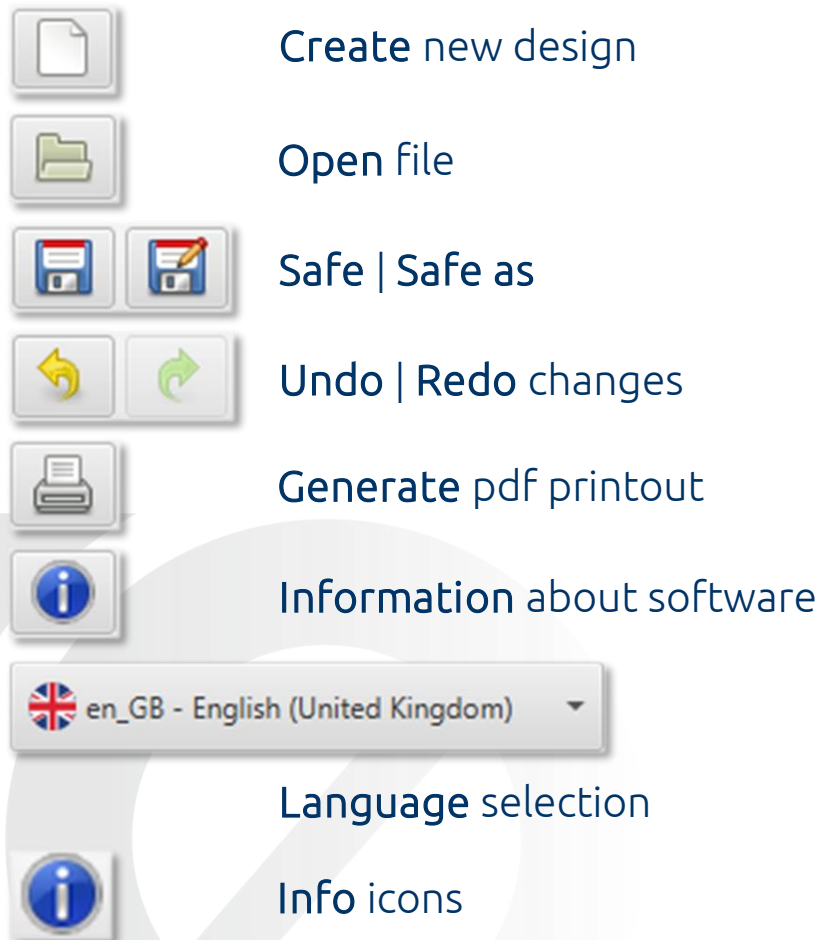




Post Installed Rebar

← Shortcut:

Meaning of icons and symbols:



Designing data:

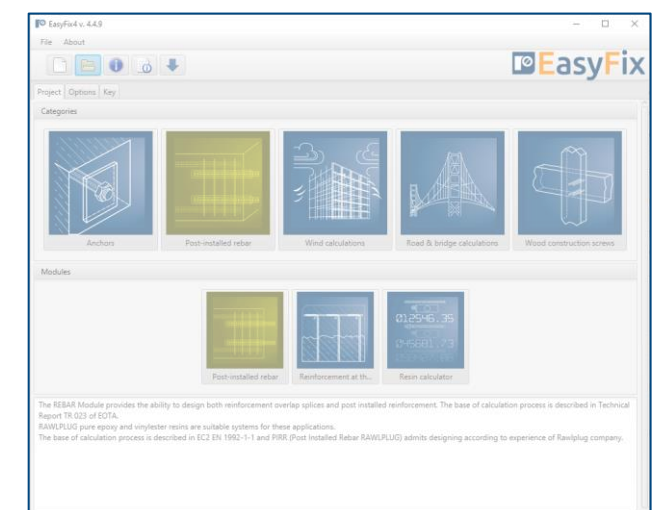
1. Selection of the product category
5. Conditions of installation
8. Defining of the acting load
9. Analysis of the results
10. Generating the printout

Existing construction:

2. Defining of the existing construction
4. Application of the construction
6. Reinforcement of the existing construction

New construction:

3. Defining of the new construction
7. Reinforcement of the new construction





Post Installed Rebar

1

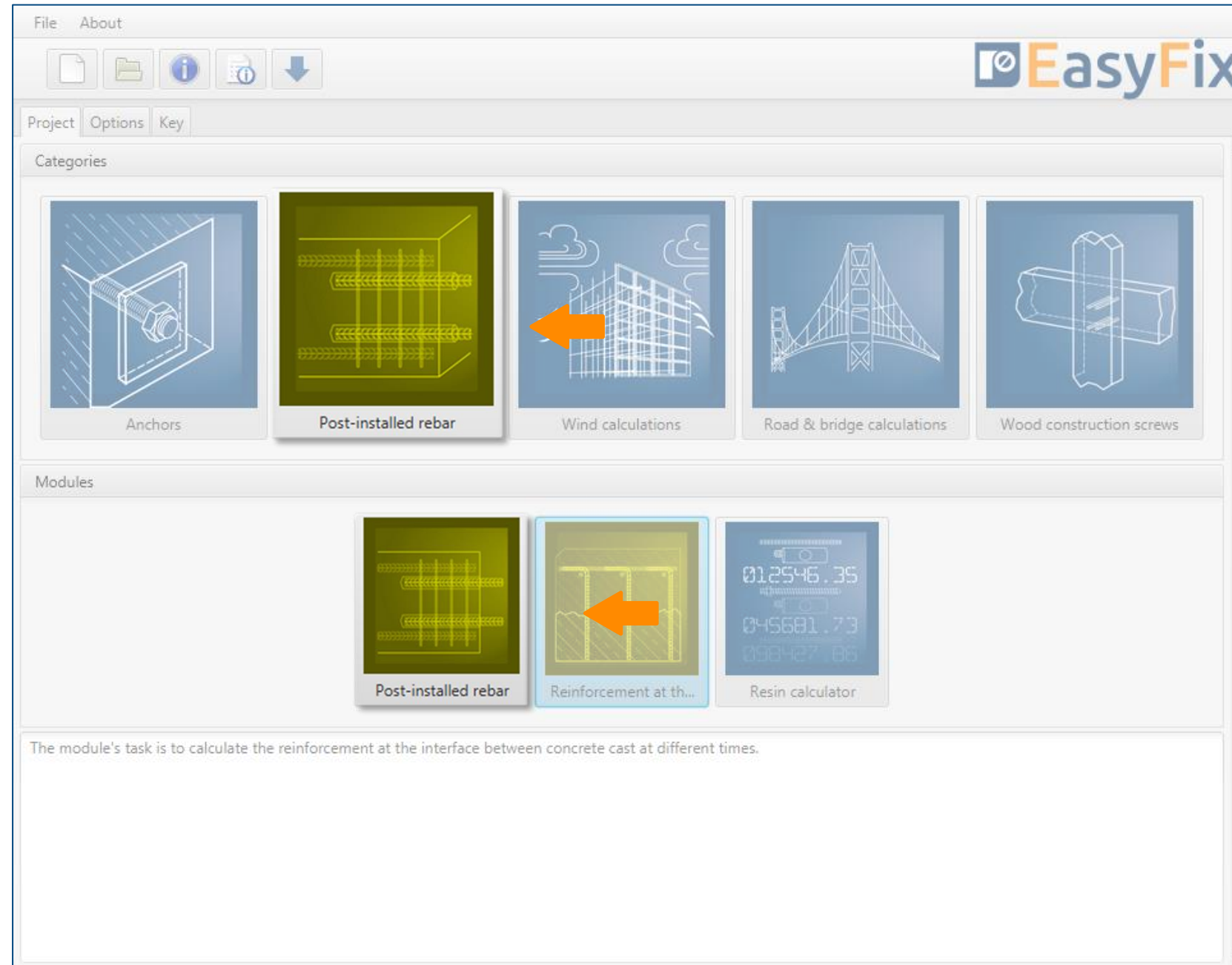
Selection of
The product category



Designing methods:

EUROCODE 2 | EN 1992-1-1

PIRR | Post Installed
Rebar Rawlplug





Post Installed Rebar

2 Defining of The existing construction »

Determining and defining the geometry of the existing structure requires knowledge of the details of the concrete in which to anchor. In example concrete class, steel yield strength, element dimensions.

Determining of the construction type:
Plate | Beam | Wall | Column | Foundation

Determining of the **structure dimensions**: The geometry of the structure can be specified in the side panel or on the model

Determining of the **concrete strength class**:
Entering data by selecting from the list or the option "by user".

Determining of the **yield steel strength**:
Entering data by selecting from the list or the option "by user".

The screenshot displays the EASYFIX 4 software interface. On the left, a side panel contains several sections for defining the existing construction:

- Existing construction:** Includes icons for different construction types. Below are input fields for Thickness (T) set to 200 mm, Length (L) set to 1.5 m, Concrete class set to C20/25 (with a 'By customer' option), and Characteristic yield strength of reinforcement f_{yk} set to 500 MPa (with a 'By customer' option).
- New construction:** Includes input fields for Thickness (t) set to 200 mm, Offset y (O_y) set to 0 mm, and Characteristic yield strength of reinforcement f_{yk} set to 500 MPa (with a 'By customer' option).
- Application:** Includes 'Slab - Slab at support (02_at_support)' and 'Support thickness (R_{SW})' set to 200 mm.
- Installation:** Includes 'Drilling method' set to Hammer drilling, 'Drilling aid' set to With drilling aid, 'In-service temperature' set to None, and 'Max. short/long term temperature' set to None.

The central 3D model shows a concrete slab with a yellow rebar. Dimensions are indicated: 1m for the slab length, 0.8m for the rebar length, and 200mm for the slab thickness. A load of $M = 0 \text{ kNm} / 1 \text{ m}$ and $N = 0 \text{ kN} / 1 \text{ m}$ is applied. On the right, a 'Result' panel shows design parameters: Design method EC2, Anchor R-KEXII, Region Europe, Design embedment depth 242 mm, and Steel utilisation per bar 0%.



Post Installed Rebar

2 Defining of The existing construction >>

Determining of the concrete strength class:

Selecting from the list:
Concrete strength class according to standard EN 206

Option „by user“:
Possibility of manual input of characteristic compressive strength of cylinder f_{ck} or
Possibility of manual input of characteristic compressive strength of cube $f_{ck, cube}$.

