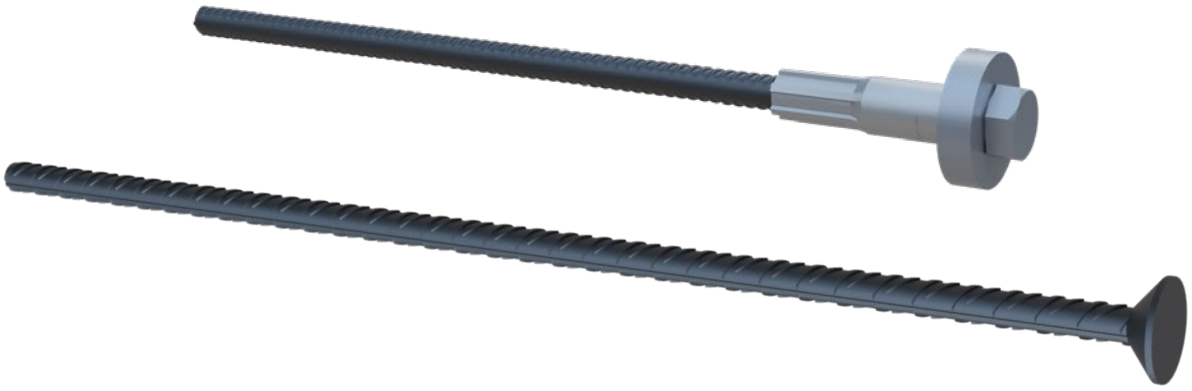
PEIKKO

WHITE PAPER



HEADED ANCHORS

FAST, SAFE, AND EFFICIENT ANCHORAGE TO CONCRETE

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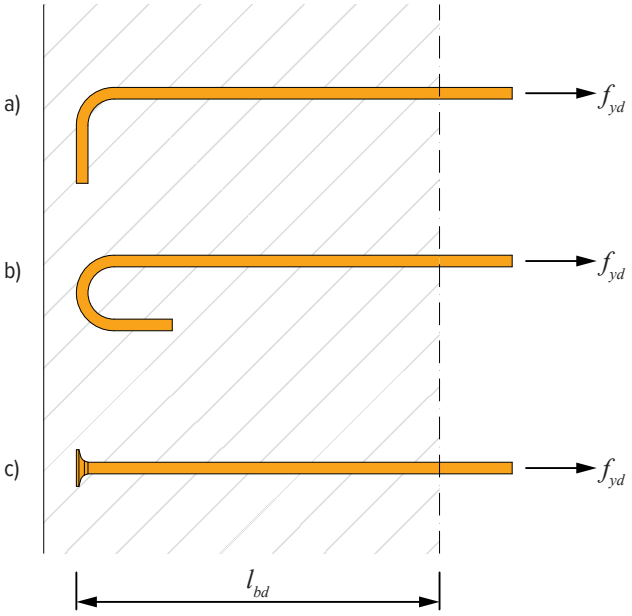
An adequate anchorage of steel into concrete is essential for the proper functioning of reinforced concrete structures. The anchorage of rebars is typically provided by small ribs continuously distributed over the length of the rebar or by mechanical end deformations of the rebar (bend, hook, or head).

Headed anchors offer multiple competitive benefits to other anchoring techniques (less congestion of reinforcement in concrete, easy installation). Headed anchors manufactured by Peikko and examples of their use cases are presented in the paper.

HOW HEADED ANCHORS WORK

Headed anchors are mechanical devices with head attached to one or both ends of rebars (B500B or similar). They are designed to develop the full tensile strength of the rebar. The anchorage of the rebar is ensured by the bearing of the head in concrete. The anchorage provided by headed anchors is at least equivalent to conventional end anchorages (bends, hooks), while offering several comparative benefits: fast and simple installation, less congestion of reinforcement, superior quality guaranteed by factory production control.



a) rebar with 90-degree hook
b) rebar with 180-degree hook
c) rebar with PSB® Headed Anchor

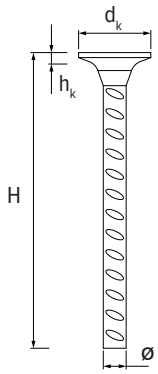
FIGURE 1. COMPARED ANCHORAGE LENGTH OF THE HOOK AND REBAR WITH THE HEAD

WHAT HEADED ANCHORS ARE

Headed anchors are available as two semi-standardized products:

PSB® Headed Anchor

- Head forged at one or both extremities of conventional rebars (B500B or similar).
- PSB® Headed Anchors are produced in Peikko factories and delivered on site.
- Assessed by ETA 21/0373 (European technical assessment).
- PSB® Headed Anchors are available in four different models for various alternative of use.
- PSB® Single, PSB® Double, PSB®-J and PSB®-S (see technical manual of PSB® Headed Anchors for further details).



