



module Notch reinforcement



Wood construction screws: Notch reinforcement

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1. General information

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- move to a selected issue



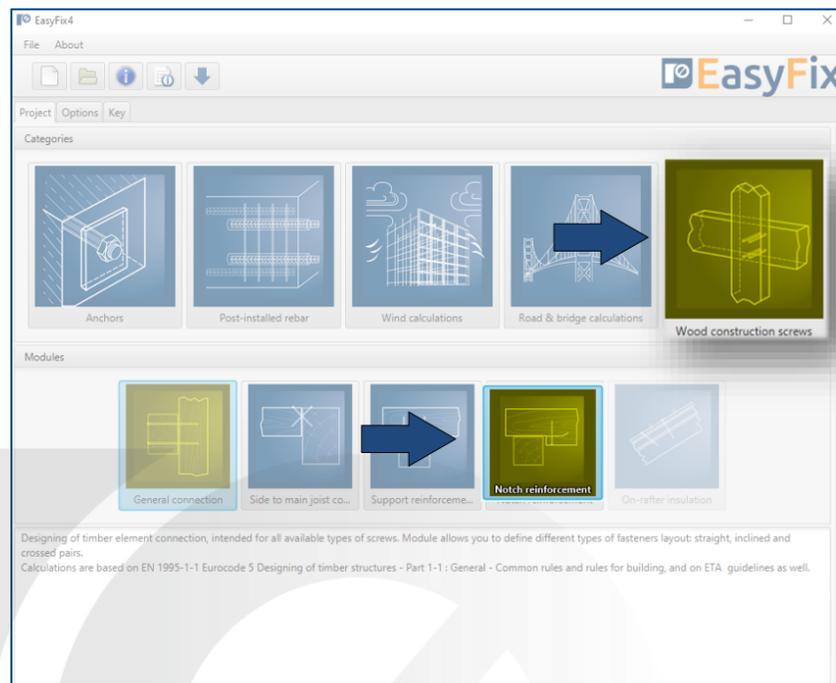
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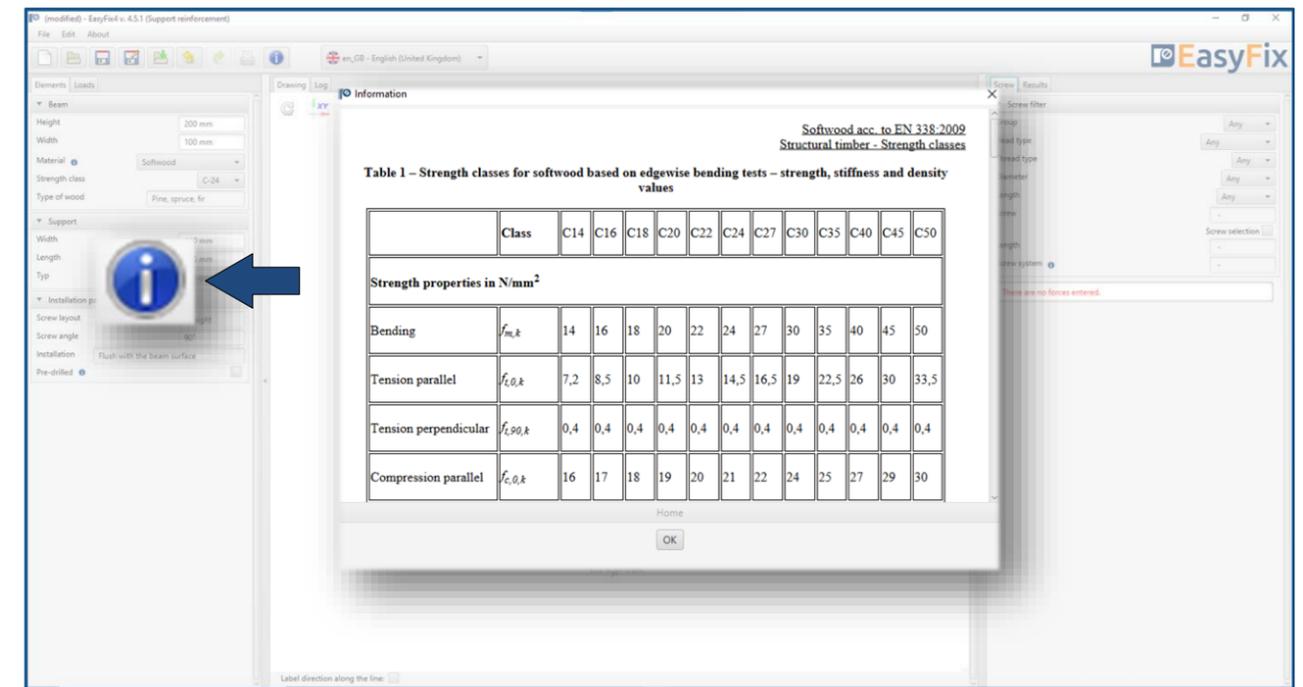
1 General information