Existing construction

Thickness (T) 200 mm

Length (L) 1.5 m

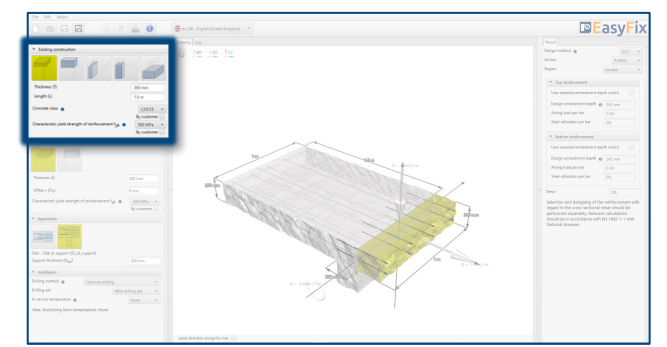
Concrete class C20/25 By customer

Characteristic yield strength 500 MPa By customer

By customer

fck 20 MPa

fck,cube





Post Installed Rebar

2 Defining of The existing construction »

Determining of the yield steel strength:

Selecting from the list:
Reinforcement according to standard EN 1992-1-1:2008

Option „by user“:
Possibility of manual input yield steel strength f_{yk} and its safety factor γ_s according to national requirements.

Existing construction

Thickness (T) 200 mm

Length (L) 1.5 m

Concrete class C20/25

By customer

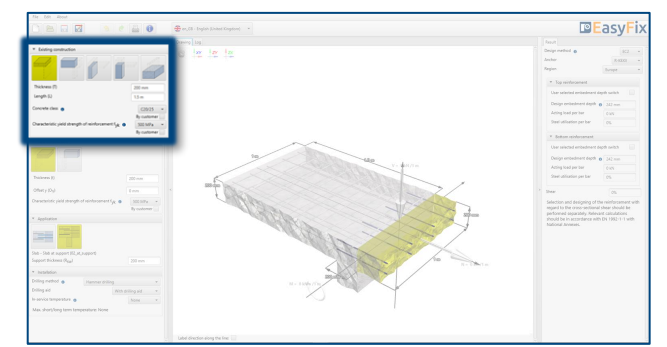
Characteristic yield strength f_{yk} 500 MPa

By customer

f_{yk} 500 MPa

Safety factor γ_s 1.15

By customer





Post Installed Rebar

3 Defining of The new construction »

Determining and defining the geometry of a new structure requires the knowledge of details, i.e., the steel yield strength, dimensions of the element, layout and diameter of the anchored rebars.

Determining of the **construction type**: Depending on the geometry of the existing construction, there is a choice between: Plate | Beam | Wall | Column

Determining of the **structure dimensions**: The geometry of the structure can be specified in the side panel or on the model

Determining the **position of the structure**: Inputting a possible shift of the new structure in relation to the existing one.

Determining of the **yield steel strength**: Entering data by selecting from the list or the option "by user".

The screenshot displays the EasyFix software interface. On the left, the 'Existing construction' and 'New construction' panels are visible. The 'New construction' panel is highlighted with a blue box and contains the following settings:

- Thickness (t): 200 mm
- Offset y (Oy): 0 mm
- Characteristic yield strength of reinforcement f_{yk} : 500 MPa (By customer)

The central 3D model shows a slab with a new construction highlighted in yellow. Dimensions of 1m and 0.8m are indicated. A vertical load $V = 4 \text{ kN/m}$ and a moment $M = 0 \text{ kNm/m}$ are applied. Green arrows point to specific dimensions on the model: 200mm, 1m, and 1m.

On the right, the 'Result' panel shows design parameters:

- Design method: EC2
- Anchor: R-KEXII
- Region: Europe
- Top reinforcement: Design embedment depth 242 mm, Acting load per bar 0 kN, Steel utilisation per bar 0%
- Bottom reinforcement: Design embedment depth 242 mm, Acting load per bar 0 kN, Steel utilisation per bar 0%
- Shear: 0%

At the bottom of the right panel, a note states: "Selection and designing of the reinforcement with regard to the cross-sectional shear should be performed separately. Relevant calculations should be in accordance with EN 1992-1-1 with National Annexes."



Post Installed Rebar

3 Defining of The new construction »

Determining of the **construction type**:
Depending on the geometry of the existing construction, there is a choice between:

- Plate – Plate | Beam
- Beam – Beam | Plate
- Wall – Plate | Beam | Wall
- Column – Beam | Column
- Foundation – Wall | Column

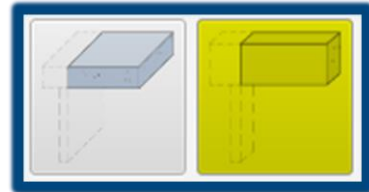


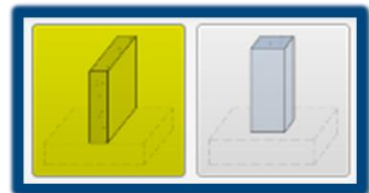
Plate | Beam



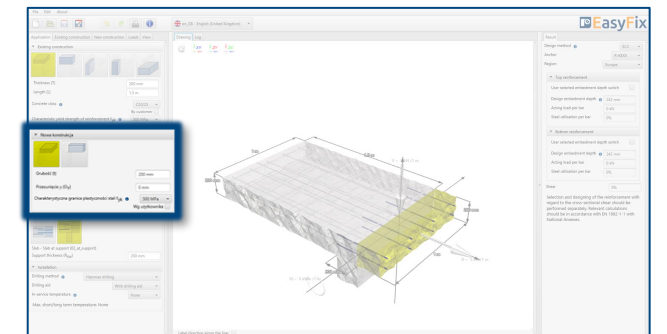
Plate | Beam | Wall



Beam | Column



Wall | Column





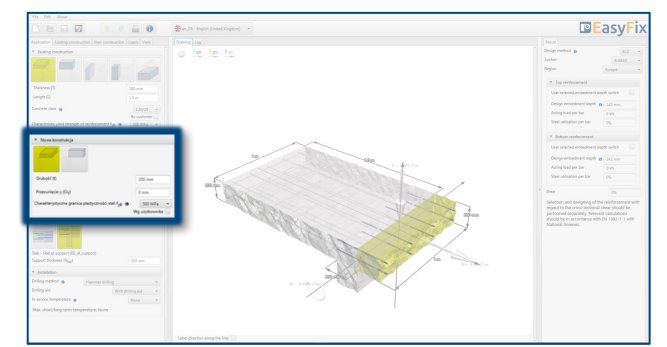
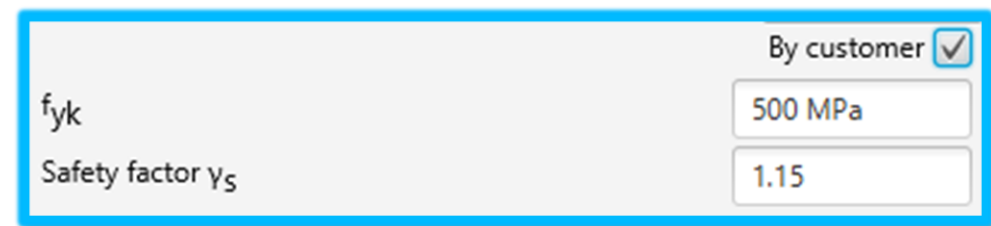
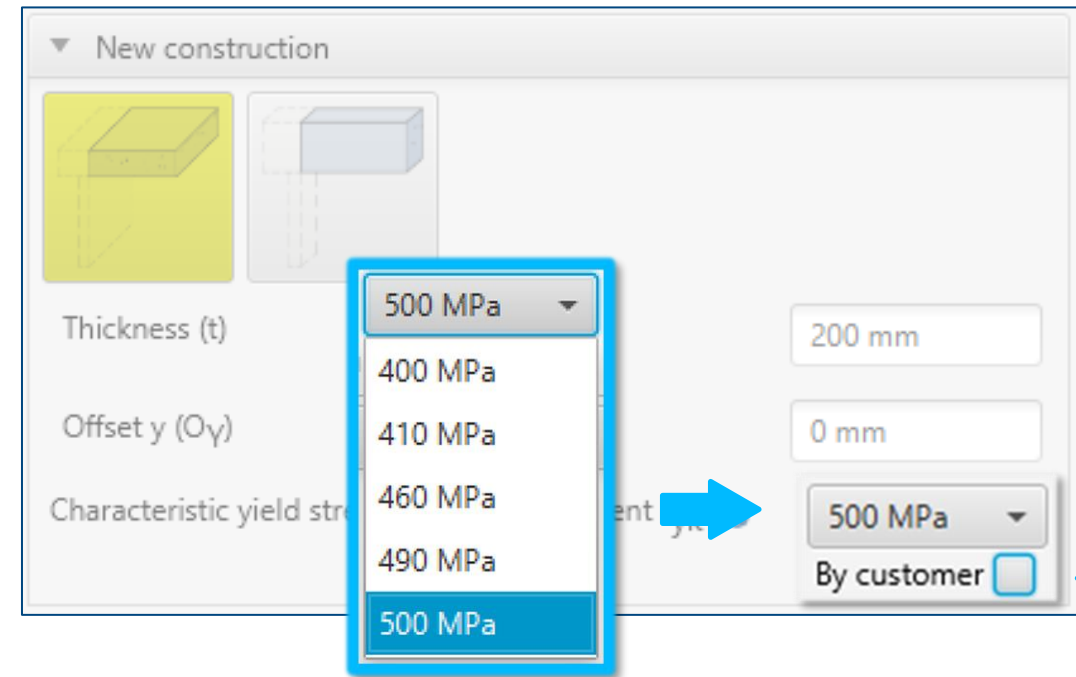
Post Installed Rebar

3 Defining of The new construction »

Determining of the yield steel strength:

Selecting from the list:
Reinforcement according to standard EN 1992-1-1:2008

Option „by user“:
Possibility of manual input yield steel strength f_{yk} and its safety factor γ_s according to national requirements.