Rebar diameter ø [mm]	Head diameter d_k [mm]	Thickness of the head h_k [mm]	Minimum length H_{min} [mm]	Maximum length H_{max} [mm]
10	31	6.0	125	11 500
12	38	7.0	125	11 500
14	44	8.0	135	11 500
16	50.5	8.0	135	11 500
20	63	10.0	185	11 500
25	79	13.0	220	11 500
28	87	21.0	220	11 500
32	96	23.0	220	11 500

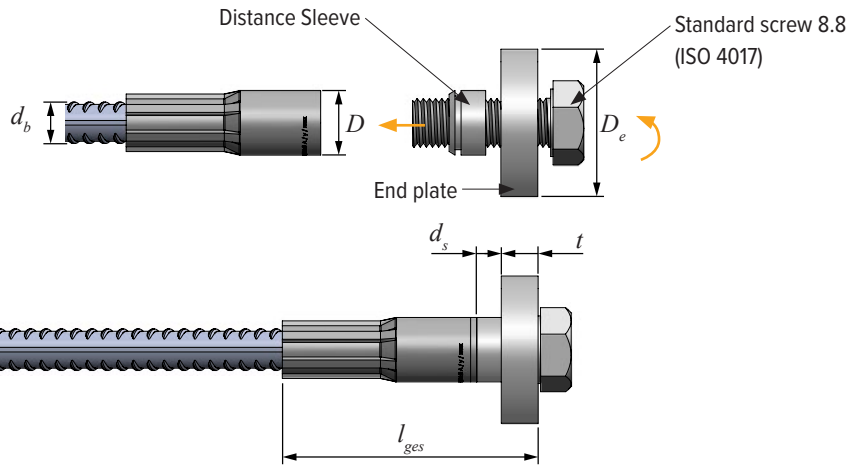
TABLE 1. DIMENSIONS OF PSB® HEADED ANCHOR

FIGURE 2. PRODUCTION OF PSB® HEADED ANCHORS

FIGURE 3. INSTALLATION OF PSB® HEADED ANCHORS ON CONSTRUCTION SITE

MODIX® EM Headed Anchor

- Round heads attached to the rebars by threaded couplers.
- Possibility to assemble the head on site after installing the rebar part.
- Female part of MODIX® EM is crimped to rebar either at Peikko factory or at the construction site by a rented crimping machine.



MODIX® EM	Rebar diameter d_b [mm]	Coupler diameter D [mm]	Thickness of distance sleeve d_s [mm]	End-plate diameter D_e [mm]	End-plate thickness t [mm]	Length fitted together l_{ges} [mm]	ISO metric thread M
10	10	17.5	9	40	10.0	71	M 12 x 1.75
12	12	21.0	10	48	12.0	85	M 16 x 2
14	14	24.0	11	55	14.0	97	M 18 x 2.5
16	16	27.0	11	63	15.0	106	M 20 x 2.5
20	20	33.0	12	80	19.0	129	M 24 x 3
25	25	41.0	14	95	24.0	160	M 30 x 3.5
28	28	47.0	16	110	28.0	185	M 36 x 4
32	32	53.0	18	130	31.0	205	M 42 x 4.5
40	40	63.5	20	150	40.0	223	M 48 x 5.0