Category and module selection:



Icons and symbols meaning:

-  Create a new project
-  Open a project
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-  Print to a pdf file
-  Software information
-  Language selection
-  Information
-  Instruction manual



Click to **information** icon to display an additional window containing theory related to a particular issue.



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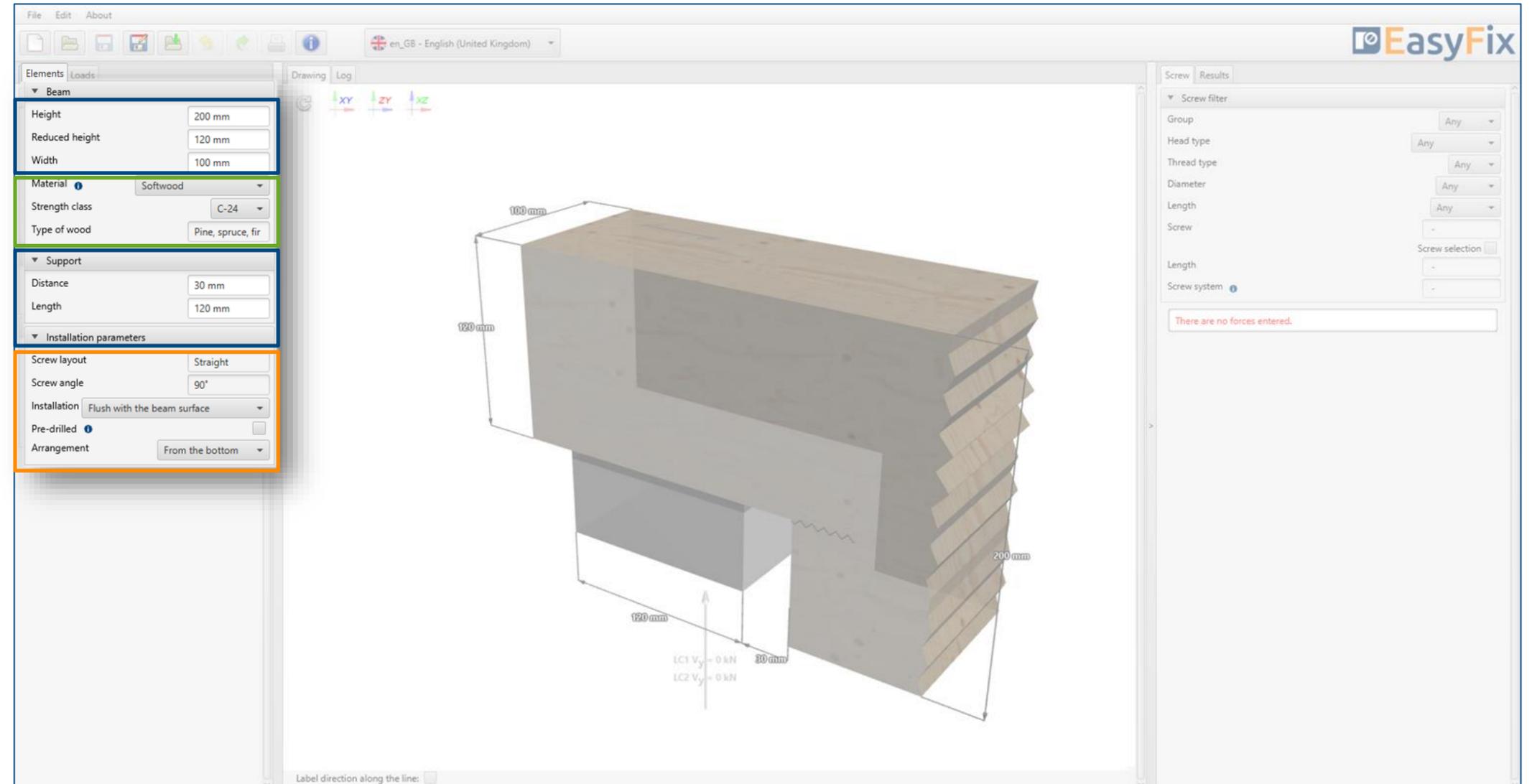
2 Data input
Elements – beam, support

