



# module BALUSTRADE



## ANCHORS – module Balustrade

General Information:

Data Input:

Model 3D:

Results:

1. General Information
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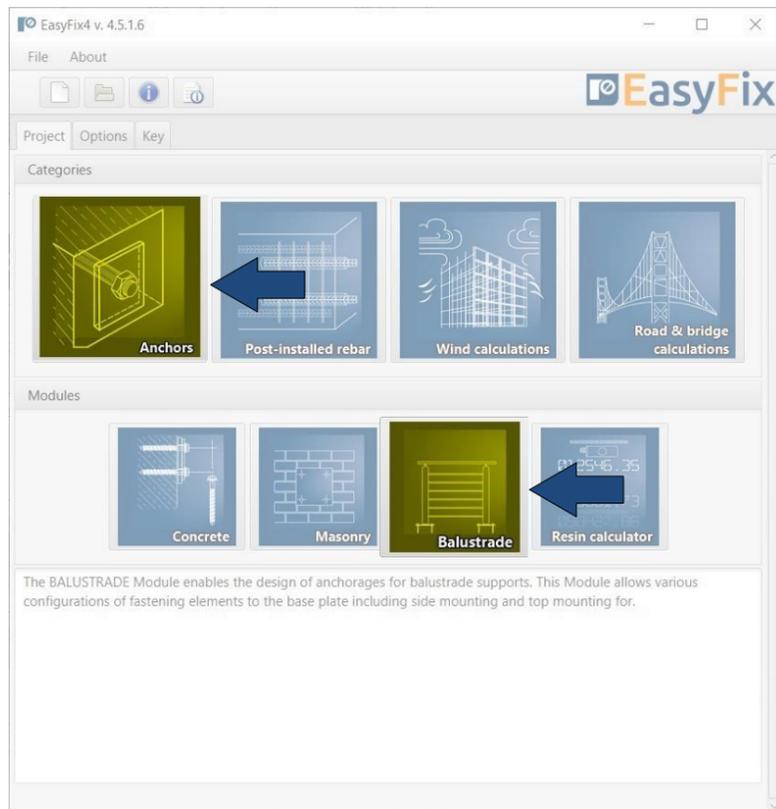


# ANCHORS – module Balustrade

1

General information

Select a category and module :



Designation of icons and symbols :