TABLE 2. DIMENSIONS OF MODIX® EM HEADED ANCHOR

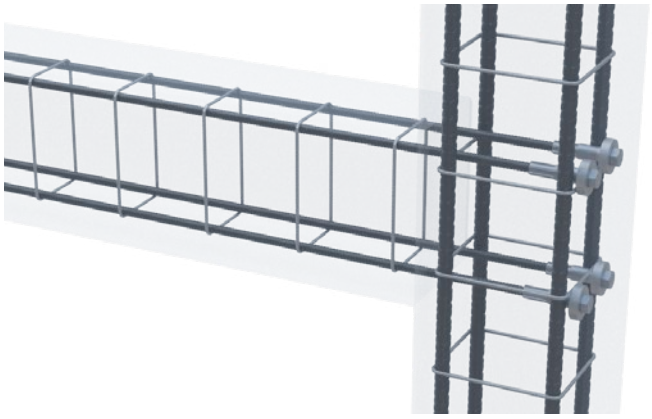


FIGURE 4. EXAMPLE OF INSTALLATION MODIX® EM HEADED ANCHORS ON SITE

APPLICATIONS IN CONSTRUCTION

CORBEL

The tensile reinforcement of concrete corbels is typically provided by rebars with large diameters. The rebars must be anchored in the corbel and in the column. Using reinforcement with headed anchors allows to reduce the amount of reinforcement in the concrete elements and simplify the installation of the reinforcement in precast factory.

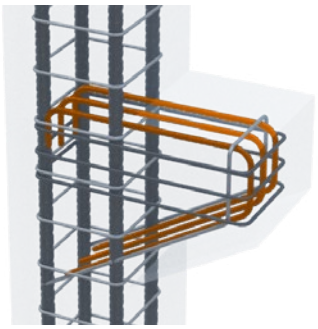


FIGURE 5. CONCRETE CORBEL REINFORCED BY HOOKED REINFORCEMENT

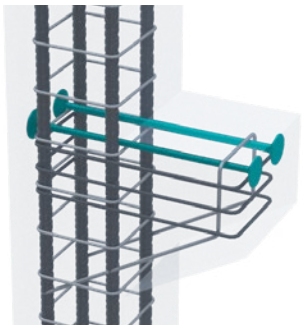


FIGURE 6. CONCRETE CORBEL REINFORCED BY USING PSB® HEADED ANCHORS

FRAME CORNERS

Frame corners are zones where the bending reinforcement of beams and columns needs to be anchored in a relatively small space. This causes reinforcement congestion. Anchoring the reinforcement using headed anchors allows to free up space and makes the installation of reinforcement and casting of concrete simpler.

FIGURE 7. CONVENTIONAL FRAME CORNER DETAIL

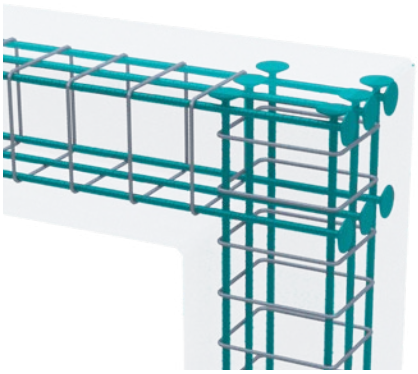


FIGURE 8. FRAME CORNER WITH REINFORCEMENT ANCHORED BY PSB® HEADED ANCHORS

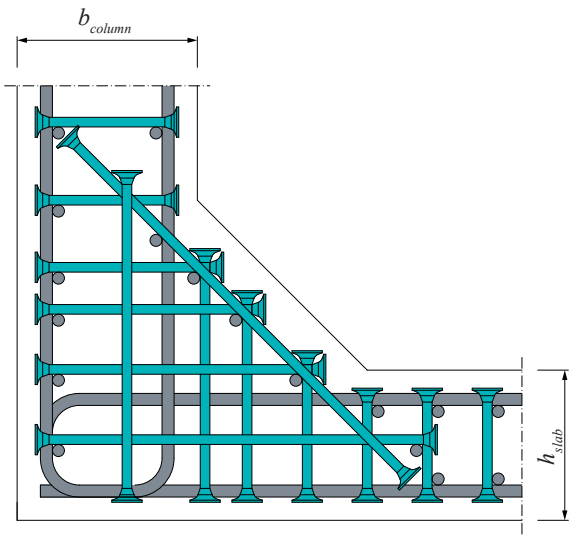


FIGURE 9. REINFORCEMENT DETAIL OF SLAB TO WALL JOINT IN FOUNDATION ELEMENTS

SHEAR REINFORCEMENT IN WALLS AND SLABS

Headed anchors used as shear reinforcement elements for slabs and walls. In thin slabs or walls, the reinforcement elements typically consist of double headed rebars welded to assembly profiles (see Figure 11).

Such prefabricated assemblies allow for a quick and precise installation of the headed rebars on site.