First, define layout of elements as well their dimensions in cross section along with possible distance from their edges. Next, determine the type and strength class of the wooden material. Further stage is defining of screws assembly. Installation parameters should be defined depend on installation side and screw arrangement.

Geometry and layout of elements: dimensions can be defined in the side panel and directly on a model as well.

Material: Inputting data by selection from the list.

Installation parameters: Inputting data by selection from the list or setting additional options.





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3 Data input Loads



The final stage of data input is related to loads. In accordance to intended use, wood construction screws are dedicated for static or quasi static loads only. Define characteristic values of permanent and variable loads, service class and load effect duration class as well.

Loads:
Load values can be defined in the side panel and directly on the model as well.

Load combinations:
Design load values for particular load combinations are presented at the bottom part of the panel.

The screenshot displays the 'Loads' configuration panel on the left and a 3D model of a wood construction notch on the right. The 'Loads' panel includes the following sections:

- Static Loads:** Loads static/quasistatic, Typ: Characteristic action/Unfactored, Service class: 1.
- Permanent action (G):**

N	V _x	V _y
0 kN	0 kN	5 kN
Safety factor (γ _G)		1.35
- Variable action (Q):**

N	V _x	V _y
0 kN	0 kN	0 kN
Safety factor (γ _Q)		1.5
Load effect duration class		Long term
- Calculated values:**

Load combination LC1		
N	V _x	V _y
0 kN	0 kN	6.75 kN
Load combination LC2		
N	V _x	V _y
0 kN	0 kN	6.75 kN

The 3D model shows a wood construction notch with dimensions: 100 mm (width), 120 mm (height), and 200 mm (depth). A notch is cut into the wood, with a depth of 80 mm. The notch is labeled with 'LC1 V_y = 0 kN' and 'LC2 V_y = 0 kN'. The software interface also shows a 'Screw filter' panel on the right with various dropdown menus and a message: 'There are no forces entered.'



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4 3D Model



Dynamic 3D model provides a User with a possibility of following results in real time.

Geometry:

Dimensions can be defined in the side panel and directly on a model as well.

Loads:

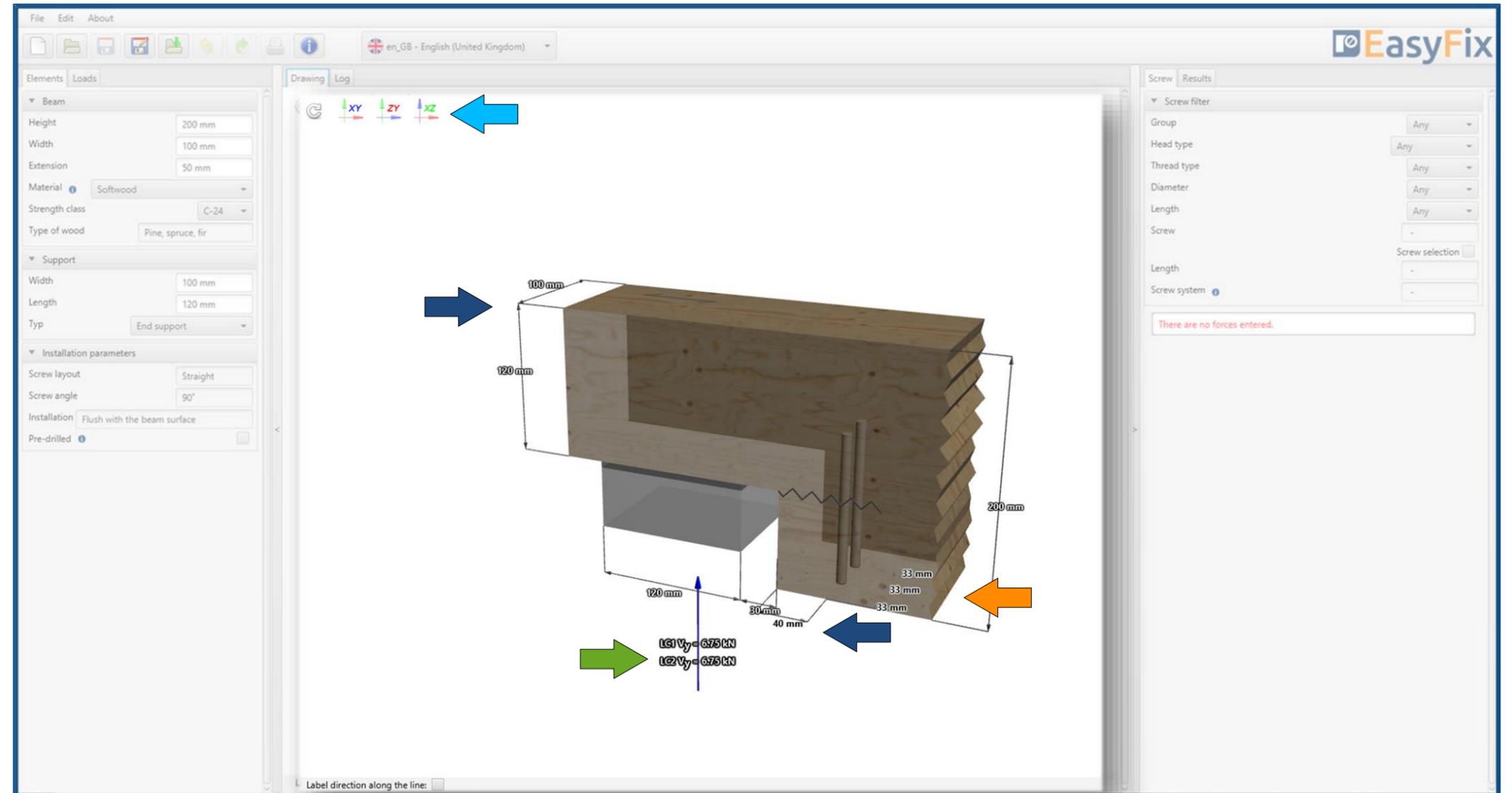
Load values can be defined in the side panel and directly on a model as well.

Screws layout:

Designed layout is presented on a model with spacings and edge distances.

Model navigation:

Model navigation utilises mouse control or default views.





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5 Results
Screw filter »

Notch reinforcement module is meant to select optimised number of the fasteners, their sizes and arrangement as well. Result can be managed by available filters. Resistance analysis is performed in two steps – without and with the reinforcement. Information of the reinforcement of the support is necessary is presented in Utilisation panel.

Screw filter:
Using available filters allows to pre-define screws.

Designed product / Screw system:
Information about design solution are presented in the middle part of the panel.

Utilisation:
Basic data of utilisation of design solution is presented at the bottom part of the panel.

The screenshot shows the EasyFix software interface. On the left, there are panels for 'Elements' and 'Support' with various input fields. The center features a 3D model of a wood beam with a notch, showing dimensions like 100 mm, 120 mm, 200 mm, 33 mm, 40 mm, and 80 mm. On the right, there are panels for 'Screw filter', 'Screw', and 'Utilisation'. The 'Utilisation' panel shows data for 'Shear in reduced beam section' and 'Notch with reinforcement'.

Category	LC1	LC2
Shear in reduced beam section	68.3%	58.5%
Notch without reinforcement	174%	149.1%
Notch with reinforcement	85.6%	73.4%
Utilisation - axial load	85.6%	
Utilisation - lateral load	ND	
Combined - axial/lateral load	ND	



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6 Result
Detailed analysis »

Detailed analysis allows to check utilisation level for particular failure modes. Defining crucial element helps analysing a case. Detailed information related to all failure modes are available via information icon.

Designed product / Screw system:
Information about design solution are presented in the upper part of the panel.

Utilisation:
Detailed data of utilisation of selected failure modes are presented at the bottom part of the panel.

