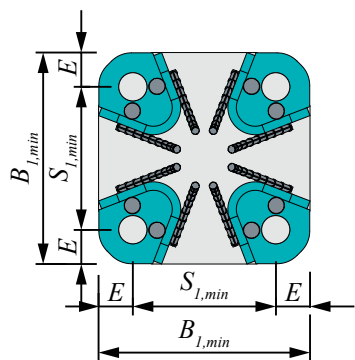
Column Shoes are designed to be used in indoors and dry conditions. When using HELKA® Column Shoes in other conditions, the surface treatment, concrete cover, or raw materials must be adequate according to environmental exposure class and intended operating life.

If the operating temperature is below -20°C, the suitability of the materials must be assessed in accordance with standards such as EN 1993-1-10. In the production of column shoes, higher impact-resistant plate materials should be utilized when required.

1.2.2 Interaction with column

HELKA® Column Shoes are pre-designed to be used in reinforced concrete columns with minimum dimensions summarized in *Table 1*. If column shoes must be placed in the column with smaller dimensions, please contact Peikko Customer Engineering Service.

Table 1. The minimum sizes of column cross-section and spacing [mm] for standard HELKA® Column Shoes.



Shoe	HELKA 24	HELKA 30	HELKA 39
$B_{1,min}$	225	275	340
$S_{1,min}$	125	175	220
E	50	50	60
Shoe	HELKA 24	HELKA 30	HELKA 39
$B_{2,min}$	230	285	345
$S_{2,min}$	130	185	225
$S_{3,min}$	120	150	200
E	50	50	60
Shoe	HELKA 24	HELKA 30	HELKA 39
$d_{C,min}$	277	348	431
$S_{4,min}$	177	247	311
$S_{5,min}$	125	175	220
E	50	50	60

$$S_{5,min} = \frac{d_{C,min} - 2E}{\sqrt{2}}, \text{ where } E \text{ is taken from the tables above. Note: } S_{5,min} \text{ is identical to } S_{1,min}.$$

The standard properties of HELKA® Column Shoes are guaranteed in reinforced concrete columns made of concrete grade C35/45 or higher. The strength of grout in the joint must be at least equivalent or higher than the designed concrete grade of the column. For minimum concrete grade for anchor bolts, see Technical Manual of HPM® Rebar Anchor Bolts or COPRA® Anchoring Couplers.

The structural properties of HELKA® Column Shoes are guaranteed only if supplementary reinforcement is provided in the column following rules of Annex A of this Technical Manual. Notably, supplementary reinforcement is used in addition to the main reinforcement designed to resist internal forces in the column.

1.2.3 Positioning of the column shoe

The concrete covers of the main anchor bars of each HELKA® Column Shoe are presented in Table 2 when HELKA® Column Shoe is located at the corner or in the middle position of the column (see Figure 4 and Table 2).

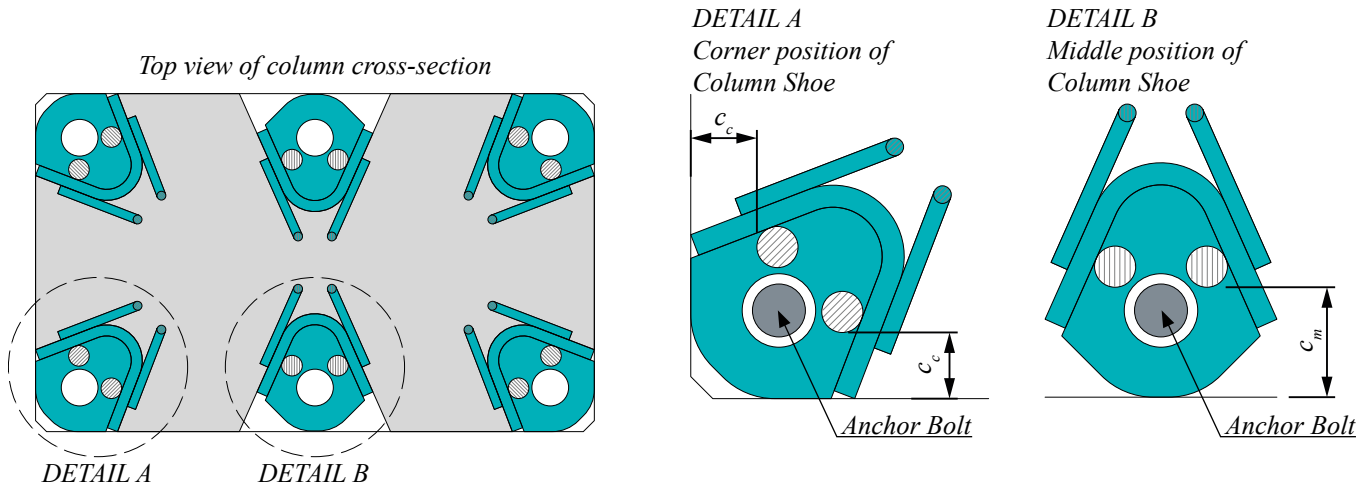


Figure 4. Concrete cover of main anchor bars – corner and middle position of column shoe.

Table 2. Concrete cover of main anchor bars in corner and middle position of column shoe.

	HELKA 24	HELKA 30	HELKA 39
Corner concrete cover c_c [mm]	42	43	43
Middle concrete cover c_m [mm]	62	69	76

If higher values of concrete cover are required ($c_{req} > c_c$ or $c_{req} > c_m$), HELKA® Column Shoes need to be placed towards center of the column (see Figure 5). To prevent concrete to fill up the pocket during casting, the recess boxes may be used.



NOTE!

When the column shoes are recessed further toward the center of the column section, the anchor bolts must be relocated accordingly in the bolt assembly drawings. Additionally, special measures are required to prevent concrete from filling the Δ_c -sized gap (for detailed information see the installation chapter of HELKA® Column Shoes). The deviating position of the column shoes and their anchor bars must also be taken into account when designing and installing the main, stirrup, and additional reinforcement of the column.