Create a new project



Open project



Save | Save as project



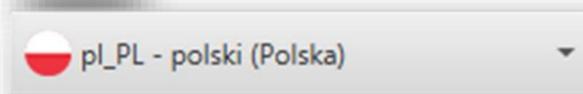
Undo | Redo changes



Generate printout to pdf file



Program information



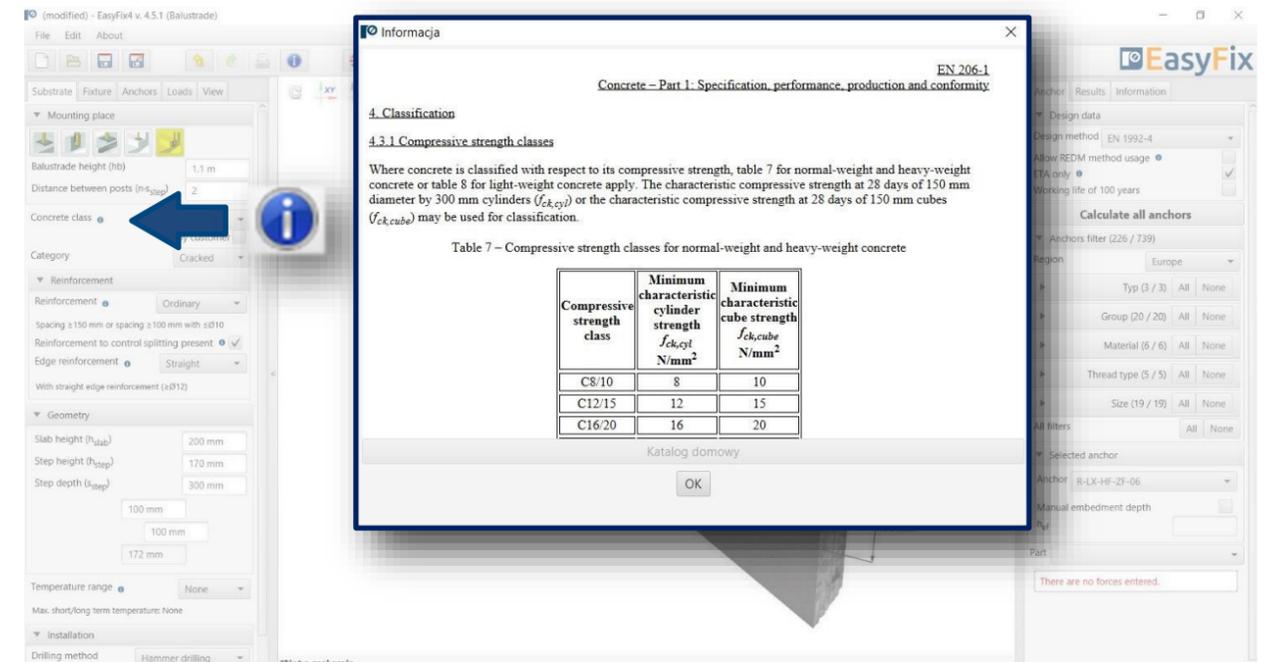
Selecting the program language



Information icon



User Manual





# ANCHORS – module Balustrade

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Introduction  
Basic window of the balustrade module

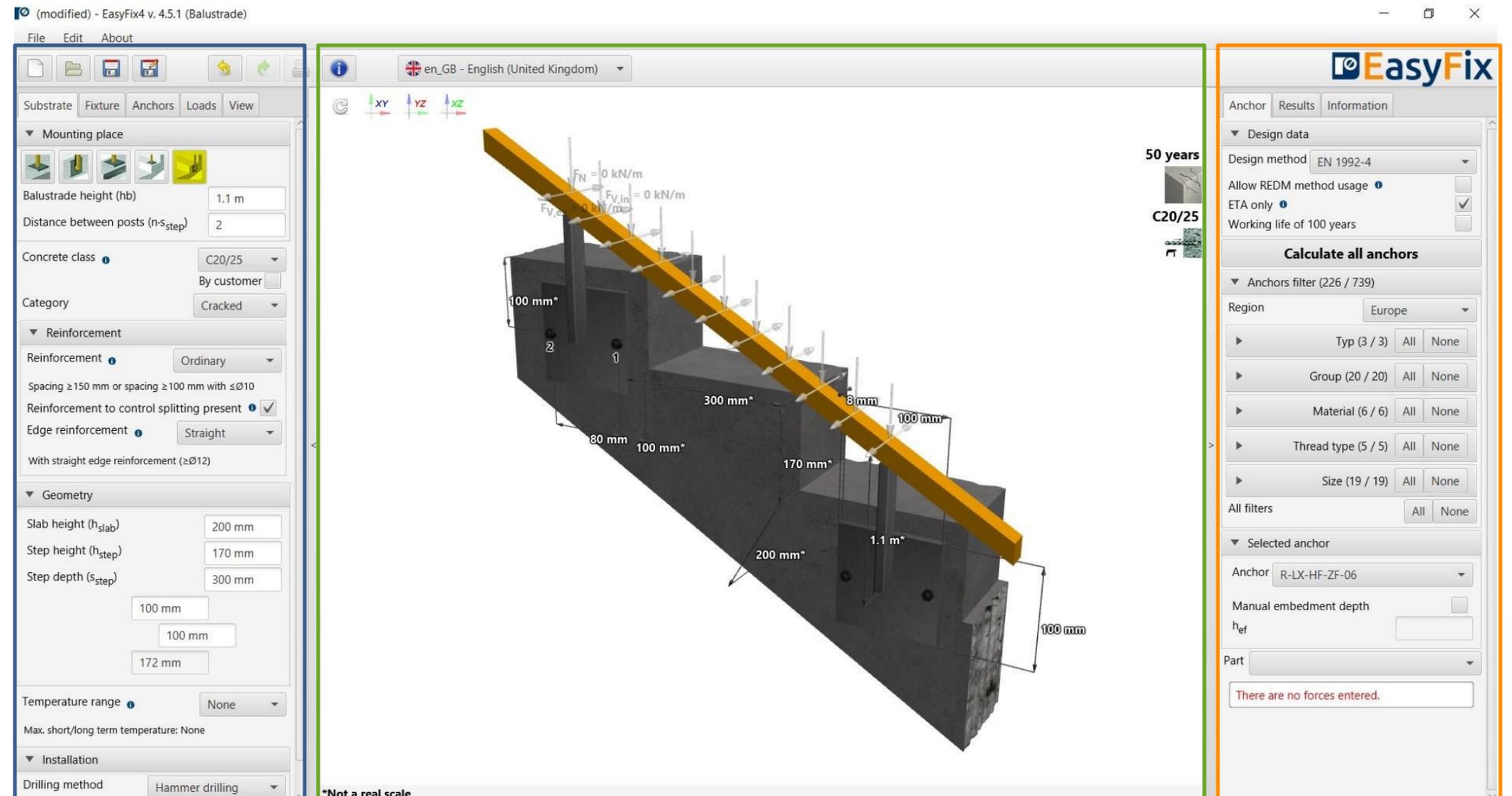
It is separated into three areas:

- data entry
- model view
- results with filters

Input area  
Substrate  
Base  
Anchors  
Loads  
View

Model view  
3D view with rotation and zoom in/out

Result area  
Anchor - Filter products  
Results - for a selected product  
Product information





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## 3 Substrate tab Data input area

Determine concrete class (also by user) and select cracked/un-cracked concrete

Definition of reinforcement or lack thereof in the structure

Definition of dimensions and edges of concrete

Definition of the temperature range and the installation method and conditions determines the filtering range of the anchors

The screenshot displays the 'Substrate' tab in the EasyFix 4 software. The 'Mounting place' section includes a concrete class dropdown menu currently set to 'C20/25', with other options like C12/15, C16/20, C25/30, C30/37, C35/45, C40/50, C45/55, and C50/60. A 'By customer' checkbox is present. The 'Reinforcement' section is set to 'Ordinary'. The 'Geometry' section defines dimensions: Slab height (h<sub>slab</sub>) = 200 mm, Step height (h<sub>step</sub>) = 170 mm, and Step depth (s<sub>step</sub>) = 300 mm. The 'Temperature range' is set to 'None', and the 'Installation' method is 'Hammer drilling'. A 3D model of a balustrade is shown with dimensions: 100 mm, 80 mm, 100 mm, 800 mm, 170 mm, 100 mm, 200 mm, and 1,1 m. A yellow arrow points from the software's concrete class dropdown to a separate panel showing 'f<sub>ck</sub>' set to '20 MPa' and 'By customer' checked. The right sidebar shows a filter for 226/739 anchors and a 'Calculate all anchors' button.