FIGURE 10. PSB®-S MODEL

FIGURE 11. CONCRETE SHEAR WALL REINFORCED BY USING STIRRUPS

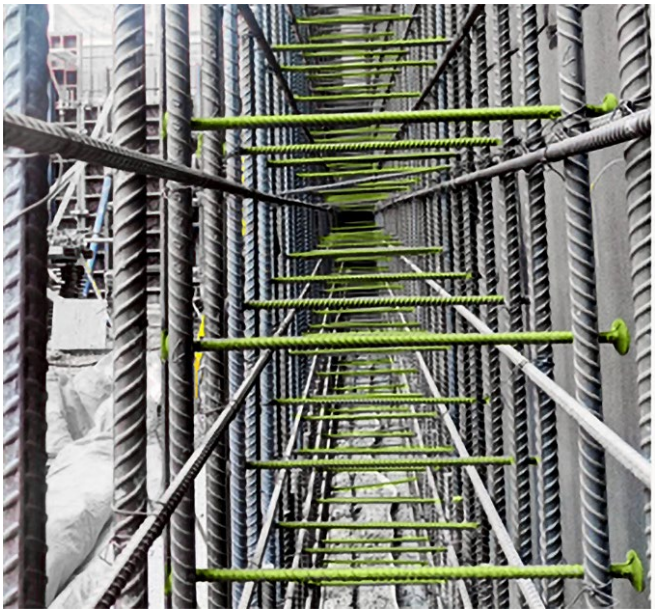


FIGURE 12. CONCRETE SHEAR WALL USING PSB® HEADED ANCHORS AS SHEAR REINFORCEMENT REPLACING THE STIRRUPS

PSB®-J elements, rebars with one head and one hook, are used primarily in thick foundation slabs. The end hook allows the element to be installed from the top by hanging it to the top reinforcement of the slab.

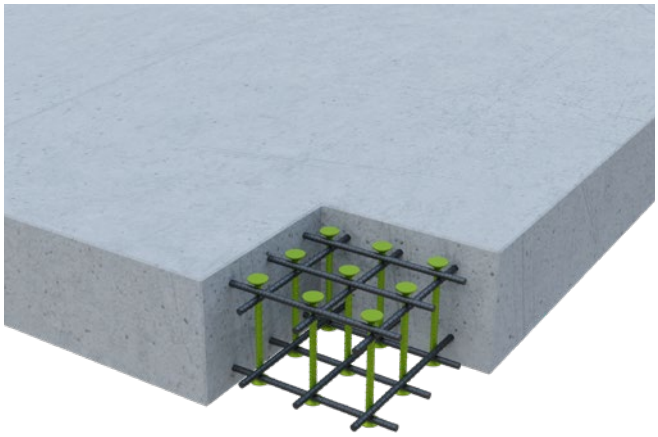
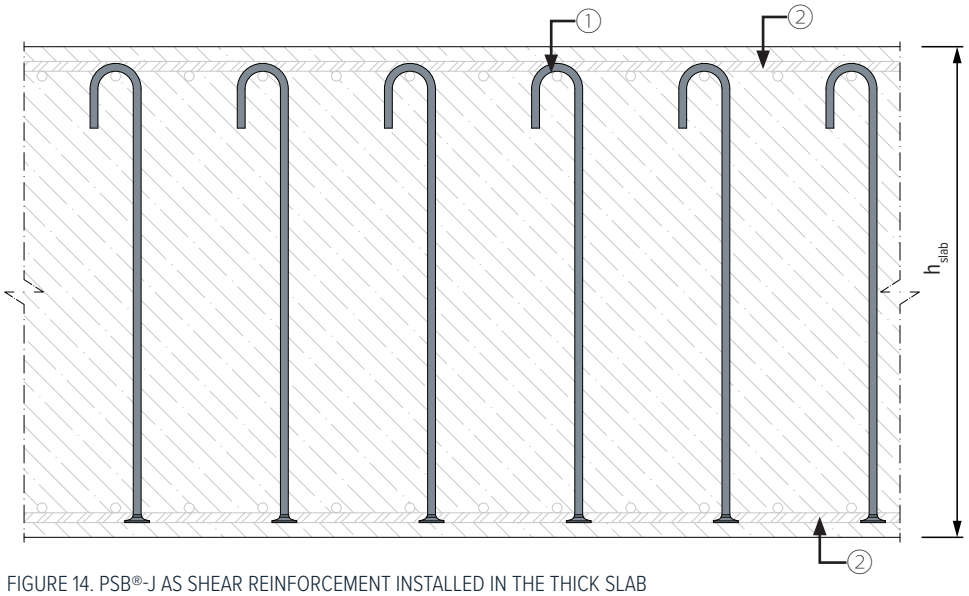