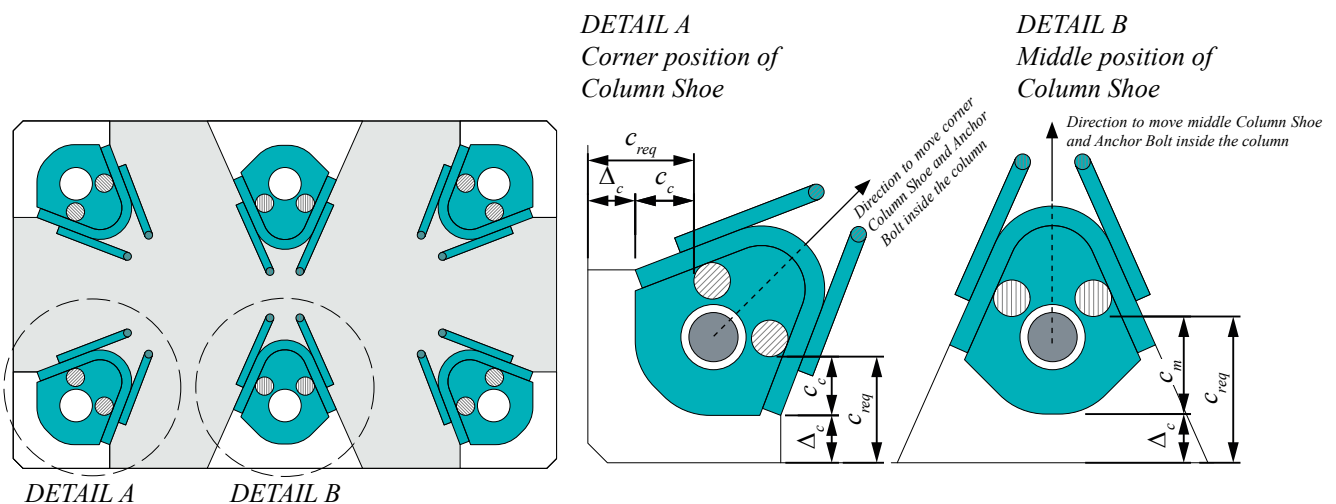


Figure 5. Concrete cover of main anchor bars – determination of required concrete cover thickness c_{req} .

1.3 Other properties

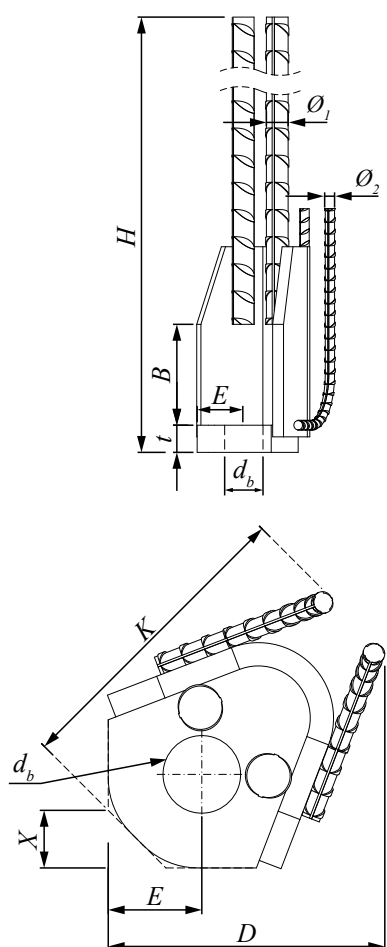
HELKA® Column Shoes are fabricated of steel plates and reinforcement steel with the following material properties:

Steel plates	S355J2+N	EN 10025-2
Ribbed bars	B500B	EN 10080

Peikko Group's production units are externally controlled and periodically audited based on production certifications and product approvals by various organizations.

Products are marked with the CE marking and the emblem of Peikko Group, the type of product, and year and week of manufacturing.

Table 3. Dimensions [mm], weights [kg] and color codes of HELKA® Column Shoes.



	HELKA 24	HELKA 30	HELKA 39	Manufacturing tolerances
H	878	1128	1592	± 10
t	20	30	40	
B	100	110	130	+3, -0
E	50	50	60	± 1
d_b	34	40	54	+2, -0
Ø₁	16	20	25	
Ø₂	6	8	10	
X	30	30	37	
D	112	137	169	
K	112	141	170	
Weight [kg]	5.1	10.4	23.4	
Color code	Gray	Green	Orange	

Color code is marked on the base surface of HELKA® base plate.

Lengths of anchor bars are defined according to concrete grade C35/45.

Lengths of anchor bars meet the requirements of EN 1992-1-1 for poor and good bond conditions.

2. Resistances

The resistances of HELKA® Column Shoes are determined by a design concept that makes reference to the following standards and specifications:

- EN 1992-1-1:2004
- EN 1992-1-2:2004
- EN 1993-1-1:2005
- EN 1993-1-8:2005
- TR 068:2020-03: Technical Report: Design of structural connections with Column shoes
- ETA-24/0589.

2.1 Axial resistance

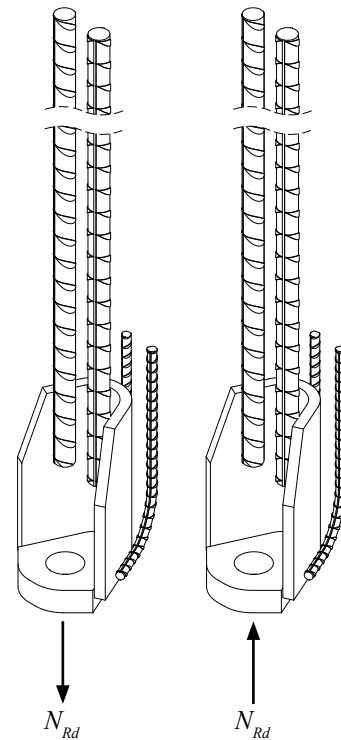
HELKA® Column Shoes are designed to withstand tensile and compressive forces corresponding to the design values of resistances of HPM® Rebar Anchor Bolts and COPRA® Anchoring Couplers. The maximum design values of resistances of individual HELKA® Column Shoes are given in *Table 4*.

It is recommended to use Peikko Designer® BOLTED CONNECTION software to calculate the resistances of column connections when utilizing Peikko connection products. Our free online software is available at <https://boltedconnection.peikkodesigner.com>. Peikko Designer® BOLTED CONNECTION software will make column connection design procedure fast and easy.

The software includes a design code selection feature, which is required for each design case and provides the user with numerous options. By selecting the valid design code, it is possible to check the resistances of each column connection easily. Checking erection stage resistances of column connection when the joint is not grouted is also an implemented feature.

Table 4. Design values of tensile or compressive resistances of individual HELKA® Column Shoes for concrete grade C35/45.

Column Shoe	Anchor Bolt	N_{Rd} [kN]
HELKA 24	HPM 24 COPRA 24H	139
HELKA 30	HPM 30 COPRA 30H	220
HELKA 39	HPM 39 COPRA 39H	383



2.2 Shear resistance

The action effects at the connection are first divided to the individual column shoes.