The screenshot shows the EasyFix software interface. On the left, there are configuration panels for 'Beam', 'Support', and 'Installation parameters'. The central part displays a 3D model of a wood beam with a notch, showing dimensions like 100 mm, 120 mm, 200 mm, 33 mm, 40 mm, and 80 mm. Below the model, there are load values: $L1 Vy = 675 LN$ and $L2 Vy = 675 LN$. On the right, there is a 'Results' panel with a table of utilisation data.

Technical data			
Screw	R-PVS 8.0		
Length	120 mm		
Screw system	[1,2]		
Axial load			
LC1		LC2	
$\beta N1$	46.9%	$\beta N1$	40.2%
$\beta N2$	85.6%	$\beta N2$	73.4%
$\beta N3$	ND	$\beta N3$	ND
$\beta N4$	9%	$\beta N4$	9%
$\beta N5$	ND	$\beta N5$	ND
$\beta N6$	ND	$\beta N6$	ND
Lateral load			
LC1		LC2	
$\beta V1$	ND	$\beta V1$	ND
$\beta V2$	ND	$\beta V2$	ND
Combined - axial/lateral load			
LC1		LC2	
Combined	ND	Combined	ND



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7 Results
Calculation report »

Generating a project report is started by clicking on the Print icon. Next, specify the language of the report along with a possible description. The report is printed to a pdf file, in a destination selected by a Customer.

Print option:
Report language can be defined independently of software language that had been used for calculation process.

Print description:
Detailed description helps to identify the calculation at a later stage of work. This information is visible on the header of each report page.

File path:
Selecting the print file save destination.

Drawing:
In the Drawing panel, it is possible to modify the final model view, that is presented in the printed version of the report.

The screenshot shows the EasyFix software interface. A 'Print' dialog box is open, divided into 'Print' and 'Drawing' tabs. The 'Print' tab is active, showing options for 'Print language selection' (Language: en_GB - English (United Kingdom), Decimal separator: Language based, System of measurement: Metric) and 'Project' information (Name, Subject, Street, City, Code, Notes, Organization, Calculations made by, Checked by, Print date: 22.09.2021). A 'Print to file' field is highlighted in orange, showing the path: C:\Users\rwdowiak\AppData\Local\Temp\easyfix20210922130343.pdf. A 'Print the document' button is at the bottom. The 'Drawing' tab shows a technical drawing of a wood joint with dimensions: 100 mm, 120 mm, 200 mm, 120 mm, and 80 mm. A 'Print the document' button is also present at the bottom of the drawing panel.



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7 Result Calculation report



Design report includes all information concerning selected design, input data, loads, spacings and edge distance requirements. There are full calculation logs presented along with references to paragraphs concerning appropriate design guidelines.

EasyFix v. 4.5.1 - Notch reinforcement TEST VERSION 1f1c1810b2

Project: Subject: Date: 2021-12-13 Page: 1/7
 Address: Organization: Address: Contact:
 Calculations made by: Radosław Widowski
 by Rawplug e-mail: radoslaw.widowski@rawplug.com
 Checked by: 2021-04-23
 Notes:

Input data

Screw type and size 2 x R-PVS Ø8 mmx120 mm; Full thread, Countersunk head
Proof EN:1995-1-1; ETA-12/3456
Screw angle 90°
Installation Flush with the beam surface, From the bottom
Screw layout Straight
Pre-drilled No

Member Beam
Height 200 mm
Reduced height 120 mm
Width 100 mm
Material Softwood
Strength class C-24
Type of wood Pine, spruce, fir

Member Support
Length 120 mm
Distance 30 mm

Design loads

National regulations, environmental and application conditions must be considered when designing the anchorage.

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Characteristic load	S _d	S _{1d}	S _{2d}
Permanent action (G)	0.90	0.90	0.90
Variable action (Q)	1.50	1.50	1.50
Variable action (W)	0.90	0.90	0.90
Variable action (E)	1.50	1.50	1.50
Load effect reduction class	LC1		
Service class	I		

Design load

LC1	S _d	S _{1d}	S _{2d}
LC1	0.90	0.90	0.75 kN
LC2	0.90	0.90	0.75 kN

Legend

- G - Dead load
- Q - Live load
- W - Wind load
- E - Earthquake load
- LC1 - Load combination 1 (Permanent action + variable action)
- LC2 - Load combination 2 (Permanent action + variable action)

Minimum edge and/or end distances and spacings of screws (EN 1995-1-1; 2004+AC2006+A1:2008; section 8.3.1.2, 8.5.1.1, 8.7.2; ETA-12/3456)

Distance	Beam	Support	k ₁ or k ₂ required
a ₁	minimum	designed	k ₁ or k ₂ required
a ₂	20 mm	0	OK
a ₃	40 mm	0	OK
a ₄	30 mm	0	OK

National regulations, environmental and application conditions must be considered when designing the anchorage.