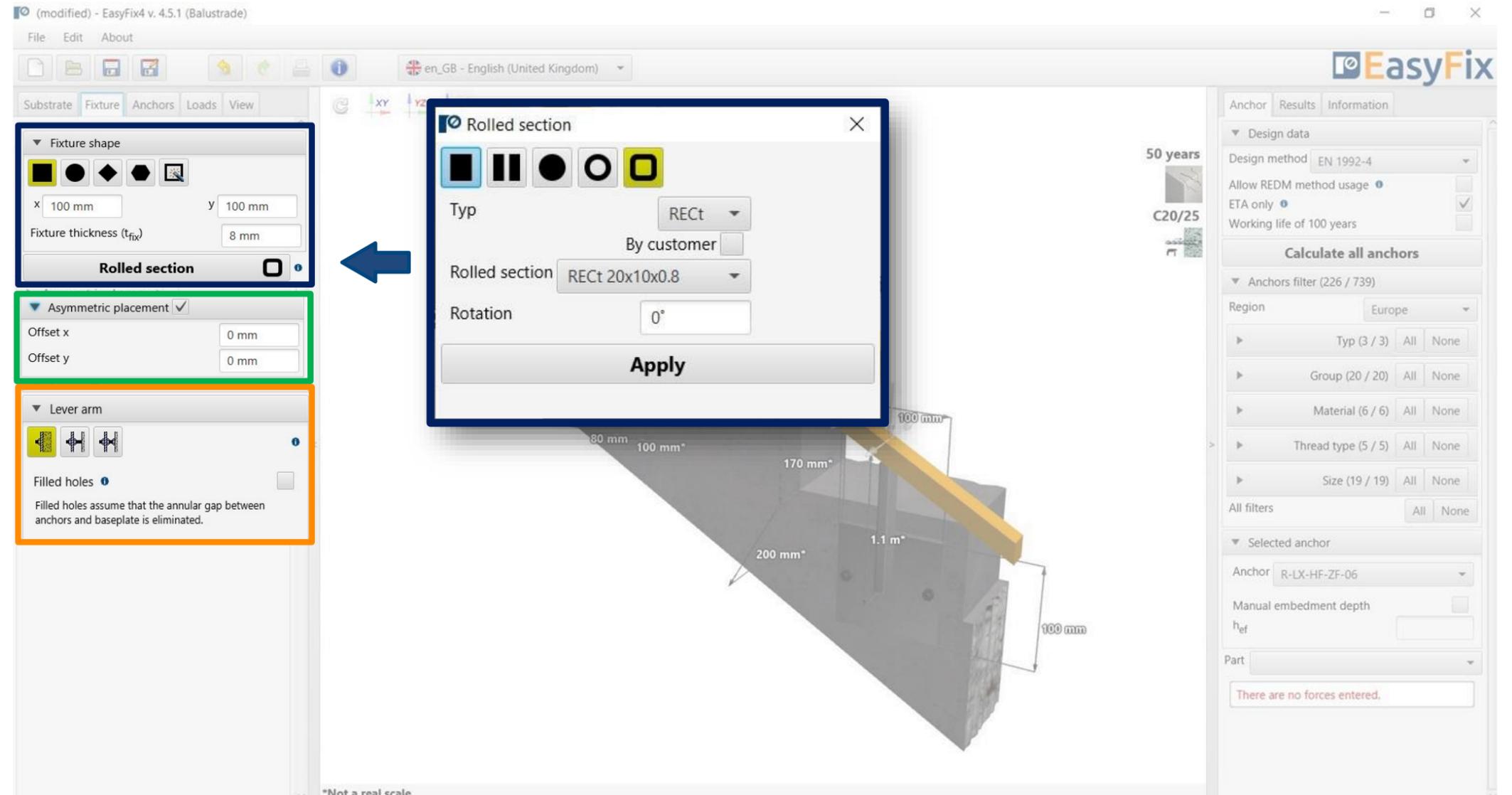
# ANCHORS – module Balustrade

## 4 Fixture tab Input area

Definition of the **Fixture shape** from the palette of predefined shapes. The **Rolled section** button allows you to select the type and size of the shape, as well as your own custom shape

Choosing an **asymmetrical placement** allows you to shift the force application point relative to the base's center of gravity

Selecting **Lever arm** allows you to calculate the forces on the arm due to the distance between the base plate and the ground