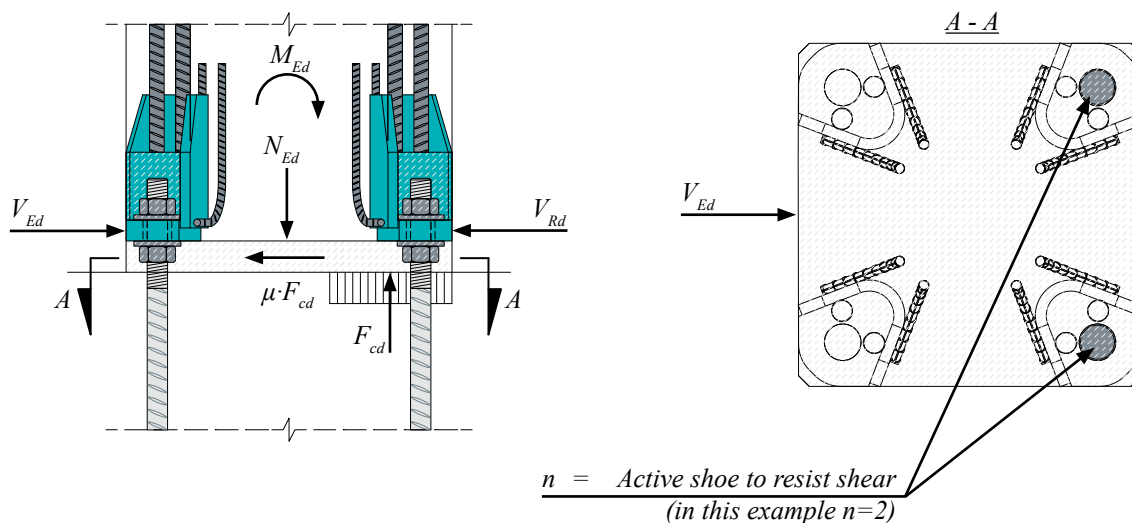


Figure 6. Column shoes on the right-hand side are considered active against shear.

The design value of the shear force for a single column shoe on the active side, see Figure 6, is calculated from

$$V_{Ed}^I = \frac{V_{Ed} - \mu \cdot F_{cd}}{n}$$

where:

V_{Ed} = total shear force of column connection.

F_{cd} = total compression force in column connection.

NOTE: The resultant F_{cd} of the compression force is obtained by summing the compression components resulting from the bending moment M_{Ed} and the normal force N_{Ed} .

μ = friction coefficient between base plate and grout = 0.20 (according to EN 1993-1-8, Chapter 6.2.2).

n = the number of the individual active column shoes resisting shear force, see Figure 6

The shear resistance of a column shoe is equal to the shear resistance of the corresponding anchor bolt.

Table 5. Design values of shear resistance V_{Rd} of individual HELKA® Column Shoe.

		HELKA 24	HELKA 30	HELKA 39
V_{Rd}	[kN]	45	72	125
$B_{1,min} \times B_{1,min}^{1)}$	[mm × mm]	280 × 280	320 × 320	370 × 370

¹⁾ Note: minimum length of the side of column $B_{1,min}^*$ is larger for shear resistances than the minimum length of the side $B_{1,min}$ in Table 1 to provide full shear resistances V_{Rd}

The shear resistance of a column shoe subjected to shear and compression shall meet the requirement:

$$V_{Ed}^I \leq V_{Rd}$$

It is recommended to calculate the shear resistances of column connections with Peikko Designer® BOLTED CONNECTION software. Peikko Designer® BOLTED CONNECTION software makes column connection shear design both final and erection stage fast and easy.

2.3 Fire resistance

The temperature development and critical minimum sections of unprotected Peikko column connections were determined using experimental fire tests and numerical analysis. In tests, the Peikko column connections were exposed to the standard fire according to standard EN 1363-1.

The concrete cover of the anchor bolt and the anchor bars of the column shoes should be at least equivalent to the concrete cover of the reinforcement of the precast element. If the fire resistance of the column shoe connection is considered insufficient, the concrete cover of the column shoe could be increased by recessing column shoes towards the center of the column and increasing the size of the cross section when necessary. For more information, refer to Section 1.2.3 and Figure 5.

Table 6. Steel temperatures [C°] timetable of HELKA® Column Shoe connections under fire exposure $T_{cr}(t_i)$ for fire design.

Time t_i [min]	HELKA 24 Minimum column size 225 × 225 [mm ²]	HELKA 30 Minimum column size 275 × 275 [mm ²]	HELKA 39 Minimum column size 340 × 340 [mm ²]
30	194	245	137
60	477	487	364
90	675	648	549
120	813	763	669

The Peikko Designer® BOLTED CONNECTION software offers a fire-resistance design procedure for Peikko column connections according to EN 1992-1-2.

Selecting HELKA® Column Shoe

The following aspects have to be considered when selecting the appropriate type of HELKA® Column Shoe to be used in a column connection:

- Resistance
- Properties of the column
- Properties of the grout
- Position and arrangement of the column shoes in the column
- Design values of actions and their interactions.

The resistance of column connection should be verified for the following design situations:

- Erection stage
- Final stage
- Fire situation
- Environmental exposure conditions

Peikko Designer® BOLTED CONNECTION Column Connection software

Peikko Designer® BOLTED CONNECTION is a software to be used for designing column connections with Peikko's products. It can be found at <https://boltedconnection.peikkodesigner.com>. With the Column Connection module, the user can design connections to resist actual loadings and optimize the connections to meet the requirements of the whole project.

The output reports of the software can be used further to verify the design and output drawings as details of the connection. The summary of the products in the project helps to plan material flow during construction.