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Distances and spacings

National regulations, environmental and application conditions must be considered when designing the anchorage.

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Shear stress in reduced beam section (EN 1995-1-1:2004+AC2006+A1:2008; section 6.1.7)

$$\tau \leq f_{v,d}$$

$$\tau = \frac{1.5 \cdot V_d}{k_{1,2} \cdot b \cdot h}$$

$$k_{1,2} = k_{1,2} \cdot k$$

$$f_{v,d} = k_{1,2} \cdot \frac{f_{v,k}}{\gamma_M$$

LC1	S _d	S _{1d}	S _{2d}	τ	f _{v,d}
LC1	0.90	0.90	0.75 kN	1.01 MPa	1.01 MPa
LC2	0.90	0.90	0.75 kN	1.01 MPa	1.01 MPa
LC3	0.90	0.90	0.75 kN	1.01 MPa	1.01 MPa
LC4	0.90	0.90	0.75 kN	1.01 MPa	1.01 MPa

Shear stress at the notch (EN 1995-1-1:2004+AC2006+A1:2008; section 6.5.2)

$$\tau \leq k_1 \cdot f_{v,d}$$

$$\tau = \frac{1.5 \cdot V_d}{k_{1,2} \cdot b \cdot h}$$

$$k_{1,2} = k_{1,2} \cdot k$$

$$f_{v,d} = k_{1,2} \cdot \frac{f_{v,k}}{\gamma_M$$

LC1	S _d	S _{1d}	S _{2d}	τ	k ₁ · f _{v,d}
LC1	0.90	0.90	0.75 kN	1.01 MPa	1.01 MPa
LC2	0.90	0.90	0.75 kN	1.01 MPa	1.01 MPa
LC3	0.90	0.90	0.75 kN	1.01 MPa	1.01 MPa
LC4	0.90	0.90	0.75 kN	1.01 MPa	1.01 MPa

The reinforcement of the notch is necessary.

National regulations, environmental and application conditions must be considered when designing the anchorage.

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Shear stress at the notch with additional reinforcement (EN 1995-1-1:2004+AC2006+A1:2008; section 6.5.2; ETA-12/3456)

LC1	S _d	S _{1d}	S _{2d}
LC1	0.90	0.90	0.75 kN
LC2	0.90	0.90	0.75 kN

Withdrawal failure of the threaded part above cracked area

LC1	S _d	S _{1d}	S _{2d}
LC1	0.90	0.90	0.75 kN
LC2	0.90	0.90	0.75 kN

Withdrawal failure of the threaded part below cracked area

LC1	S _d	S _{1d}	S _{2d}
LC1	0.90	0.90	0.75 kN
LC2	0.90	0.90	0.75 kN

Axial load (EN 1995-1-1:2004+AC2006+A1:2008; section 8.7.2; ETA-12/3456)

LC1	S _d	S _{1d}	S _{2d}
LC1	0.90	0.90	0.75 kN
LC2	0.90	0.90	0.75 kN

Withdrawal failure of the threaded part below cracked area

LC1	S _d	S _{1d}	S _{2d}
LC1	0.90	0.90	0.75 kN
LC2	0.90	0.90	0.75 kN

National regulations, environmental and application conditions must be considered when designing the anchorage.

EasyFix v. 4.5.1 - Notch reinforcement TEST VERSION 1f1c1810b2

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Building of screw in element [1]

LC1	S _d	S _{1d}	S _{2d}
LC1	0.90	0.90	0.75 kN
LC2	0.90	0.90	0.75 kN

Building of screw in element [2]

LC1	S _d	S _{1d}	S _{2d}
LC1	0.90	0.90	0.75 kN
LC2	0.90	0.90	0.75 kN

Full-through failure of the screw head

LC1	S _d	S _{1d}	S _{2d}
LC1	0.90	0.90	0.75 kN
LC2	0.90	0.90	0.75 kN

Tensile failure of the screw

LC1	S _d	S _{1d}	S _{2d}
LC1	0.90	0.90	0.75 kN
LC2	0.90	0.90	0.75 kN

National regulations, environmental and application conditions must be considered when designing the anchorage.