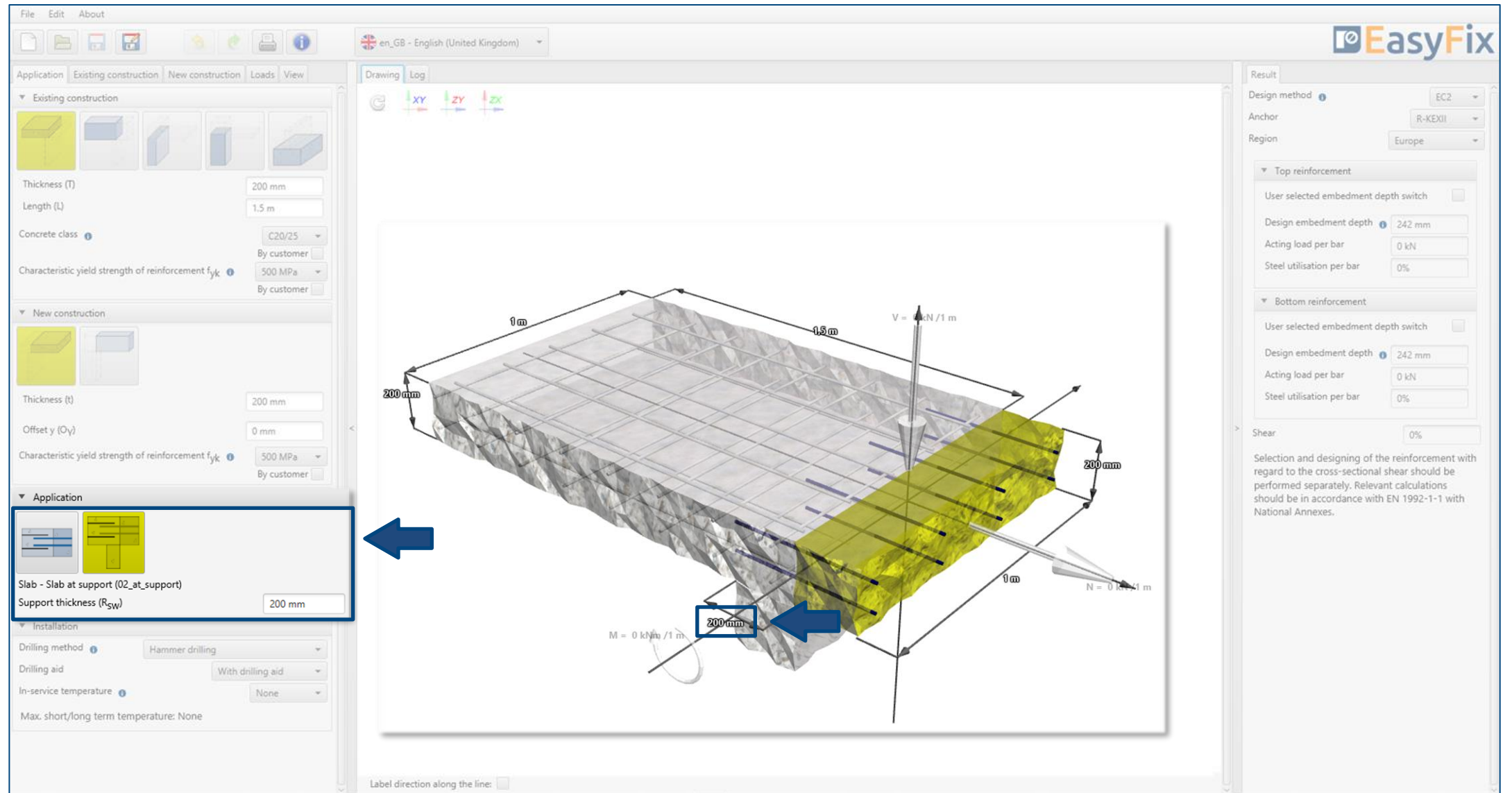


Post Installed Rebar

4 Defining of the Construction and its application »

Determining of the type of construction: Depending on the type of structure, determining the exact work of the structure along with the required dimensions.

The **Application** panel is used to detail the type of structure and its use. Here we define information on the cooperation of the existing and new elements.





Post Installed Rebar

4 Defining of the Construction and its application »

Determining of the type of construction:

Depending on geometry of existing structure:

- The structure without support
- The structure with support
- The structure simply supported
- Elongation of the structure
- Compression of the structure
- Calculation of lap length



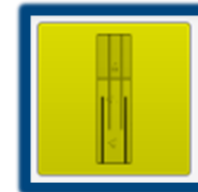
The structure **without support**



The structure **with support**



The structure **simply supported**



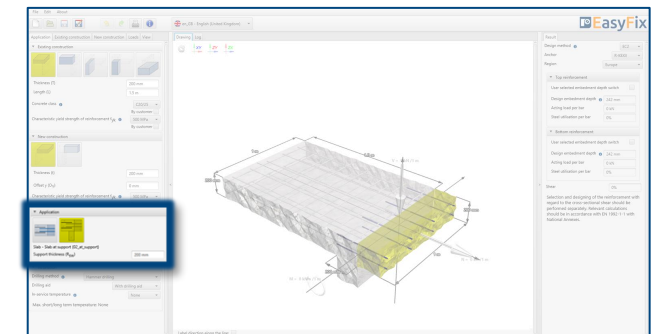
Elongation of the structure



Compression of the structure



Calculation of **lap length**





Post Installed Rebar

5 Conditions of The installation »

Determination and defining of the drilling method in the existing structure. The selection of the drilling method affects on the thickness of the concrete cover. The choice of the service temperature determines the minimum and maximum temperature of the substrate at the time of installation of the anchor.

Determination of drilling method:
Selecting from the list:
Hammer | Diamond

Determination of service temperature:
Selecting from the list of results filters the proper anchor group.

The screenshot shows the EasyFix software interface. On the left, there are configuration panels for 'Existing construction', 'New construction', and 'Application'. The 'Installation' panel at the bottom is highlighted with a blue box and a blue arrow pointing to the 'Drilling method' dropdown (set to 'Hammer drilling') and a green box and green arrow pointing to the 'In-service temperature' dropdown (set to 'None'). The 'Max. short/long term temperature' is set to 'None'. The central area displays a 3D model of a concrete slab with a grid of rebar. On the right, a 'Result' panel shows design parameters: Design method (EC2), Anchor (R-KEXII), Region (Europe), Design embedment depth (242 mm), and Steel utilisation per bar (0%). A note at the bottom of the result panel states: 'Selection and designing of the reinforcement with regard to the cross-sectional shear should be performed separately. Relevant calculations should be in accordance with EN 1992-1-1 with National Annexes.'



Post Installed Rebar

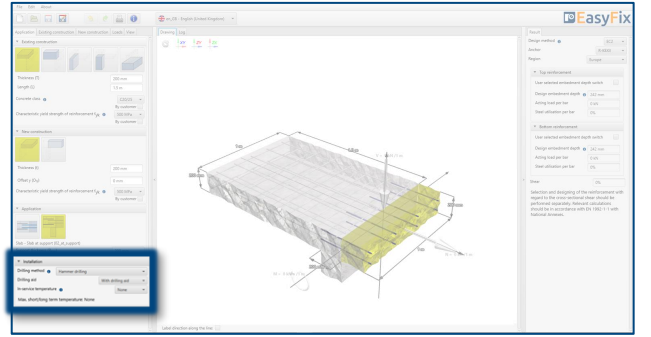
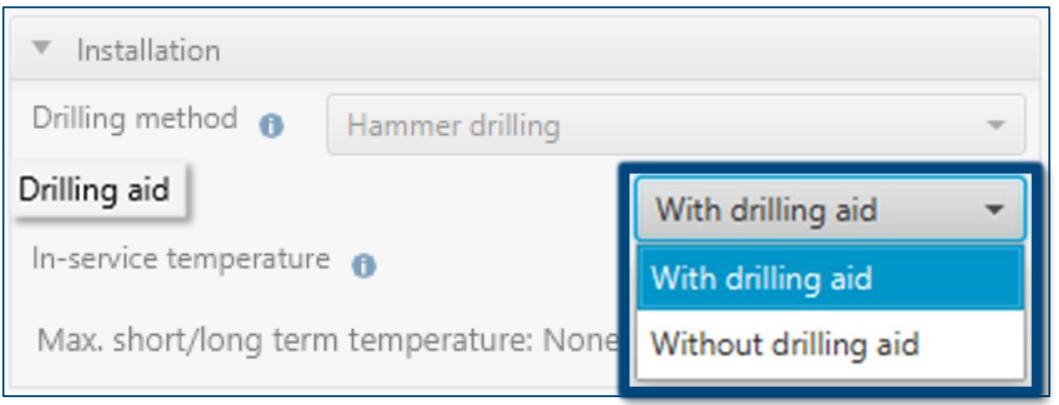
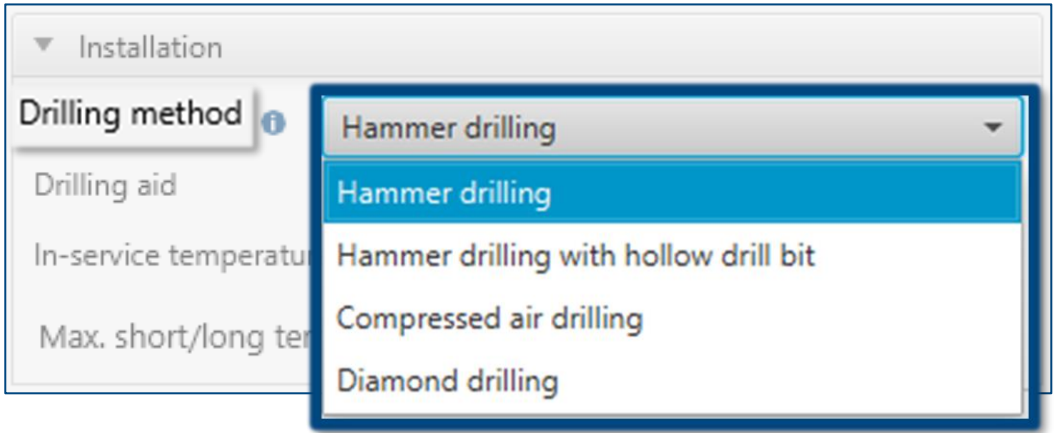
5 Conditions of The nstallation



Determination of drilling method:
Selecting from the list:

- Hammer drilling
- Hammer drilling with hollow drill bit
- Compressed air drilling
- Diamond drilling

Selecting from the list of results filters the proper anchor group.





Post Installed Rebar

5 Conditions of The installation



Determination of service temperature range:

Selecting from the list:

- 40° C ÷ + 40° C
- 40° C ÷ + 80° C
- 40° C ÷ + 120° C

For the appropriate range, the program displays information about the range of short and long-term work.

Selecting from the list of results filters the proper anchor group.

Installation

Drilling method *i* Hammer drilling

Drilling aid With drilling aid

In-service temperature → -40/40°C

Max. short/long term temperature: None

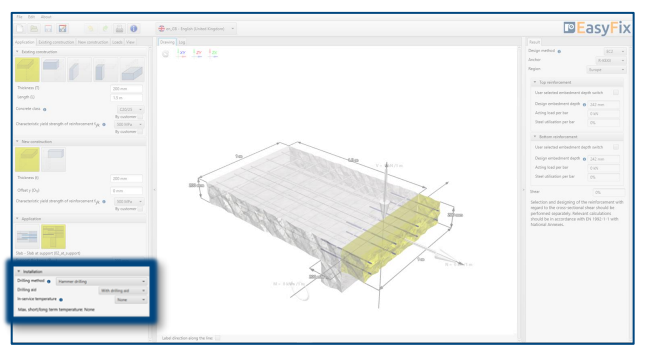
Installation

Drilling method *i* Hammer drilling

Drilling aid With drilling aid

In-service temperature *i* None

Max. short/long term temperature: 80/50°C ←





Post Installed Rebar

6 Reinforcement of the existing construction »

Defining reinforcement in an existing structure enables entering data in a simplified or detailed way. The detail model allows you to move the reinforcement in relation to the appropriate axis. Top and bottom reinforcement is defined for each layer.