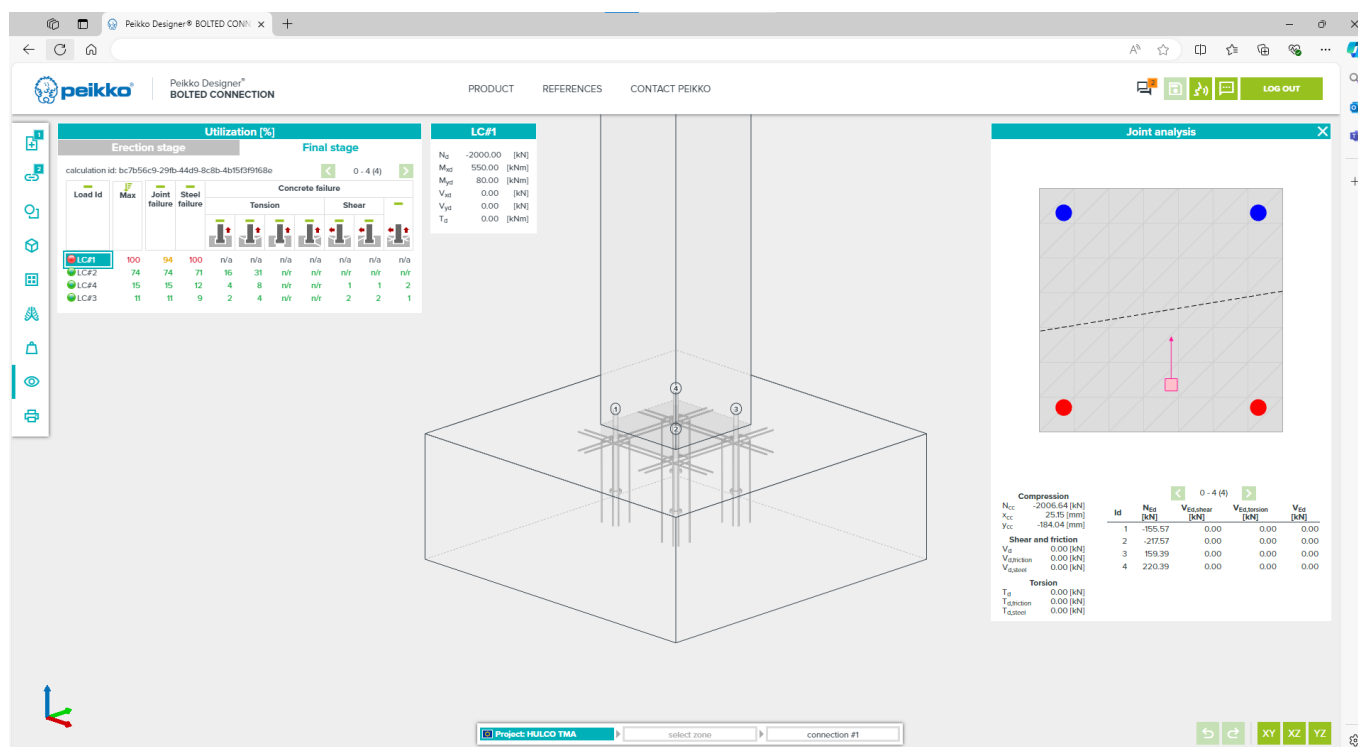


Figure 7. The user interface of Peikko Designer® BOLTED CONNECTION Column Connection module.

SELECTING

The typical selection procedure is done in the following steps:

USER INPUT

- Materials for column, structure under column and grouting
- Geometries of the column and structure under column
- Design values of the actions – temporary, final, and fire stage
- Type of column shoes and anchor bolts
- Column shoe arrangement
- Column reinforcement (optional).

NOTE: In load cases, the second order effects must also be taken into account.

PEIKKO DESIGNER OUTPUT

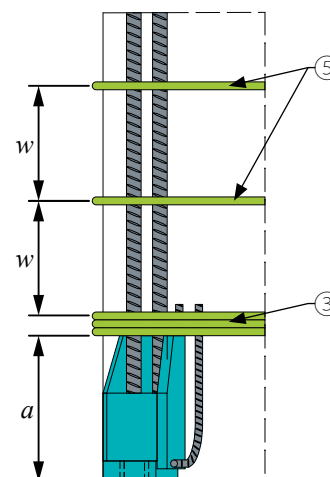
- N-M diagram (axial force-bending moment diagram) of joint in final and fire stage
- N-M diagram of reinforced column
- Calculation results for column connection in final stage
- Calculation results for column connection in temporary stage
- Supplementary reinforcement details
- Summary of products in the project.

Annex A – Transverse reinforcement in the lap zone and supplementary reinforcement

Details of transverse reinforcement in the lap zone and supplementary reinforcement for HELKA® Column Shoes are shown in the following figures. Required quantities and lengths of stirrups are given in *Table 7*.

Table 7. Transverse reinforcement in the lap zone and supplementary reinforcement (B500B).

	HELKA 24	HELKA 30	HELKA 39
① U-Stirrup	Ø 6	Ø 6	Ø 8
② U-Stirrup	Ø 6	Ø 6	Ø 8
③ Stirrup	3 Ø 8	3 Ø 8	3 Ø 10
④ Stirrup	3 Ø 8	3 Ø 8	3 Ø 10
⑤ Stirrup	Ø 8	Ø 8	Ø 8
<i>a</i>	185	220	270
<i>w</i>	100	100	100
<i>l_b</i>	250	250	270
All dimensions given in millimeters [mm]			



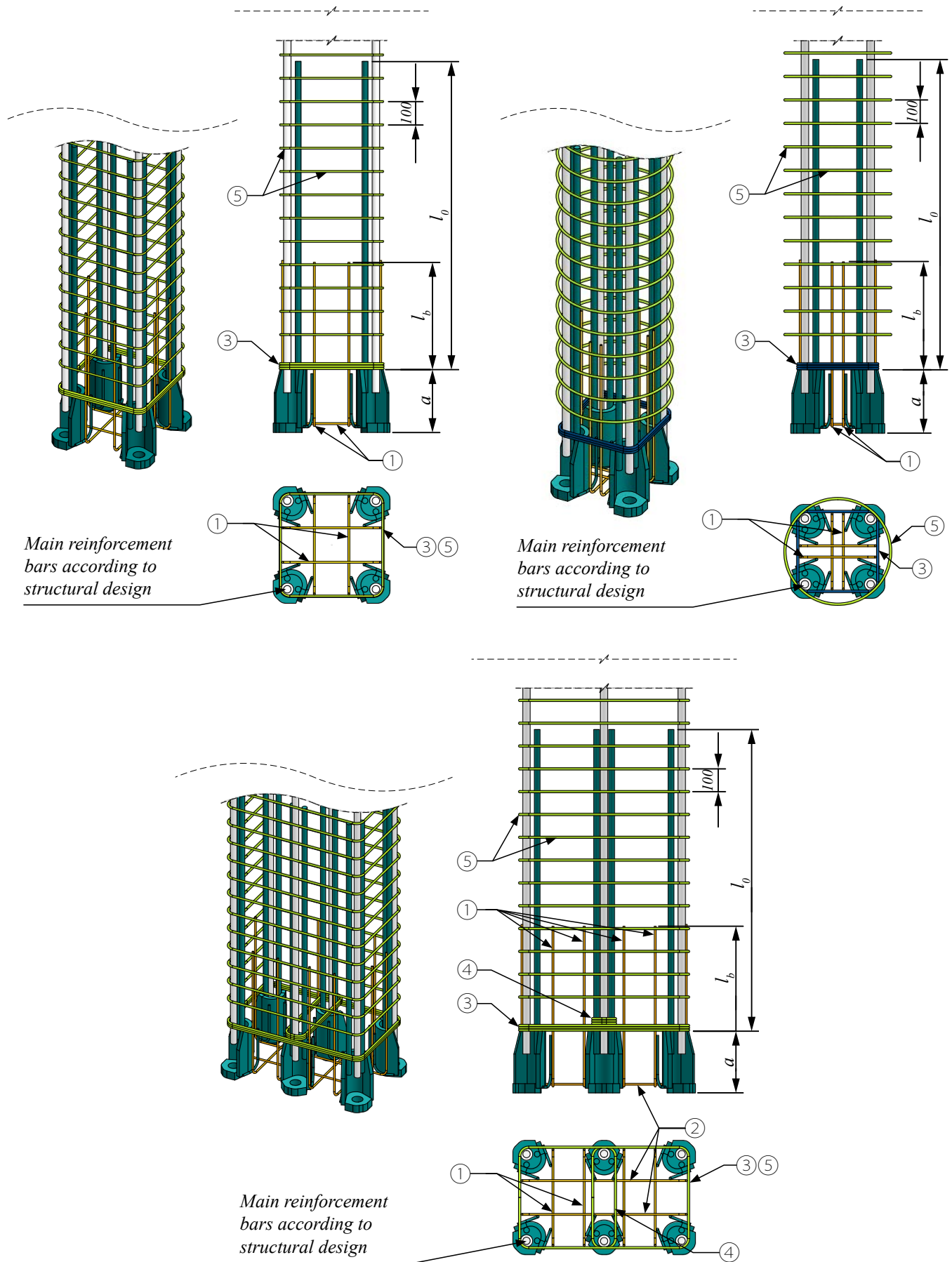


Figure 8. Transverse and supplementary reinforcement needed for HELKA® Column Shoes.