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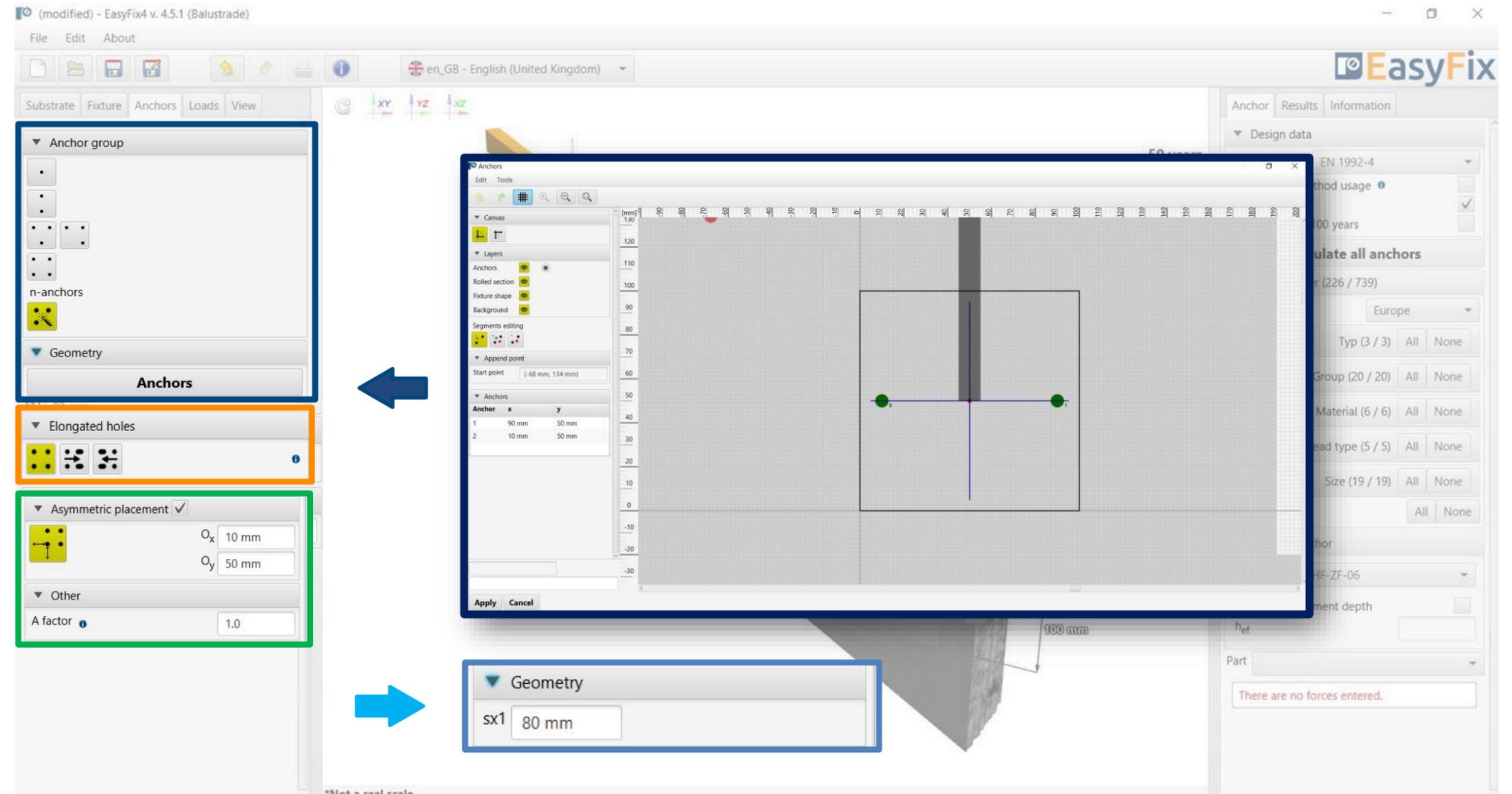
## 5 Anchors tab Input area

**Group Anchor** - allows selection of anchor layout from pre-defined layouts or by user using from a group of n-anchors

Declaring elongated "bean" holes changes the distribution of shear forces on the anchors

Choosing an **asymmetrical placement** allows you to shift the force application point relative to the base's center of gravity

**Dimensions** - distances between anchors can be entered in the tab or directly on the model by clicking on the dimension line.