- Defining the input data:
- Longitudinal bars:**
- The diameter of the bars
 - Cover thickness - top| bottom
 - Spacing | number of bars
- Transverse bars:**
- The diameter of the bars
 - Spacing

The screenshot displays the EasyFix software interface. On the left, there are configuration panels for reinforcement. The 'Existing construction' tab is active. The 'Layout of bars' is set to 'Simplified layout of bars' and 'Reinforcement type' is 'Top and bottom reinforcement'. The 'Bar spacing in construction /1 m' is set to 'Axial position'. The panels are divided into 'Top reinforcement' and 'Bottom reinforcement', each with 'Longitudinal' and 'Transverse' sub-sections. Parameters include 'Bar size' (Ø10), 'Bar spacing' (200 mm), and 'Cover to face' (50 mm top, 30 mm bottom). The 'Bottom reinforcement - Transverse' section is checked. The 3D model in the center shows a rectangular slab with a grid of rebar. A yellow highlighted section shows a cross-section with a vertical load $V = 0 \text{ kN/1 m}$ and a horizontal load $N = 0 \text{ kN/1 m}$. The slab dimensions are 1.0 m by 0.5 m. The rebar is shown with a spacing of 200 mm. The right side of the interface shows a 'Result' panel with design parameters: 'Design method' (EC2), 'Anchor' (R-KEXII), 'Region' (Europe), 'Design embedment depth' (242 mm), 'Acting load per bar' (0 kN), and 'Steel utilisation per bar' (0%). A note at the bottom right states: 'Selection and designing of the reinforcement with regard to the cross-sectional shear should be performed separately. Relevant calculations should be in accordance with EN 1992-1-1 with National Annexes.'



Post Installed Rebar

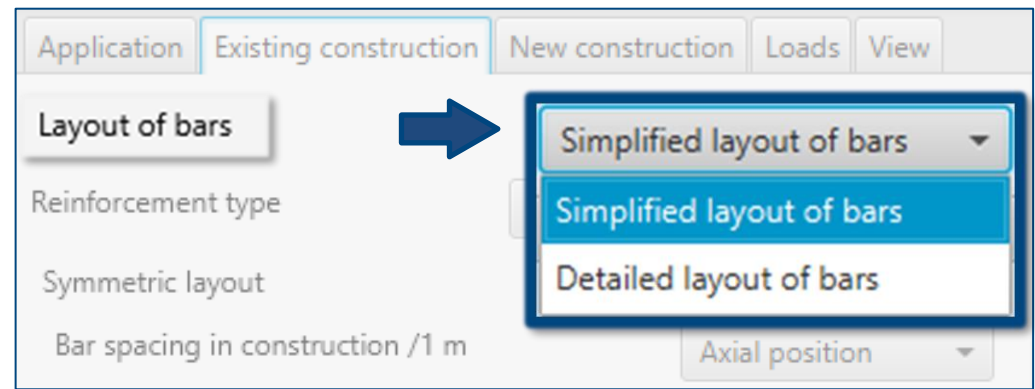
6 Reinforcement of the existing construction »

Determination of bars layer:

Selecting from the list:

- Simplified bars layout
- Detailed bars layout.

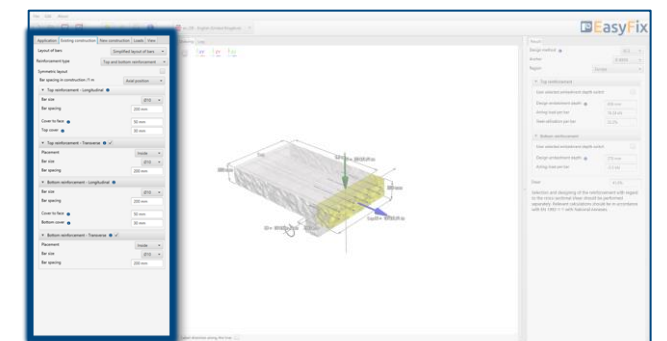
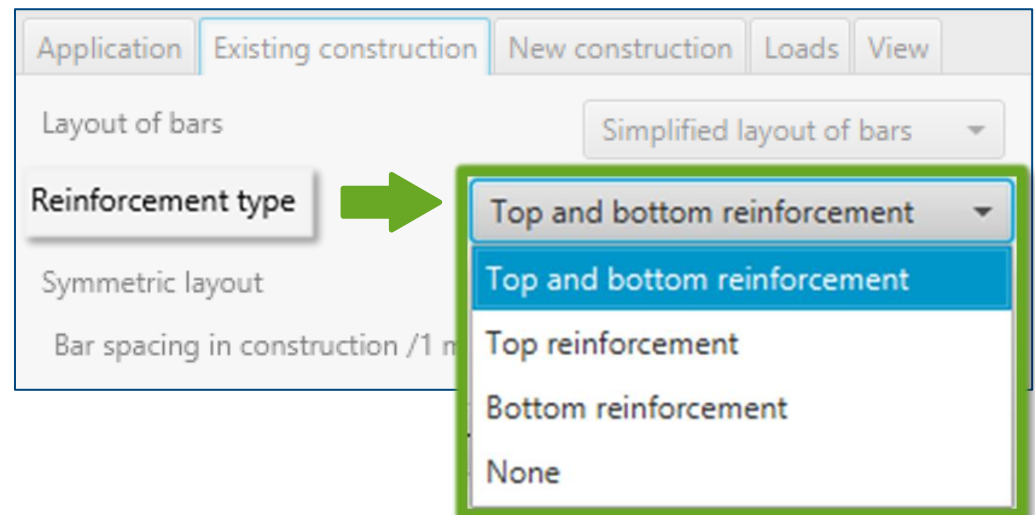
It allows to move the reinforcement in relation to the appropriate axis.



Determination of positioning of rebar:

Selecting from the list:

- Top and bottom reinforcement
- Top reinforcement
- Bottom reinforcement
- None



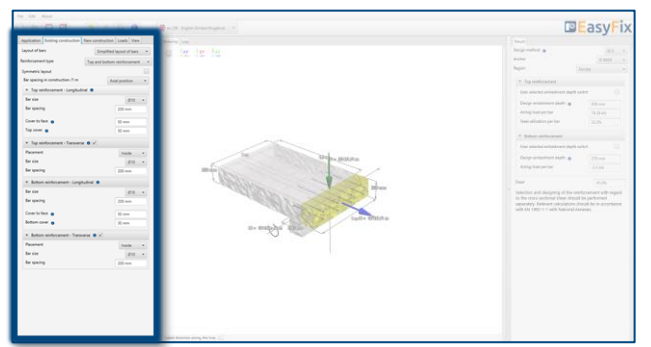
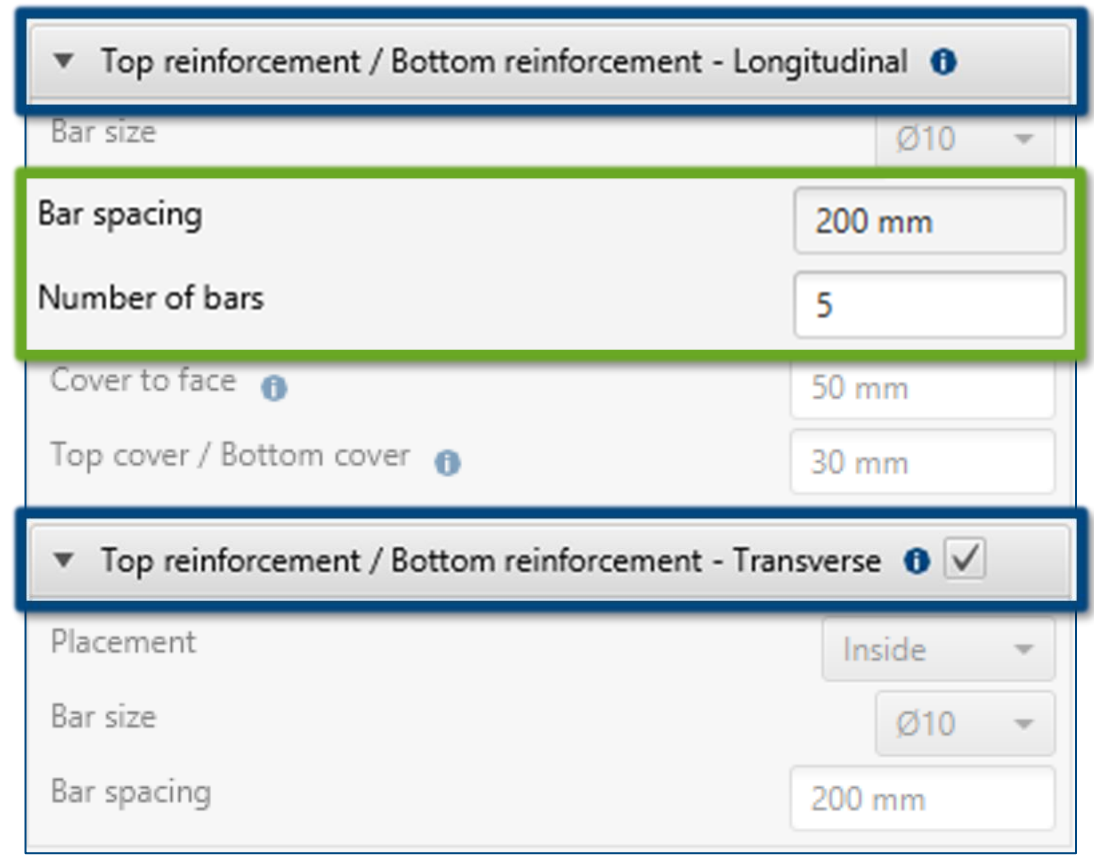
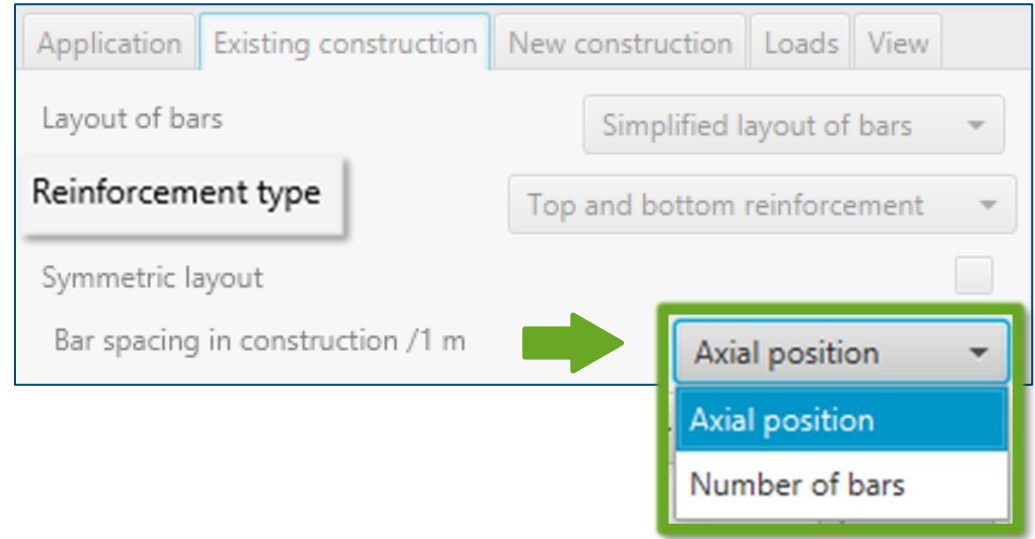
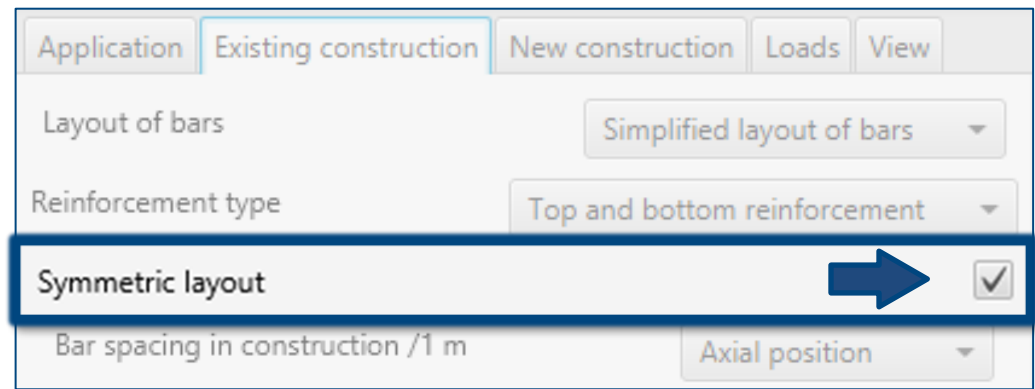