Annex B – Alternative use of HELKA® Column Shoe

Column shoes on an integrated steel plate

In the case when column shoes are colliding in the column (column cross-section is too small for the designed column shoes) an integrated steel plate may be used to connect shoes together.

By welding the column shoes to the plate, the rear anchor bars can be removed to reduce the required space. However, the forces typically carried by the rear anchor bars must instead be transferred through the weld joints and steel plate.

The steel plate may be used as an endplate of the mold as well. The minimum clear distance between anchor bars and side plates of column shoes should be not less than distance requirements according to EN 1992-1-1, chapter 8.2. Supplementary reinforcement for the anchor bolt's group must be checked.

Shoes on integrated steel plates are manufactured according to the customer's specifications. Please ask for more instructions from Peikko Customer Engineering Service.

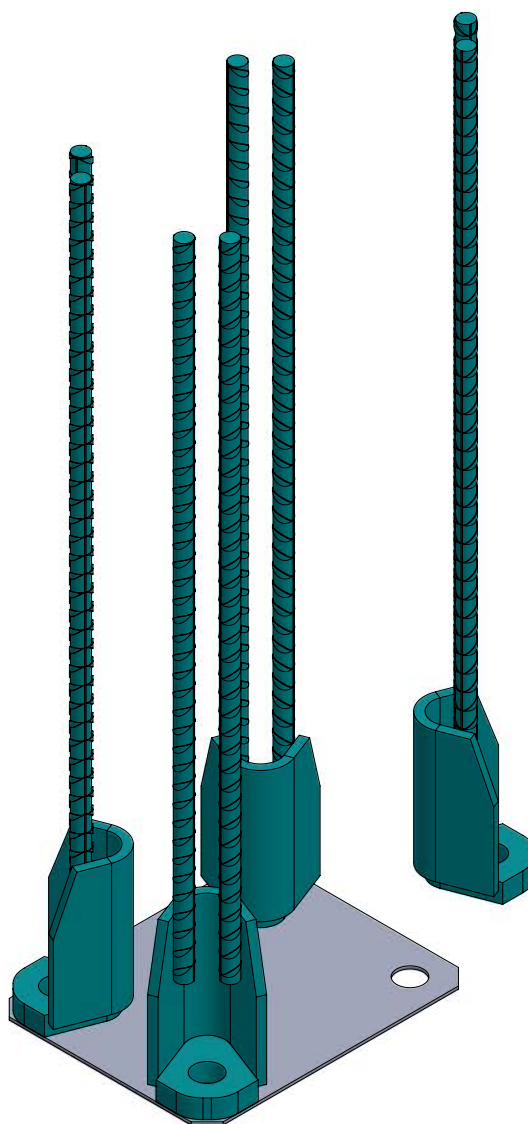
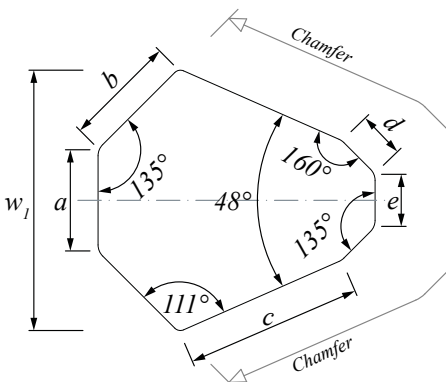
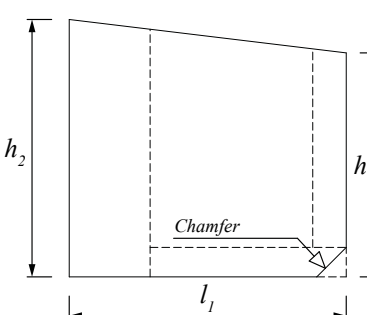


Figure 9. Column shoes on an integrated steel plate.

Self-made recess formers

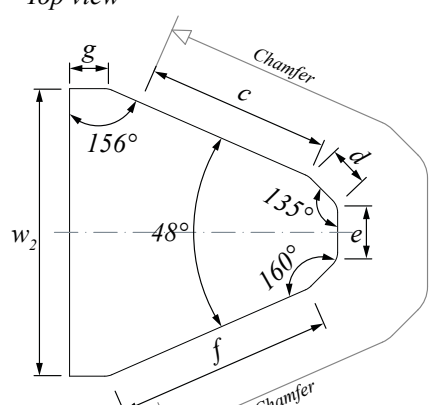
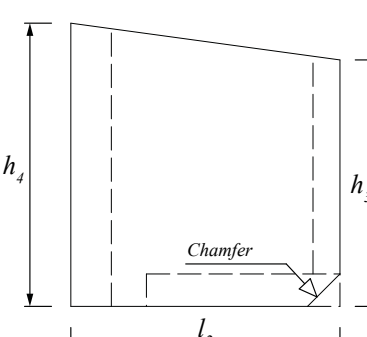
Recess formers can be alternatively made by customers themselves, according to the required dimensions shown in Table 8 and Table 9. They can be made of wood, polystyrene, or similar material. Column shoes should be fixed into the formwork properly either by bolting them to the endplate of the mold or welding all shoes together.

Table 8. Dimensions of corner recess boxes to use with HELKA® Column Shoe.

Corner recess former – dimension [mm]		a	b	c	d	h ₁	w ₁	l ₁	h ₁	h ₂
<p>Top view</p>  <p>Side view</p> 	HELKA 24 ¹⁾	40	38	50	18	29	95	87	84	96
	HELKA 30 ¹⁾	40	49	62	18	35	110	105	93	107
	HELKA 39 ²⁾	50	58	62	39	28	135	128	119	136

¹⁾ Chamfer 10 × 10 mm required on bottom part of recess

Table 9. Dimensions of middle recess boxes to use with HELKA® Column Shoe.