EasyFix v. 4.5.1 - Notch reinforcement TEST VERSION 1f1c1810b2

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Combined loads LC1 (EN 1995-1-1:2004+AC2006+A1:2008; section 8.7.3)

Actual	Lateral	Combined
OK	OK	OK
75.4%	NO	NO

Combined loads LC2 (EN 1995-1-1:2004+AC2006+A1:2008; section 8.7.3)

Actual	Lateral	Combined
OK	OK	OK
75.4%	NO	NO

Remarks

- Designing according to EN 1995-1-1:2004+AC2006+A1:2008 and ETA-12/3456
- The characteristic values of the timber materials according to EN 1338:2009 (softwood), EN 14080:2013 (glued laminated timber)
- The screws shall be subjected to static or quasi-static loading only.
- Screw with the same lengths and diameters has to be used.
- The design, arrangement, amount of screws and further indicated details are valid exclusively for the use of Rawplug screws.
- Calculation report must be verified and accepted by the designer in charge before installation.

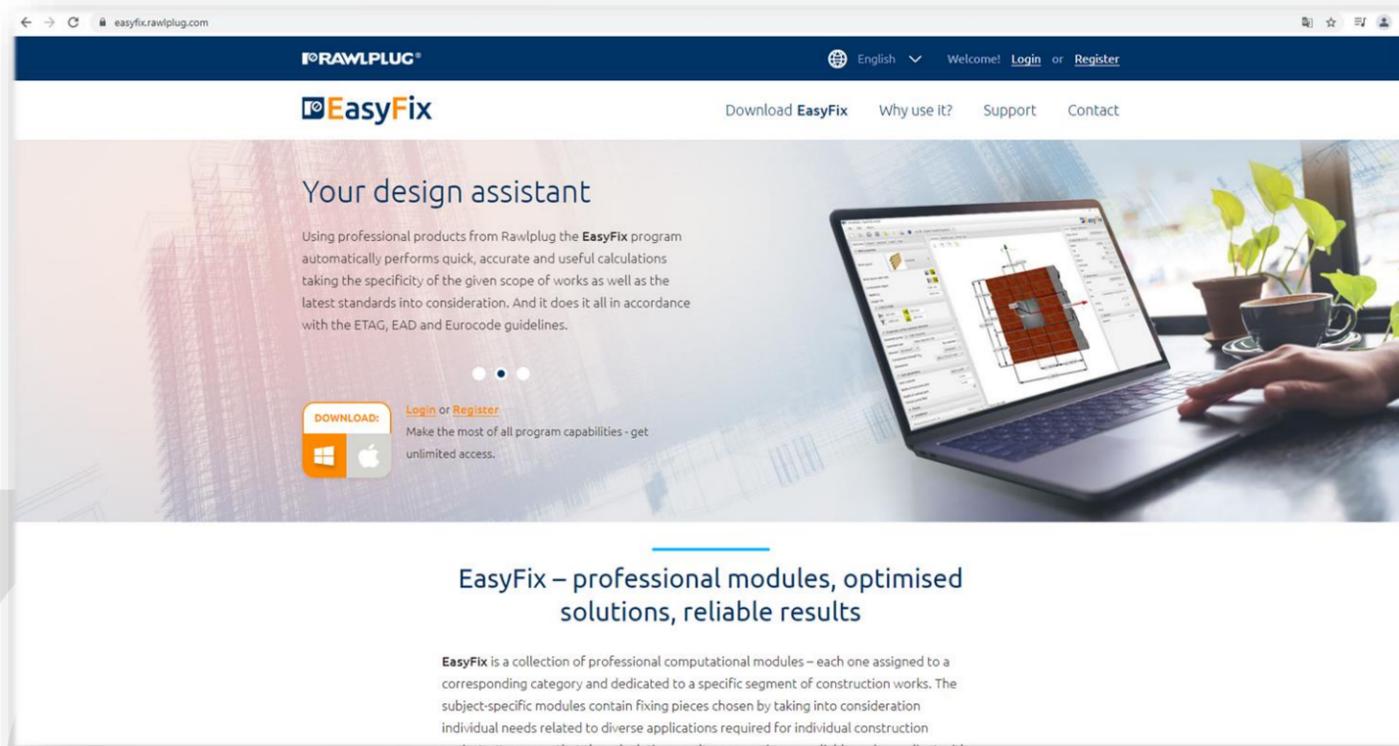
National regulations, environmental and application conditions must be considered when designing the anchorage.