Post Installed Rebar

6 Reinforcement of the existing construction »

Symmetric layout:
 Selecting this option allows to enter data for the top and bottom reinforcement, which have the same layer system, at the same time.

Determination of reinforcement spacing:
 Selecting from the list:
 - Axial spacing
 - Number of bars





Post Installed Rebar

6 Reinforcement of the existing construction »

The diameter of longitudinal reinforcement

Thickness of concrete cover face

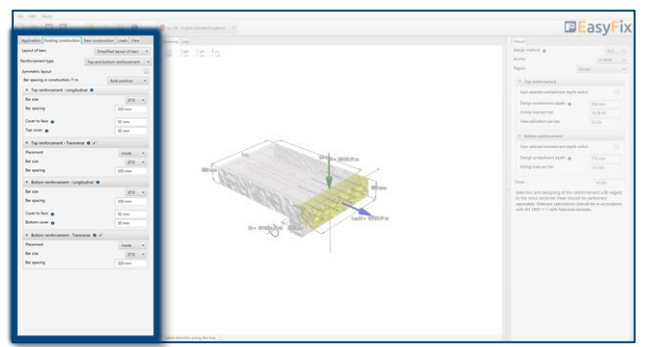
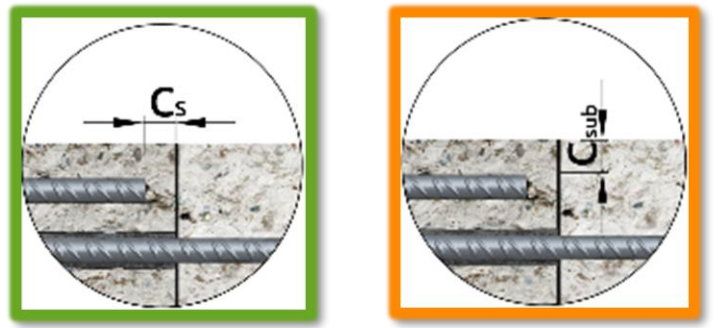
Thickness of top and bottom concrete cover

▼ Top reinforcement / Bottom reinforcement - Longitudinal ⓘ

Bar size	→	Ø10
Bar spacing		200 mm
Number of bars		5
Cover to face ⓘ	→	50 mm
Top cover / Bottom cover ⓘ	→	30 mm

▼ Top reinforcement / Bottom reinforcement - Transverse ⓘ ✓

Placement		Inside
Bar size		Ø10
Bar spacing		200 mm





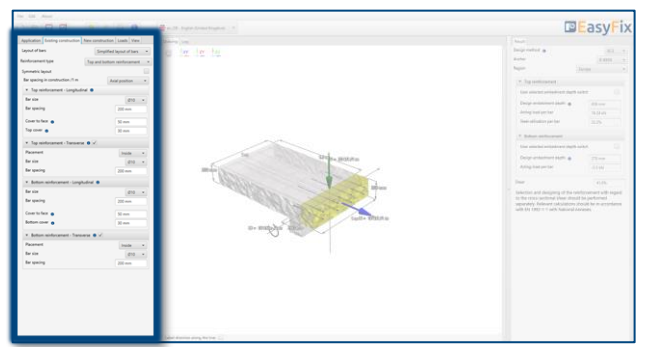
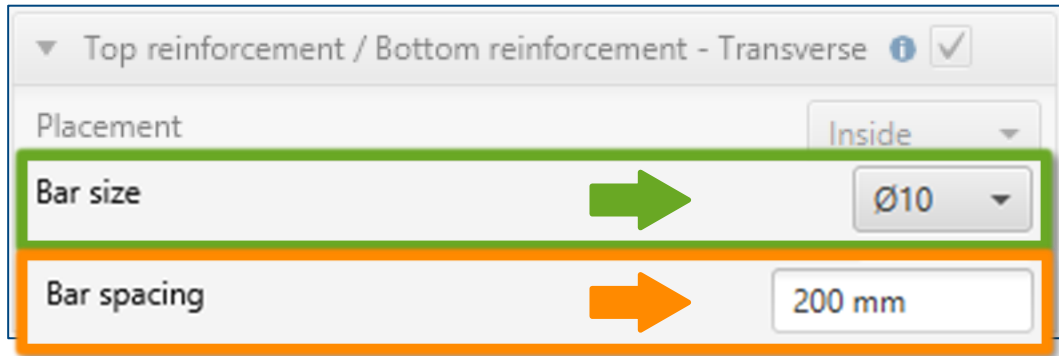
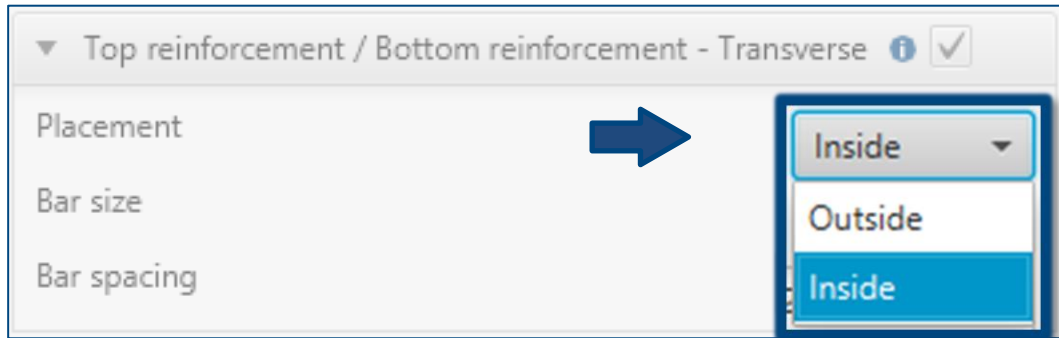
Post Installed Rebar

6 Reinforcement of the existing construction »

Positioning of the transverse reinforcement:
Internal | External of longitudinal reinforcement

The diameter of the transverse reinforcement or stirrups

The spacing of the transverse reinforcement





Post Installed Rebar

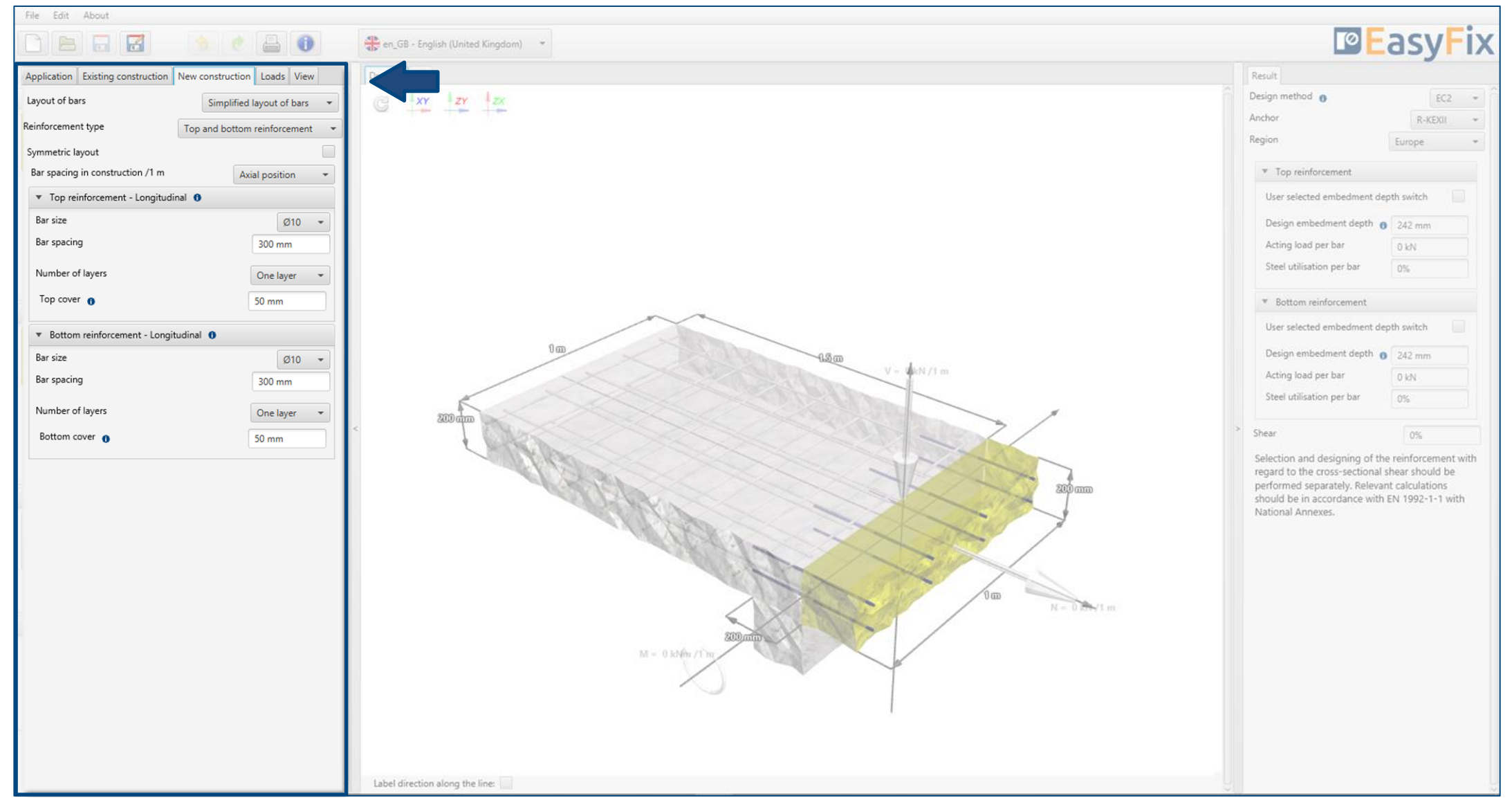
7 Determination of reinforcement In the new construction »