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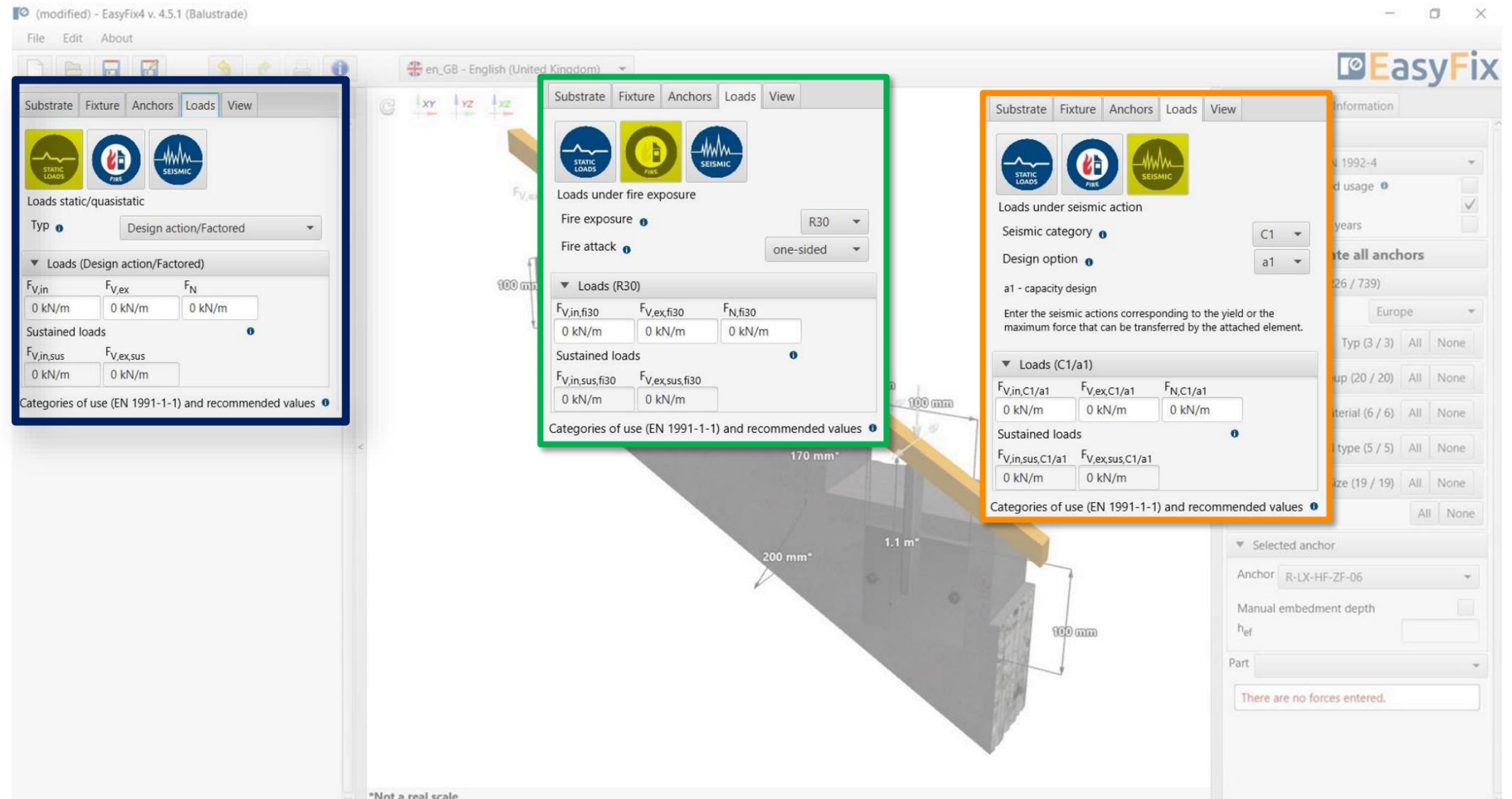
## 6 Loads tab Input area

The suffix SUS applies to long-term loads for screw-in anchors according to EN 1992-4

Static loads - calculated or characteristic, with user-defined safety factors

Loads under fire - for different fire resistances

Seismic loads - for seismic resistance C1 and C2







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8 Anchor tab  
Result area

**Design method** - enables selection of the calculation method and the program database.

**Filters** allow selection of anchors by design region, and type and material of construction

**Selected anchors**- makes it possible to specify the choice of anchor, to impose the depth of anchorage

**Utilisation** - summary results window for the selected anchor

**REDM** - Rawlplug Engineering Design Method - is a method which allows for the calculation of anchor systems not covered by EN and ETAG methods.