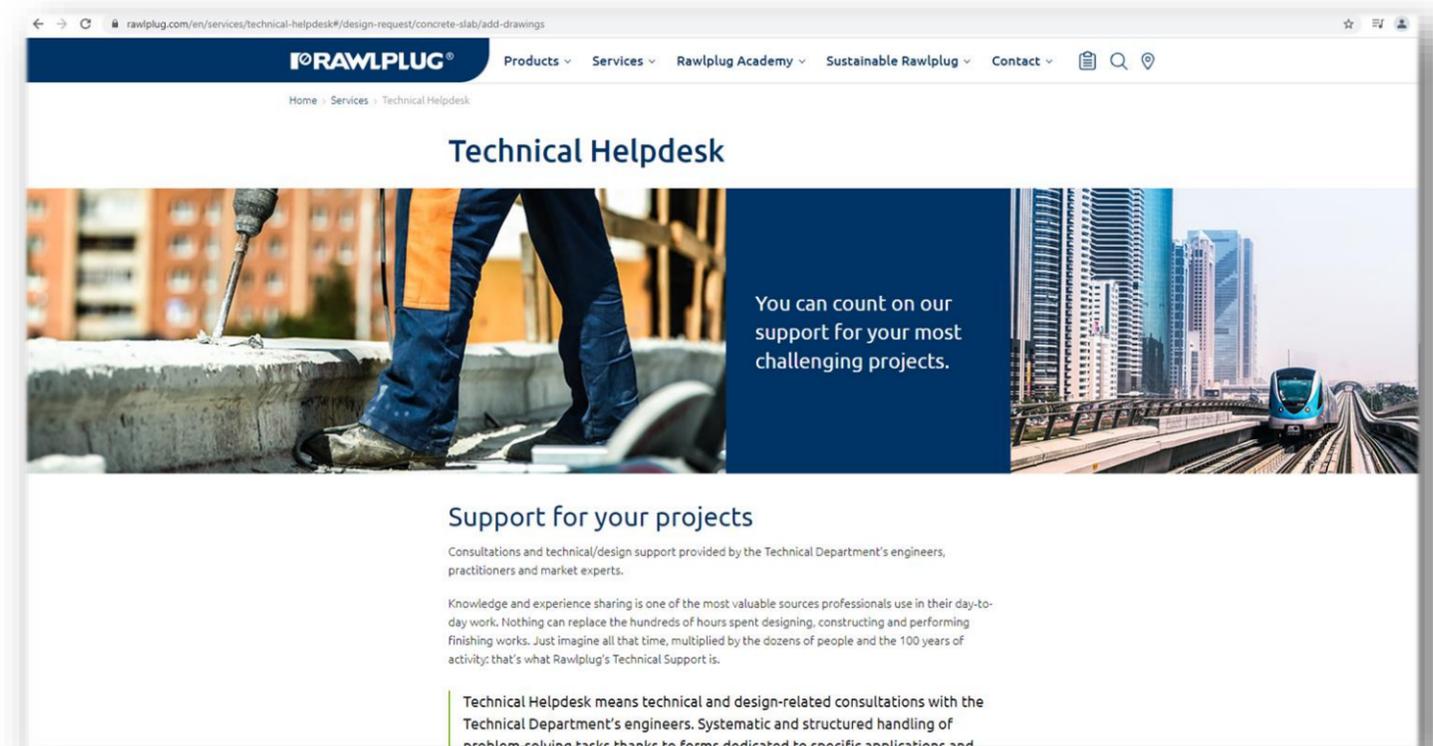
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Have you got any questions?

Visit **EasyFix website** or contact directly with Rawlplug Technical Department via **Rawlplug Technical Helpdesk**.



<https://easyfix.rawlplug.com/>



<https://www.rawlplug.com/en/services/technical-helpdesk#/>