Middle recess former – dimension [mm]		c	d	e	f	g	w ₂	l ₂	h ₃	h ₄
<p>Top view</p>  <p>Side view</p> 	HELKA 24 ¹⁾	50	18	29	61	19	103	87	84	96
	HELKA 30 ¹⁾	62	18	35	75	23	122	105	93	107
	HELKA 39 ²⁾	62	39	28	76	30	148	128	119	136

¹⁾ Chamfer 10 × 10 mm required on bottom part of recess

Installation of HELKA® Column Shoe

Precast factory – Casting of HELKA® Column Shoe

Identification of the product

HELKA® Column Shoes are available in standard models (24, 30 and 39) analogous to M-thread sizes of the HPM® Rebar Anchor Bolts or COPRA® Anchoring Couplers. The model of column shoe can be identified by the name in the label on the product and according to the color of the product too. Color codes are shown in the table hereafter. Color codes of recess boxes are corresponding to the color codes of HELKA® Column Shoes.

BOLDA® Column Shoe with corresponding recess box.

Column Shoe	Anchor Bolt	Corner recess	Middle recess	Color code
HELKA 24	HPM 24 / COPRA 24H	HELKA 24 CBOX	HELKA 24 MBOX	Gray
HELKA 30	HPM 30 / COPRA 30H	HELKA 30 CBOX	HELKA 30 MBOX	Green
HELKA 39	HPM 39 / COPRA 39H	HELKA 39 CBOX	HELKA 39 MBOX	Orange

Installation of the column shoes

HELKA® Column Shoes are placed into the reinforcement of the column and fixed through their base plates to the endplate of the mold with recess boxes. Installation tolerance of column shoe in the crosswise direction of the column is ± 2 mm. Supplementary reinforcement must be placed at the area of the column base, according to drawings (Technical Manual Annex A). After casting the column, boxes are removed from shoes, and voids are checked that they are clean from concrete.

Recess boxes are fixing accessories used to form pockets in the concrete column for anchor bolts. There are separate recess boxes available for all types of column shoes and depending on the column shoe position in the column's cross-section:

- CBOX is used with column shoes fixed in corner of the column.
- MBOX is used with column shoes fixed in the middle of the column.

Recess boxes enable the shoes to be fastened and positioned to the endplate of the mold. The wing screw M16, which comes with a spacer equal to the size of the column shoe's bolt hole, is used for fixing. With the help of the spacer, the shoe can be fixed to the correct place in the endplate. Environmentally friendly formers are very durable and re-usable. It is recommended to maintain them to achieve long operating life.

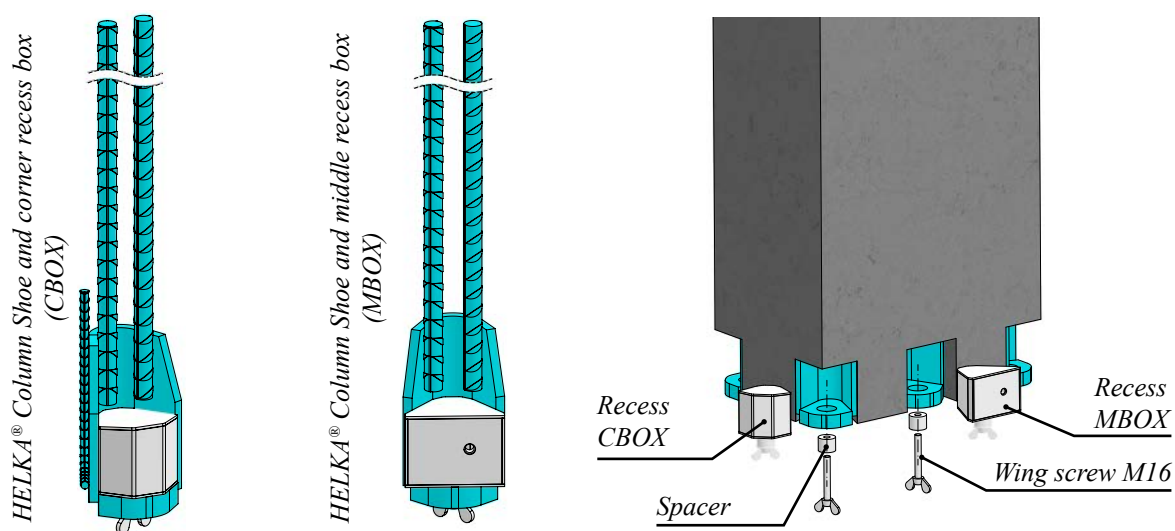


Figure 10. Recess boxes for corner and middle position of HELKA® Column Shoe.

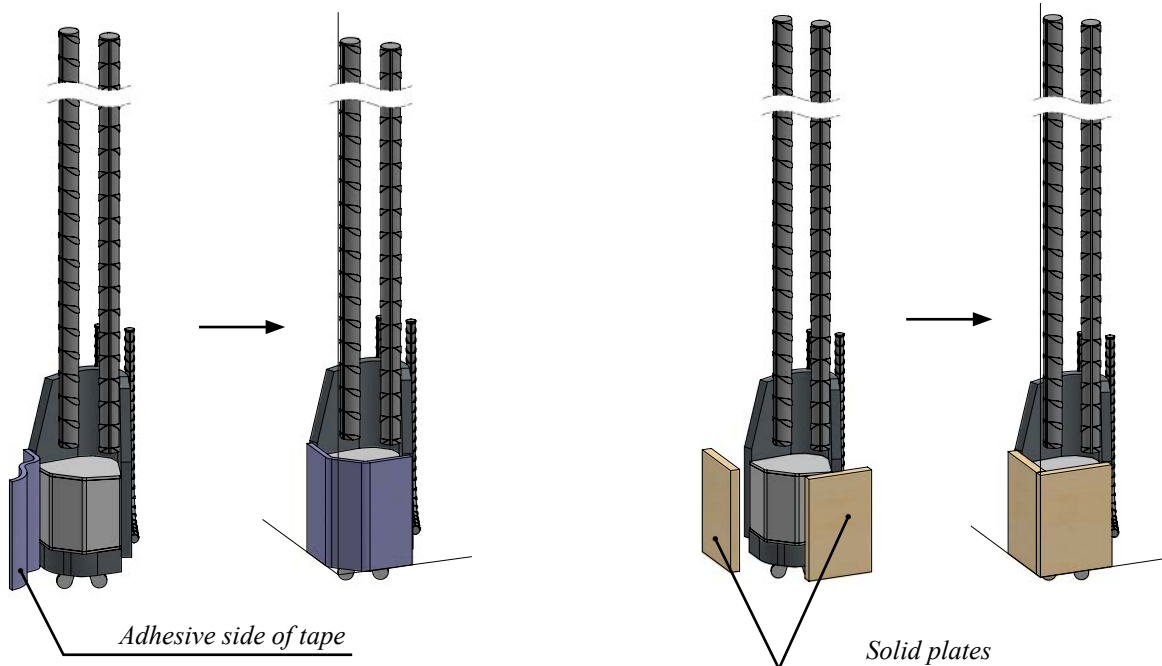
INSTALLING

To ensure higher values of concrete cover thicknesses of the main anchor bars in accordance with chapter 1.2.3 of the technical manual, follow these instructions for increased values Δ_c of concrete cover:

- If $\Delta_c < 5\text{mm}$, there is no special request for recess boxes; instructions are same as for standard concrete cover of column shoes. The gap is too small to be filled up with concrete. However if the gap is filled or partially filled, the concrete shell can be easily crushed after removing mold.
- If $5\text{mm} \leq \Delta_c \leq 10\text{mm}$, self-adhesive foam tape or equivalent can be used to prevent the fill up of the gap. Foam tape of corresponding thickness Δ_c is fixed on two sides of the recess box.
- If $\Delta_c > 10\text{mm}$, to prevent the concrete to fill up the gap, it is recommended to use some kind of solid plate – e.g. plywood or hardened polystyrene of corresponding thickness Δ_c . These plates can be fixed to the surface of the mold.