By checking the box **Only ETA data** it is possible to use test data from Rawlplug

The screenshot displays the EasyFix4 v. 4.5.1 (Balustrade) software interface. The central 3D model shows a balustrade with two anchors, subjected to various loads:  $F_N = 1 \text{ kN/m}$ ,  $F_{V,ex} = 1 \text{ kN/m}$ , and  $F_{V,in} = 1 \text{ kN/m}$ . Dimensions for the anchors and balustrade are provided, such as 100 mm, 300 mm, 170 mm, 200 mm, 80 mm, 100 mm, 170 mm, 100 mm, and 1.1 m.

On the right side, a dropdown menu for the design method is open, listing options: EN 1992-4, ACI 318-11, AS 5216:2018, CTO 36554501-048-2016, ETAG, FIB SAG4 06, and CEN/TS 1992-4-4. The 'EN 1992-4' option is selected.

Below the dropdown, the 'Anchor' tab of the results panel is visible. It includes a 'Design data' section with 'Design method' set to EN 1992-4, 'Allow REDM method usage' checked, 'ETA only' checked, and 'Working life of 100 years' unchecked. A 'Calculate all anchors' button is present.

The 'Anchors filter' section shows filters for Region (Europe), Typ (3 / 3), Group (20 / 20), Material (6 / 6), Thread type (5 / 5), and Size (19 / 19). The 'Selected anchor' section shows 'Anchor' set to R-LX-HF-ZF-08, 'Manual embedment depth'  $h_{ef}$  set to 53 mm, and 'Part' set to R-LX-08X090-HF-ZF.

The 'Utilisation' section shows the following results:

Utilisation - Tension	105.2%
Utilisation - Shear	7.6%
Combined - Tension/Shear	110%



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Anchor tab  
Result area

Calculate all anchors - calculation of all anchors for a given load

Calculate all anchors

Sorting enabled by header click

Anchor	Typ	$h_{ef}$	Tension	Shear	Combined	Total	Apply
R-LX-HF-ZF-05	Mechanical	32 mm	348.4%	9.1%	652.9%	652.9%	<input type="checkbox"/>
R-LX-HF-ZF-06	Mechanical	42 mm	189.7%	8.1%	263.5%	263.5%	<input type="checkbox"/>
R-LX-HF-ZF-08	Mechanical	53 mm	105.2%	7.6%	110%	110%	<input checked="" type="checkbox"/>
R-LX-HF-ZF-10	Mechanical	65 mm	70.6%	7.2%	61.2%	70.6%	<input type="checkbox"/>
R-LX-HF-ZF-12	Mechanical						<input type="checkbox"/>
R-LX-HF-ZF-14	Mechanical						<input type="checkbox"/>
R-KERII M8-5.8	Bonded	94 mm	98.7%	7.3%	100%	100%	<input type="checkbox"/>
R-KERII M8-5.8 HDG	Bonded	94 mm	98.7%	7.3%	100%	100%	<input type="checkbox"/>
R-KERII M10-5.8	Bonded	60 mm	93.8%	7.6%	92.9%	93.8%	<input type="checkbox"/>
R-KERII M10-5.8 HDG	Bonded	60 mm	93.8%	7.6%	92.9%	93.8%	<input type="checkbox"/>
R-KERII M12-5.8	Bonded						<input type="checkbox"/>
R-KERII M12-5.8 HDG	Bonded						<input type="checkbox"/>

Apply Cancel

▼ Anchors filter (226 / 739)

Region: Europe

- ▶ Typ (3 / 3) All None
- ▶ Group (20 / 20) All None
- ▶ Material (6 / 6) All None
- ▶ Thread type (5 / 5) All None
- ▶ Size (19 / 19) All None

All filters: All None

Show OK only

EasyFix

Anchor Results Information

▼ Design data

Design method: EN 1992-4

Allow REDM method usage

ETA only

Working life of 100 years

**Calculate all anchors**

▼ Selected anchor

Anchor: R-LX-HF-ZF-08

Manual embedment depth  $h_{ef}$ : 53 mm

Part: R-LX-08X090-HF-ZF

▼ Utilisation

Utilisation - Tension: 105.2%

Utilisation - Shear: 7.6%

Combined - Tension/Shear: 110%

\*Not a real scale



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## 10 Anchor tab Result area