Defining reinforcement in a new structure enables entering data in a simplified or detailed manner. The detail model allows to move the reinforcement in relation to the appropriate axis. Top and bottom reinforcement is defined for each layer.
Possibility to add an additional row of bars in each layer.

Defining the input data:

Longitudinal bars:

- The diameter of the bars
- Cover thickness - top| bottom
- Spacing | number of bars





Post Installed Rebar

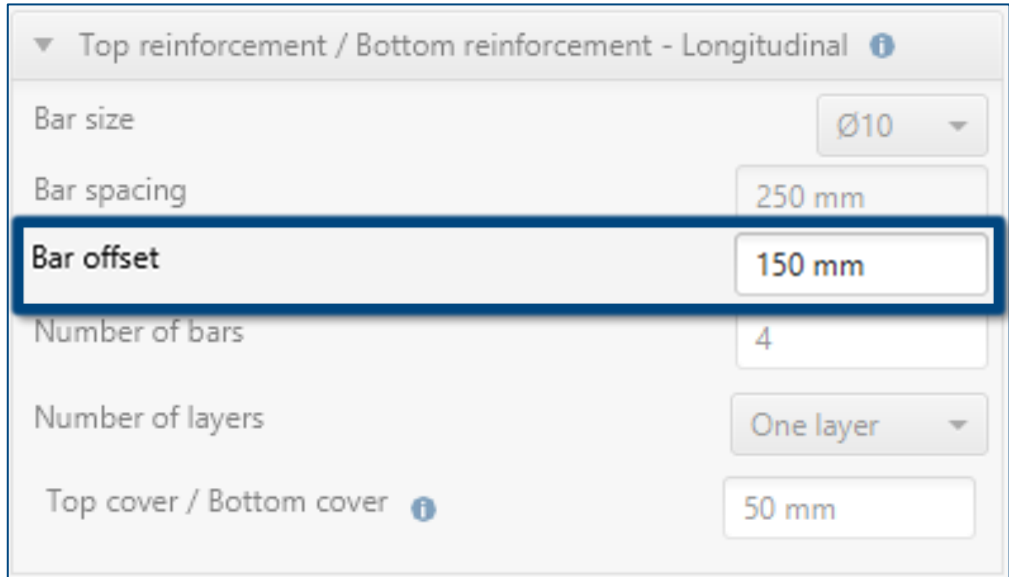
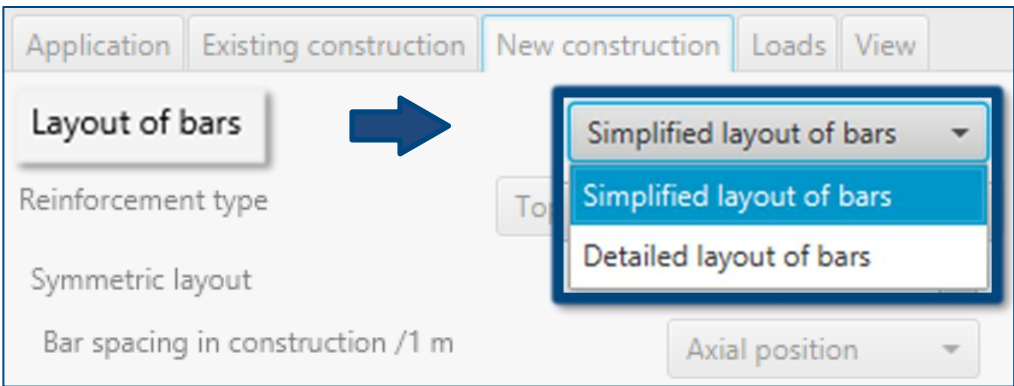
7 Determination of reinforcement In the new construction >>

Determination of bars layer:

Selecting from the list:

- Simplified bars layout
- Detailed bars layout.

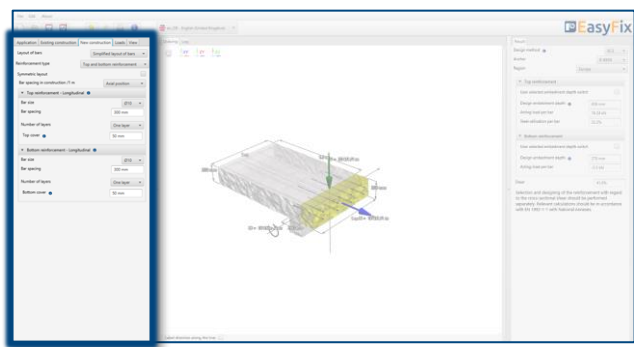
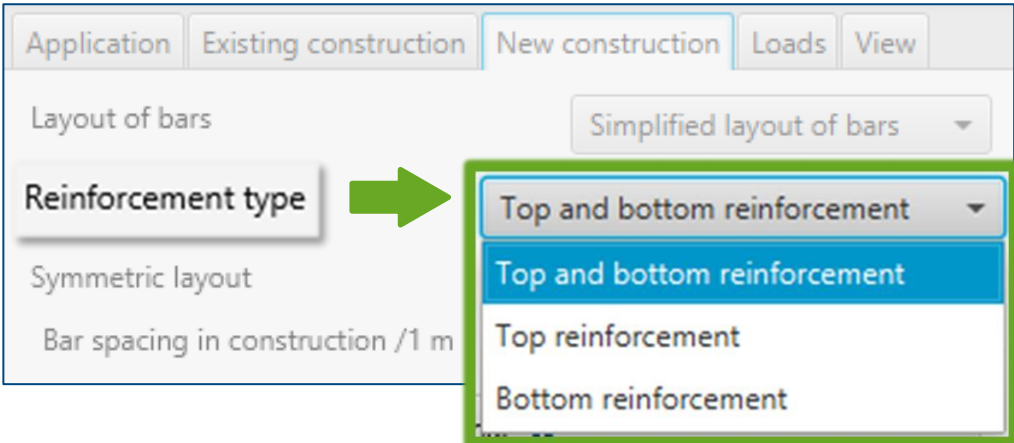
It allows to move the reinforcement in relation to the appropriate axis.



Determination of positioning of rebar:

Selecting from the list:

- Top and bottom reinforcement
- Top reinforcement
- Bottom reinforcement

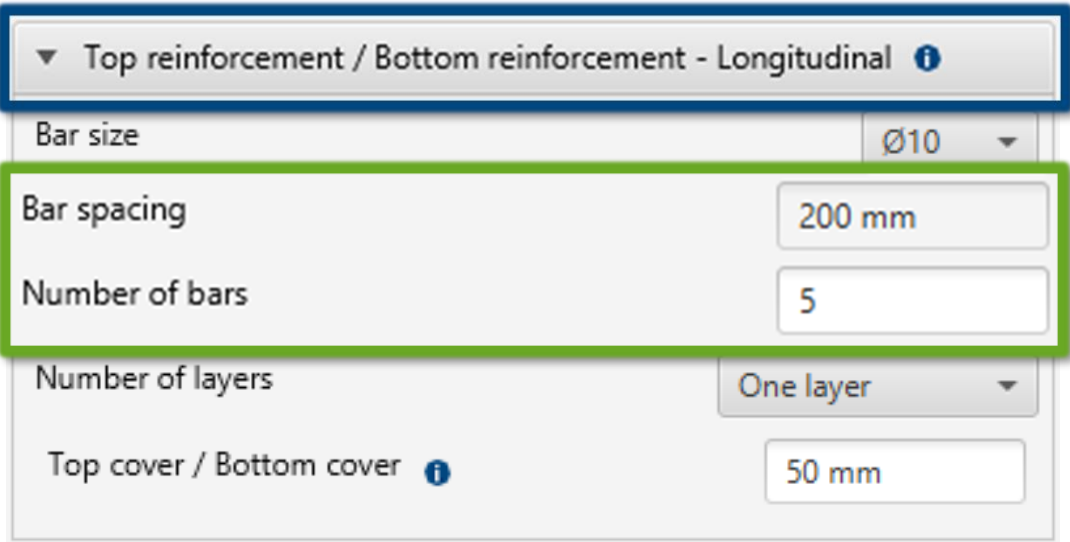
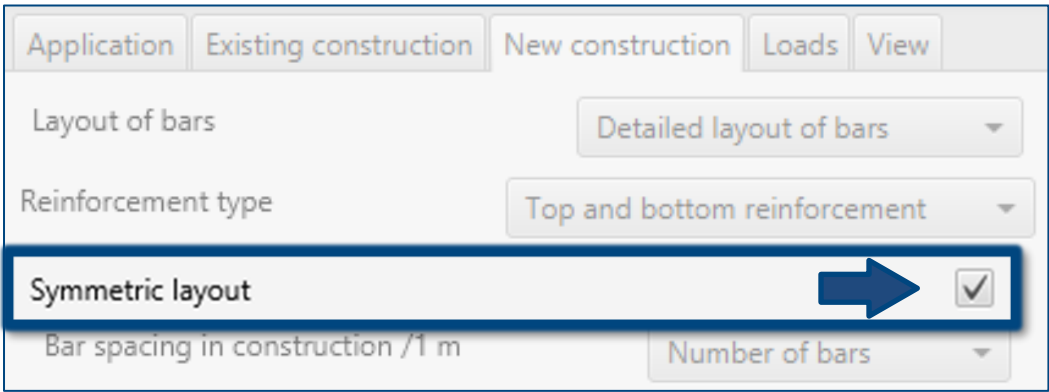