Use of **self-adhesive foam tape** to prevent the gap from filling up with concrete.

Use of **solid plates** to prevent the gap from filling up with concrete.



Ensure thicker concrete cover if using self-adhesive foam tape or solid plates

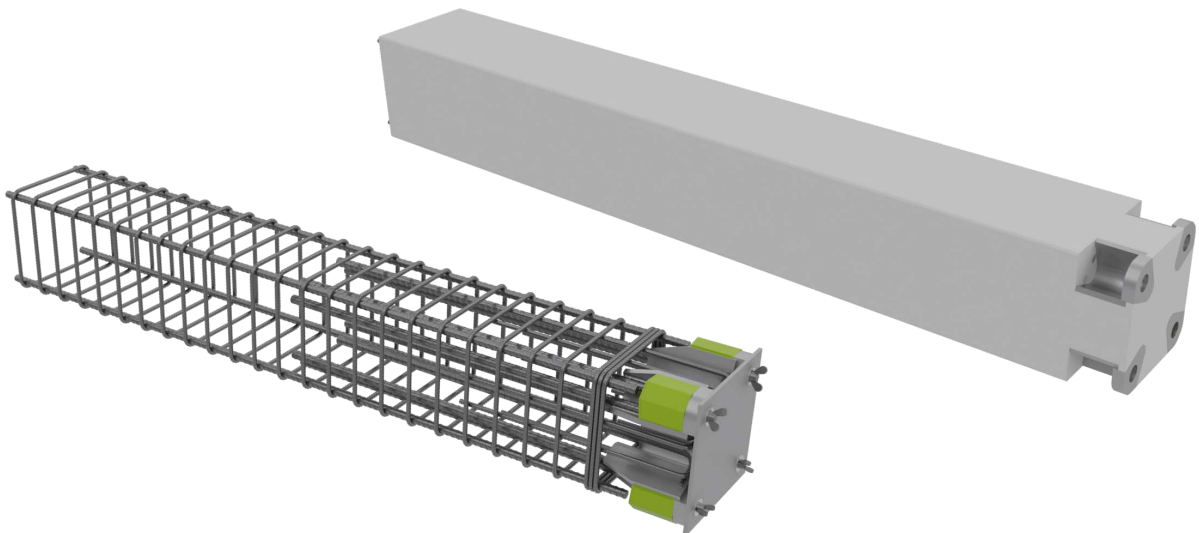


Figure 11. HELKA® Column Shoes before and after casting.

Construction site – Assembling the connection

Identification of the product

HELKA® Column Shoes are available in standard models (24, 30 and 39) analogous to M-thread sizes of the HPM® Rebar Anchor Bolts or COPRA® Anchoring Couplers. The model of column shoe can be identified by the name in the label on the product and according to the color of the product too. Color codes are shown in the table hereafter.

BOLDA® Column Shoe color identification.

Column Shoe	Color code	Anchor Bolt	Installation template
HELKA 24	Grey	HPM 24 / COPRA 24H	PPL 24
HELKA 30	Green	HPM 30 / COPRA 30H	PPL 30
HELKA 39	Orange	HPM 39 / COPRA 39H	PPL 39

Erection of precast column

1. To level precast concrete column

Before erecting the column, upper nuts and washers are removed from anchor bolts. Lower leveling nuts and washers are adjusted at the correct level. The column is erected directly on the pre-leveled washers and nuts.

In alternative method shim plates are placed between anchor bolts and adjusted at the proper level. Lower leveling nuts must be leveled at least 5 mm under the top level of shims to secure that column will rest first on the shims. This method is recommended for heavier columns for easier and faster alignment of the column.

2. To align precast concrete column

Upper nuts and washers are screwed on the bolts and column is aligned in the vertical position by leveling nuts. It is practical to use long builder's spirit level, optical or laser level or two theodolites from different directions to ensure verticality. Adequate torque can be achieved typically by 10-15 impacts of a slogging ring spanner (DIN 7444), combination spanner or open ended slogging spanner (DIN 133) and 1.5 kg sledgehammer.

Recommended minimum T_{min} torque values of nuts.

Anchor Bolt	T [Nm]	Size of the slogging wrench
HPM 16	120	24 mm
HPM 20	150	30 mm
HPM 24	200	36 mm
HPM 30	250	46 mm
HPM 39	350	60 mm



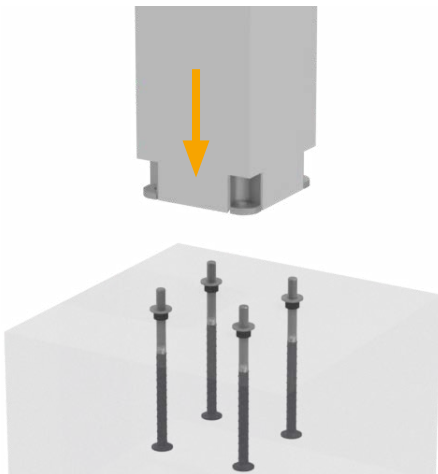
3. To grout joint and recesses

Before loading the column by any other structures e.g. beams or columns, the joint underneath the column and bolt recesses must be grouted by following instructions of the grout supplier. The grout must be non-shrink grade and strength according to plans. To avoid air being trapped in the joint, it is recommended to pour grout from one side of the column only. Grouting formwork is made so that adequate concrete cover for column shoes and anchor bolts is achieved.

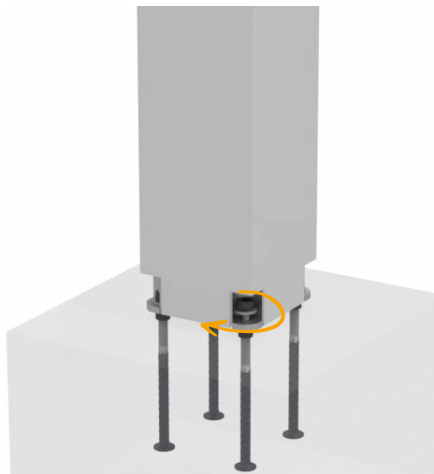
After grout has reached sufficient strength, the connection is finalized and joining structures may be erected on the column.