FIGURE 13. PSB® DOUBLE AS SHEAR REINFORCEMENT IN THE THIN SLAB



① PSB®-J
② Main reinforcement of the slab

FIGURE 14. PSB®-J AS SHEAR REINFORCEMENT INSTALLED IN THE THICK SLAB

The fatigue performance of PSB® Headed Anchors has been tested in accordance with ISO 15698-2: 2012, which allows such elements to be used also in structures subjected to cyclic loading such as wind turbine foundation.

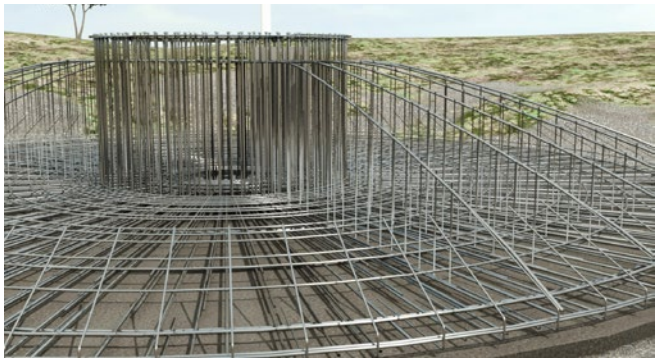


FIGURE 15. THE REINFORCEMENT CAGE OF FOUNDATION FOR WIND TURBINE

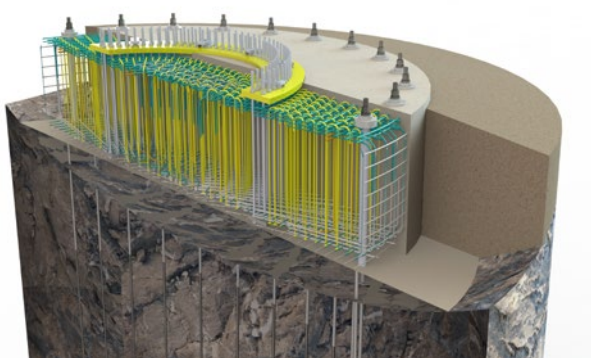


FIGURE 16. THE SECTION VIEW OF REINFORCEMENT CAGE OF WIND TURBINE'S FOUNDATION

SHEAR CONNECTION BETWEEN TWO LAYERS OF CONCRETE

A need to connect concrete layers cast at different times may occur in a wide range of situations, such as the strengthening of the existing concrete decks. The transfer of shear forces between the connected elements is conditioned by the presence of transverse rebars that cross the interface and are anchored in both connected elements. The PSB® Headed Anchors are installed in holes drilled in the existing concrete and anchored by using adhesive with adequate ETA assessment for that purpose (a list of recommended adhesives can be provided by local Peikko representatives). The PSB® Headed Anchors provide adequate anchorage of the rebar in the new concrete even in the case of relatively thin slabs.