Post Installed Rebar

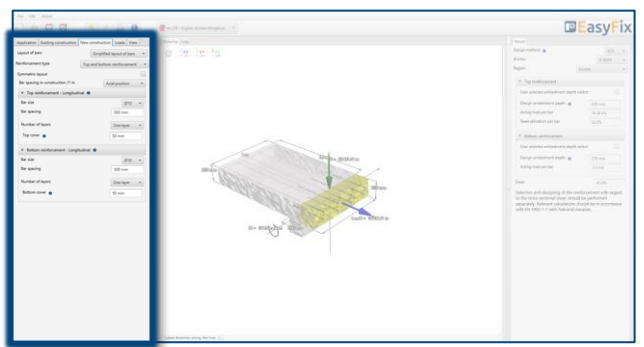
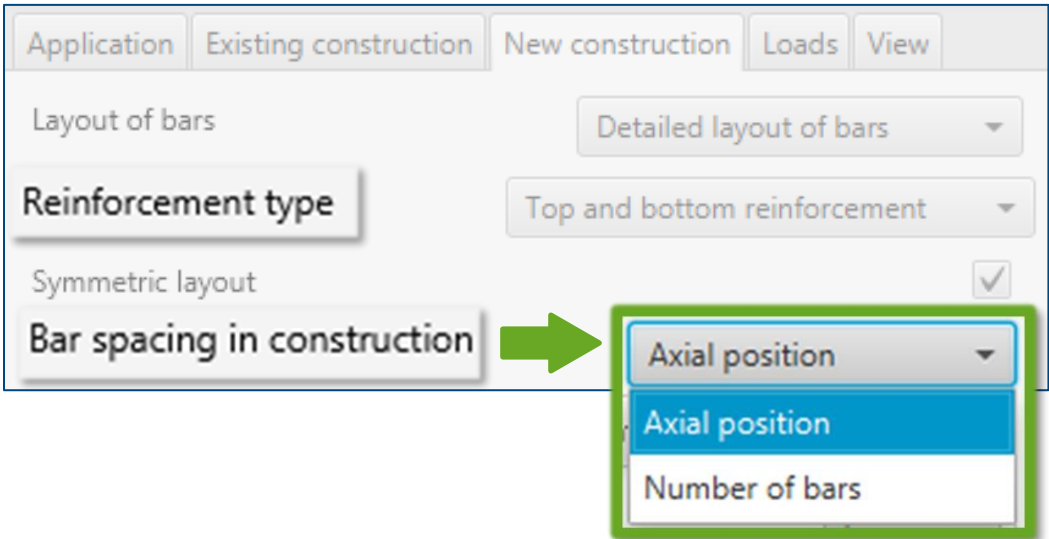
7 Determination of reinforcement In the new construction »

Symmetric layout:
 Selecting this option allows to enter data for the top and bottom reinforcement, which have the same layer system, at the same time.



Determination of reinforcement spacing:
 Selecting from the list:

- Axial spacing
- Number of bars





Post Installed Rebar

7 Determination of reinforcement In the new construction »

The diameter of longitudinal reinforcement

Determination of number of layers of longitudinal rebar

Thickness of top | bottom concrete cover

▼ Top reinforcement / Bottom reinforcement - Longitudinal ⓘ

Bar size

Bar spacing

Bar offset

Number of layers

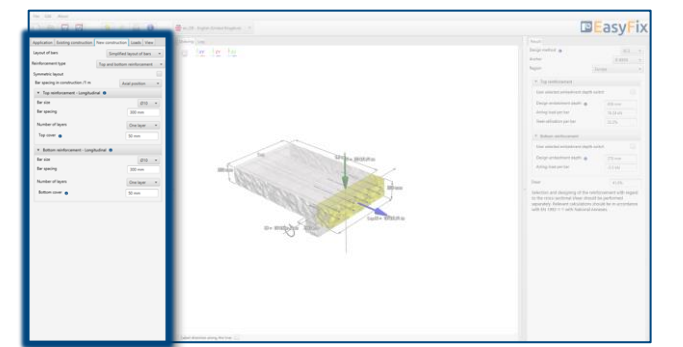
▼ Layer 1

Top cover / Bottom cover ⓘ

▼ Layer 2

Top cover / Bottom cover ⓘ

Detailed description: This is a screenshot of a software interface for configuring reinforcement. It features several input fields and dropdown menus. The 'Bar size' field is set to 'Ø10'. 'Bar spacing' is '250 mm' and 'Bar offset' is '150 mm'. A 'Number of layers' dropdown is set to 'Two layers'. Below, there are two sections for 'Layer 1' and 'Layer 2', each with a 'Top cover / Bottom cover' field set to '50 mm'. Colored arrows point from the text boxes on the left to these specific settings in the screenshot.





Post Installed Rebar

8 Defining Of acting load



Defining of the load depends on the type of structure or the constructor's assumptions. It is also possible to enter loads from the model level. Depending on the work of the structure, it is also possible to take into account the transverse reinforcement and transverse pressure. According to the theory described in Eurocode 2 (EN 1992-4) Part 1.

Determination of the input data:

Selecting from the list:

- Acting load per meter | cross section
- Acting load per bar
- Load per yield strength

Including the transverse pressure

Including the transverse shear reinforcement in the new structure

The screenshot displays the EasyFix software interface. On the left, the 'Load definition' panel is visible, with the 'Include the transverse shear reinforcement in the new structure' checkbox checked. The 'Surfaces are classified' dropdown is set to 'Rough'. The 'Transverse pressure' is set to 0 Pa. The 'Load definition' table shows:

Load definition	Per meter
Tension load /1 m (N)	10 kN
Shear load /1 m (V)	30 kN
Bending moment /1 m (M)	10 kNm

The central 3D model shows a concrete slab with a grid of reinforcement bars. A yellow highlighted section of the slab is shown in a cutaway view. Blue arrows point to various load labels: $V = 50 \text{ kN/m}$ (shear load), $N = 100 \text{ kN/m}$ (axial load), and $M = 10 \text{ kNm/m}$ (bending moment). The right-hand side of the interface shows the 'Result' panel with design parameters for top and bottom reinforcement, including design embedment depth, acting load per bar, and steel utilisation per bar.



Post Installed Rebar

8 Defining Of acting load



Acting load per meter | cross section

Acting load per bar

Defining of load per yield strength

Load definition

Tension load /1 m (N)
Shear load /1 m (V)
Bending moment /1 m (M)

Per meter

Load definition

Tension load /1 m (N)
Shear load /1 m (V)
Bending moment /1 m (M)

Per bar

Load definition

Tension load /1 m (N)
Shear load /1 m (V)
Bending moment /1 m (M)

Per bar yield strength

Load definition Per meter

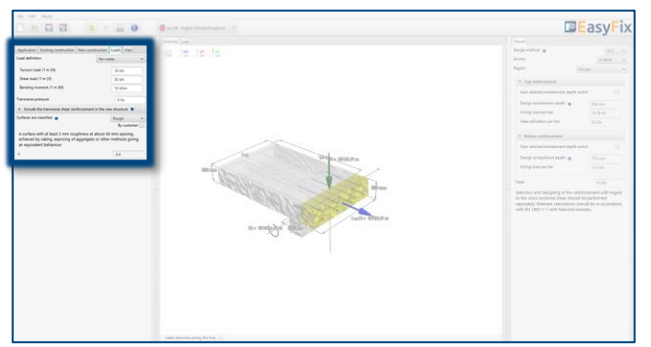
Tension load /1 m (N) 120 kN
Shear load /1 m (V) 100 kN
Bending moment /1 m (M) 10 kNm

Top reinforcement

Per bar (N) 30 kN

Bottom reinforcement

Per bar (N) 55 kN





Post Installed Rebar

8 Defining Of acting load



Including the transverse shear reinforcement in the new structure

α - the angle between shear reinforcement and the main tension chord
 β - the angle between concrete compression struts and the main tension chord

Including Roughness of old concrete surface

Include the transverse shear reinforcement in the new structure

α 90°

β 24°

Surfaces are classified By customer

A surface with at least 3 mm roughness at about 40 mm spacing, achieved by raking, exposing of aggregate or other methods giving an equivalent behaviour

c 0.4

Include the transverse shear reinforcement in the new structure

α 90°

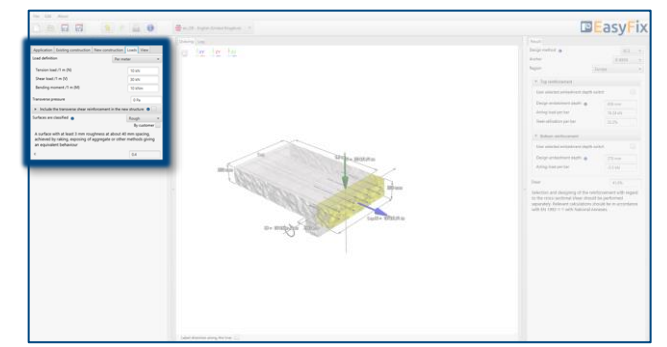
β 24°

Surfaces are classified By customer

A surface with at least 3 mm roughness at about 40 mm spacing, achieved by raking, exposing of aggregate or other methods giving an equivalent behaviour

c 0.4

- Rough
- Very smooth
- Smooth
- Rough
- Indented





Post Installed Rebar

9 Analysis of the results

In the results panel, we can choose a design method between the calculation of the anchorage according to the standards contained in Eurocode 2 and the PIRR engineering method. In addition, it is possible to filter products and the region in which the products will be used.

Panel of filters:

- Design method
- Type of resin
- Region

Results of top reinforcement.