Erection of a precast concrete column step by step

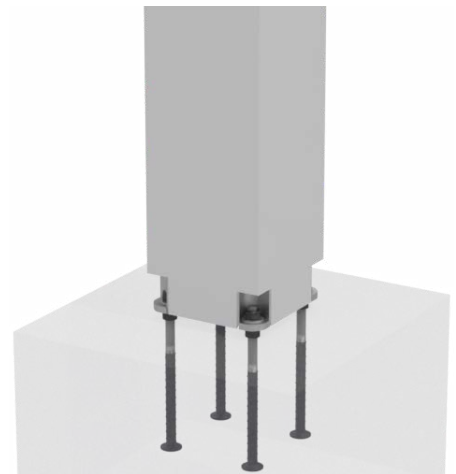
The column is installed directly on the pre-leveled washers and nuts.



The upper nuts and washers are screwed onto the bolts.



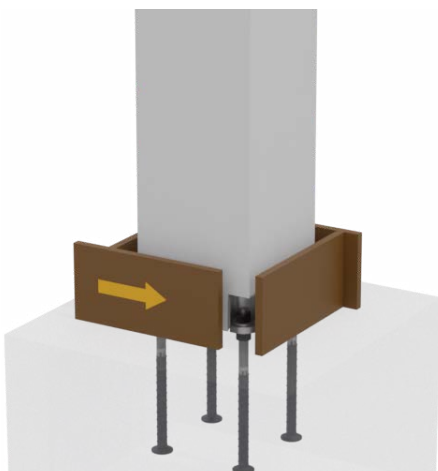
After the nuts are tightened, the crane can be released.



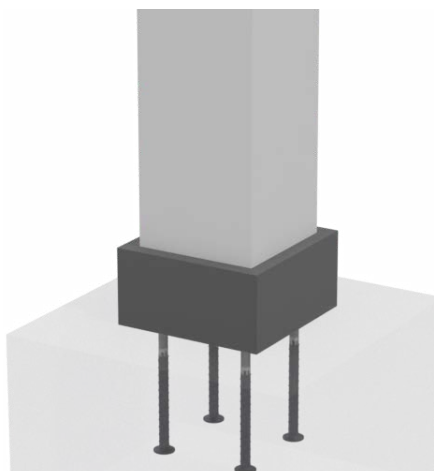
NOTE!

The open joint must be grouted, and the grout has to reach its designed strength before the column is loaded by other structures.

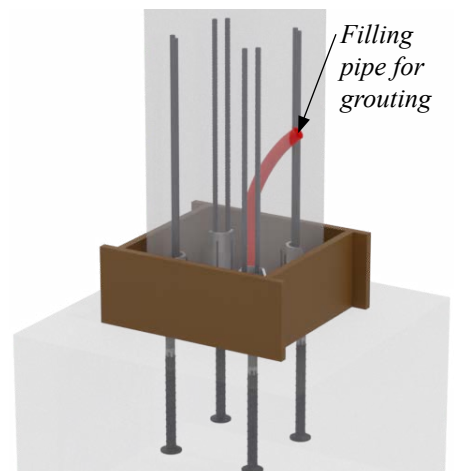
Formwork for grouting the joint and recesses.



Finalized connection after grouting has hardened.



Alternative where grouting is aligned with column face.



In column to foundation connections wider grouting can be provided to ensure higher concrete cover if it is required. It is recommended to increase the cover in aggressive environment.

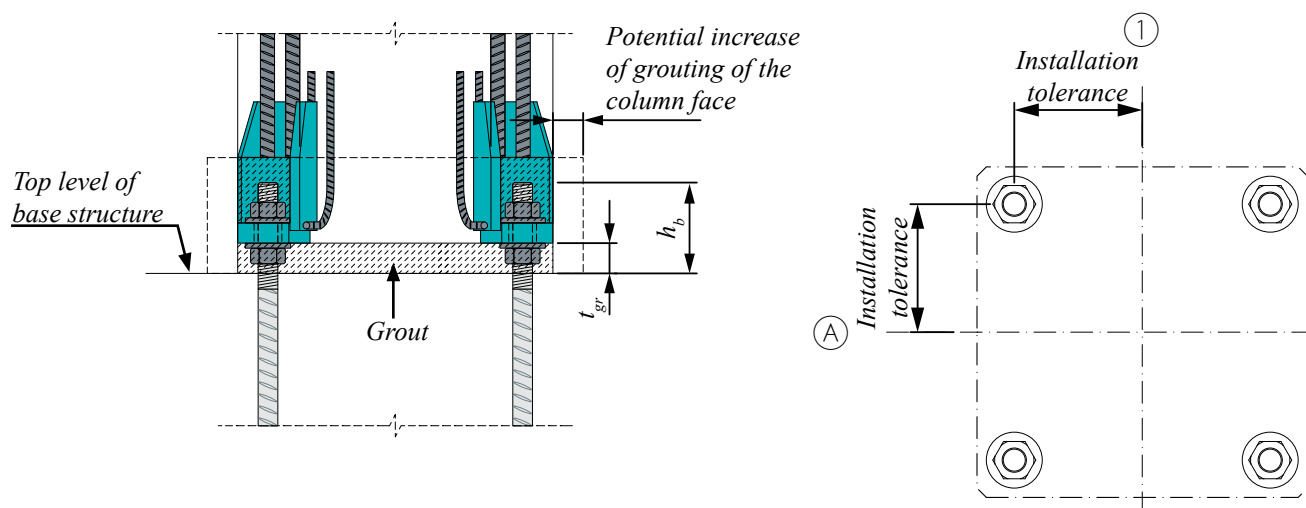


Figure 12. The anchor bolt's protrusion from the surface of concrete and installation tolerances when HELKA® Column Shoes are used.

Column Shoe	HELKA 24	HELKA 30	HELKA 39
Anchor Bolt	HPM 24	HPM 30	HPM 39
Thickness of grouting t_{gr} [mm]	50	50	60
Protrusion of bolt h_b [mm] ¹⁾	120	145	175
Installation tolerance for the bolt [mm]	±3	±3	±3

¹⁾ Anchor bolt protrusions h_b are guideline values and they are valid for grout thicknesses and corresponding HELKA® Column Shoe in the table.



Revisions

Version: PEIKKO GROUP 10/2024. Revision: 01

- First publication.

Resources

DESIGN TOOLS

Use our powerful software every day to make your work faster, easier and more reliable. Peikko design tools include design software, 3D components for modeling programs, installation instructions, technical manuals and product approvals of Peikko's products.

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APPROVALS

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EPDS AND MANAGEMENT SYSTEM CERTIFICATES

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