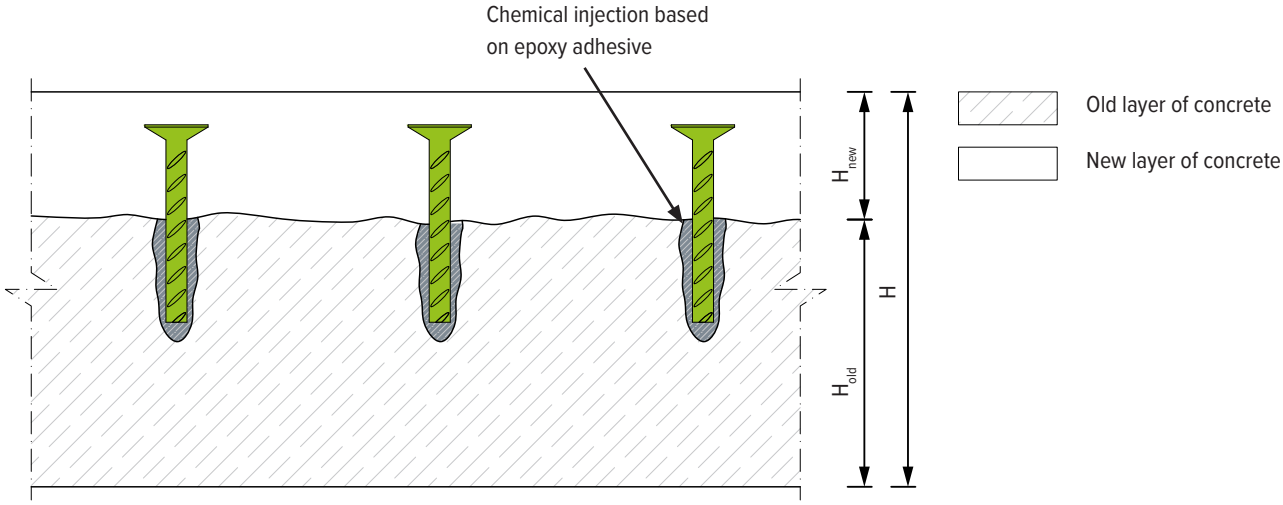


FIGURE 17. SHEAR CONNECTION BETWEEN OLD AND NEW LAYER OF CONCRETE SECURED BY PSB® HEADED ANCHORS

FIGURE 18. MODEL OF PSB® HEADED ANCHORS WAITING FOR CONNECTING NEW LAYER OF CONCRETE

HIGHLY REINFORCED COMPONENTS

In overcrowded reinforcement cage where the space for installation of PSB® Headed Anchor with already forged head is limited, it is possible to use removable MODIX® EM headed anchor, for easier installation. The head is assembled after reinforcement of the component is installed to reinforcement cage.

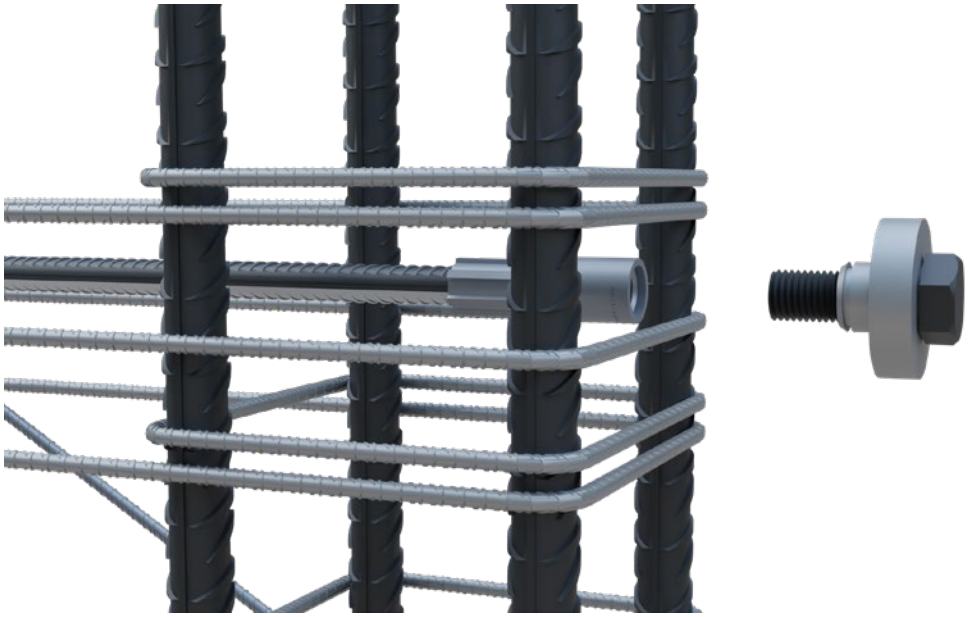


FIGURE 19. MODIX® EM HEADED ANCHOR'S BENEFIT OF REMOVABLE AND POST-INSTALLED HEAD IN HIGHLY REINFORCED CAGE

Headed anchor provides an attractive and versatile solution for many kinds of reinforced concrete structures. Two semi standardized models of headed anchors are suitable for use in various cases which are congested by conventional bend reinforcement. Anchorage performance of the headed anchors has been tested and verified with various approvals to bring safer, faster, and more reliable solutions to customers.

A faster, safer, and more efficient way to design and build

Peikko is a leading global supplier of slim floor structures, wind energy applications and connection technology for precast and cast-in-situ. Peikko's innovative solutions offer a faster, safer, and more efficient way to design and build.

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