Resulting forces in anchors - gives values for pull-out and shear forces acting on individual anchors

Tensile loads - percentage strain of the anchor system from tensile forces in individual failure images

Shear loads - percentage stress of the anchor system from shear forces in individual failure images

Combined action - shear and tensile interaction - percentage of steel and concrete stresses

The screenshot shows the EasyFix software interface for a balustrade model. The 3D model displays a concrete base with five anchors (labeled 1-5) and a yellow balustrade post. Applied loads are shown as  $F_N = 1 \text{ kN/m}$ ,  $F_{V,in} = 1 \text{ kN/m}$ , and  $F_{V,ex} = 1 \text{ kN/m}$ . Dimensions include 100 mm, 300 mm, 170 mm, 200 mm, 180 mm, 100 mm, 8 mm, 100 mm, and 1.1 m. The results table on the right provides the following data:

Anchor			
R-LX-HF-ZF-08			
Calculate all anchors			
Resulting anchor forces			
No.	$V_x$	$V_y$	N
1	0 kN	-344.8 N	9.116 kN
Tensile load			
$\beta_{N1}$	21.2%		
$\beta_{N2}$	105.2%		
$\beta_{N3}$	94.4%		
$\beta_{N4}$	ND		
$\beta_{N5}$	ND		
Shear load			
$\beta_{V1}$	2.2%		
$\beta_{V2}$	ND		
$\beta_{V3}$	3.6%		
$\beta_{V4}$	7.6%		
Combined - Tension/Shear			
Steel failure	4.6%		
Concrete failure	110%		



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Anchor tab  
Result area

Installation data - installation parameters for the designed anchor

Links to:  
[Technical Library](#)  
[BIM Library](#)  
[RTH Technical Help](#)

The screenshot shows the EasyFix software interface for a balustrade design. The central 3D model displays a balustrade with two anchors, each with a load of  $F_N = 1 \text{ kN/m}$  and  $F_{V,ex} = 1 \text{ kN/m}$ . Dimensions for the balustrade and anchors are shown, including 100 mm, 300 mm, 170 mm, 200 mm, 100 mm, 80 mm, 100 mm, 170 mm, 8 mm, 100 mm, and 1.1 m. The left sidebar contains load settings for static/quasistatic loads, with design action/factored loads set to 1 kN/m for  $F_{V,in}$ ,  $F_{V,ex}$ , and  $F_N$ . The right sidebar shows the results for anchor R-LX-08X090-HF-ZF, including installation data and technical data.

Installation data	
Thread diameter (d)	10 mm
Hole diameter in substrate ( $d_0$ )	8 mm
Min. hole depth in substrate ( $h_0$ )	92 mm
Nominal depth ( $h_{nom}$ )	82 mm
Calculated min. substrate thickness ( $h_{min}$ )	1.001 m
Installation torque ( $T_{inst}$ )	40 Nm
Anchor length (L)	90 mm
Fixture thickness ( $t_{fix}$ )	8 mm
Hole diameter in fixture ( $d_f$ )	12 mm
Technical data: ETA-17-0806 v29/06/2020	

Technical Library  
 BIM  
 Technical questions



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## 12

Generation of Printout

Print option - enables generation of a document in pdf extension.

The screenshot displays the EasyFix 4 software interface. The main window shows the 'Anchors' module settings for a balustrade, including parameters like 'Balustrade height (hb)', 'Distance between posts (n-step)', 'Concrete class', 'Reinforcement', and 'Geometry'. A blue arrow points from the 'Print' icon in the top toolbar to the 'Print' dialog box. The dialog box is open, showing options for 'Print language selection' (Language: en\_GB - English (United Kingdom), Decimal separator: Language based, System of measurement: Metric), 'Project' information (Name, Subject, Street, City, Code, Notes), 'Organization', 'Calculations made by', and 'Checked by'. A 'Print to file' section shows the path 'C:\Users\t1sznura\AppData\Local\Temp\easyfix20211223100540.pdf' and a 'Print the document' button. The background window shows a technical drawing of a balustrade and a 'TechnicalLibrary BIM' logo.