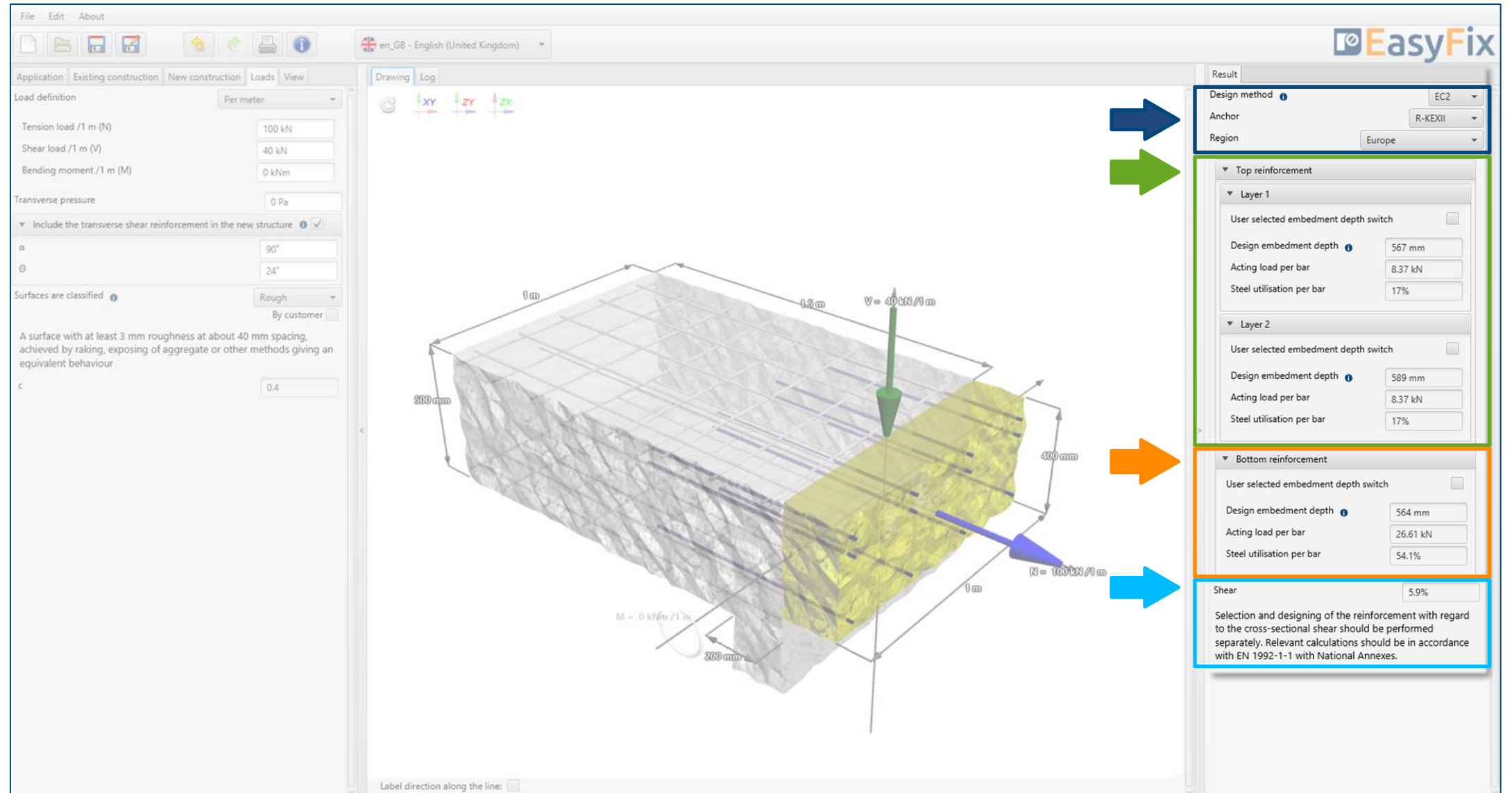
For both layers, if there's more then one.

Results of bottom reinforcement.

For both layers, if there's more then one.

Verification of shear loads

The results depends on the influence of the transverse shear reinforcement in the new structure.





Post Installed Rebar

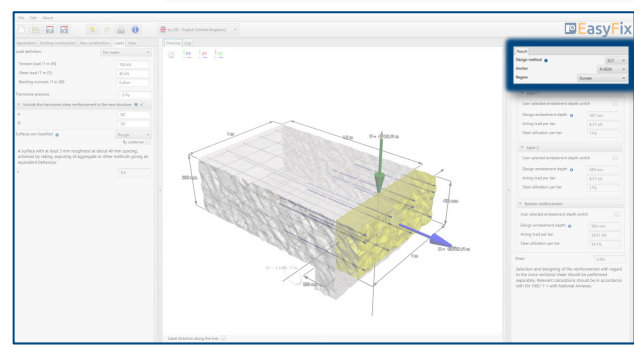
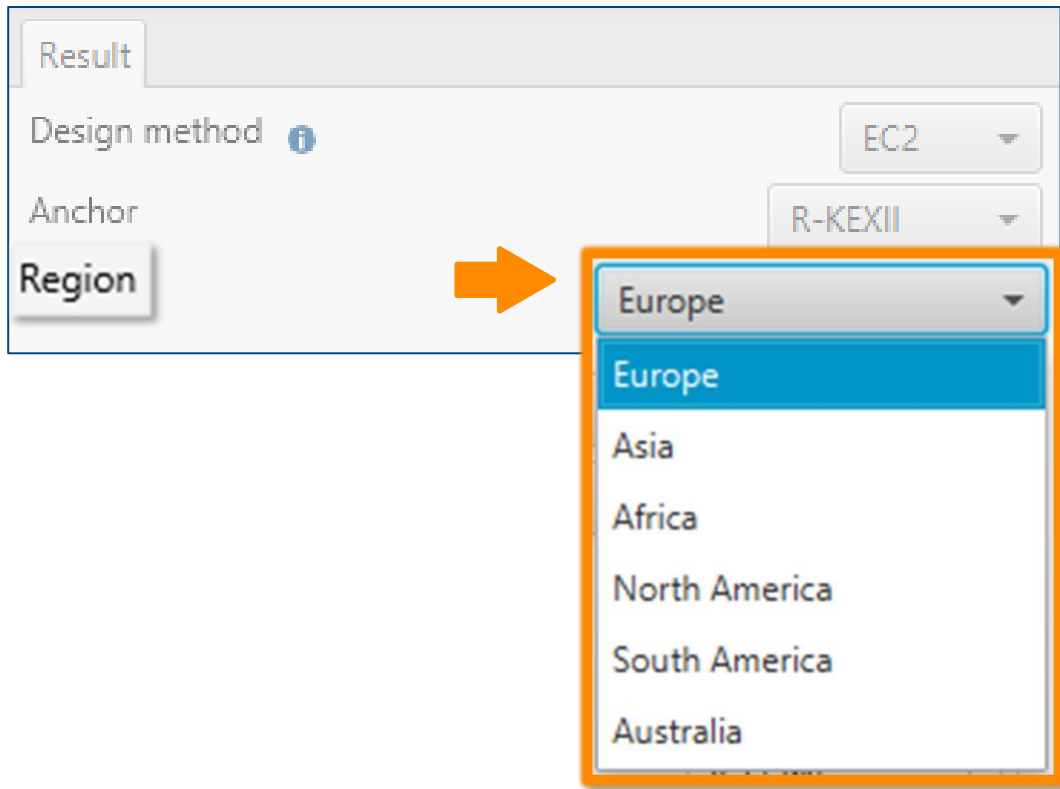
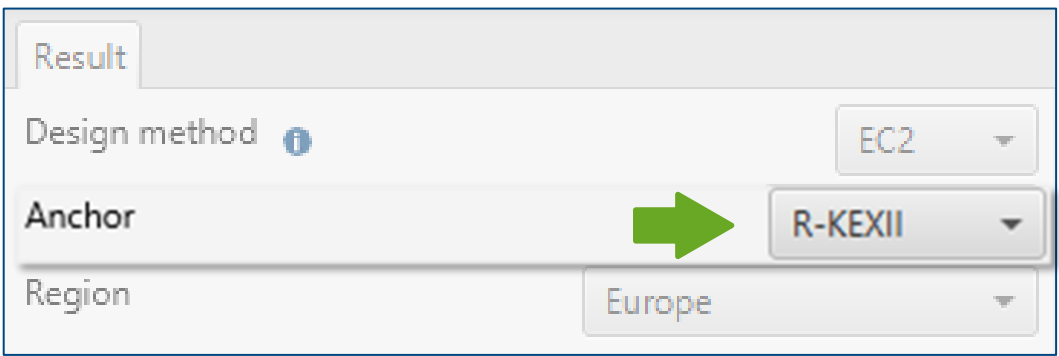
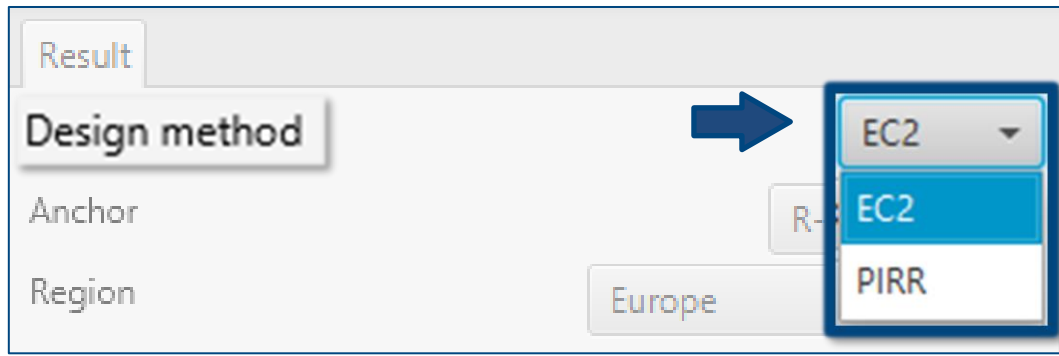
9 Analysis of the results



Design method:
- Eurocode 2
- Post Installed Rebar Rawlplug

Selecting a product from the list available for a given region.

Selecting the region where the product will apply.





Post Installed Rebar

9 Analysis of the results



The results are shown separately for each layer.

Possibility to enter the declared anchorage depth, not less than the calculated value.

▼ Top reinforcement

▼ Layer 1 ←

User selected embedment depth switch

Design embedment depth ⓘ 567 mm

Acting load per bar 8.37 kN

Steel utilisation per bar 17%

▼ Layer 2 ←

User selected embedment depth switch

Design embedment depth ⓘ 589 mm

Acting load per bar 8.37 kN

Steel utilisation per bar 17%

▼ Bottom reinforcement

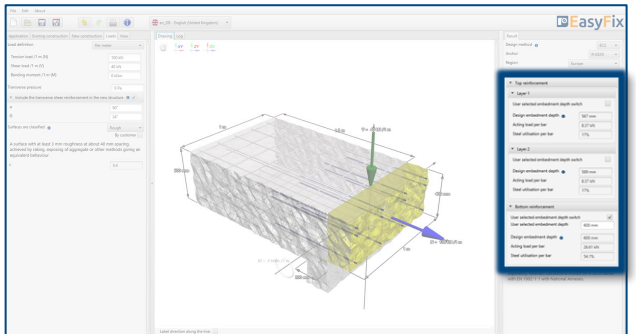
User selected embedment depth switch

User selected embedment depth 600 mm

Design embedment depth ⓘ 600 mm

Acting load per bar 26.61 kN

Steel utilisation per bar 54.1%





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10

Generating
The printout



In the printout panel it is possible to set regional options, i.e., language, decimal separator and system of units. The printout in pdf format contains all the data that is necessary in design and during the installation of the product.

Print option.
Enables you to generate a document in a pdf format.

