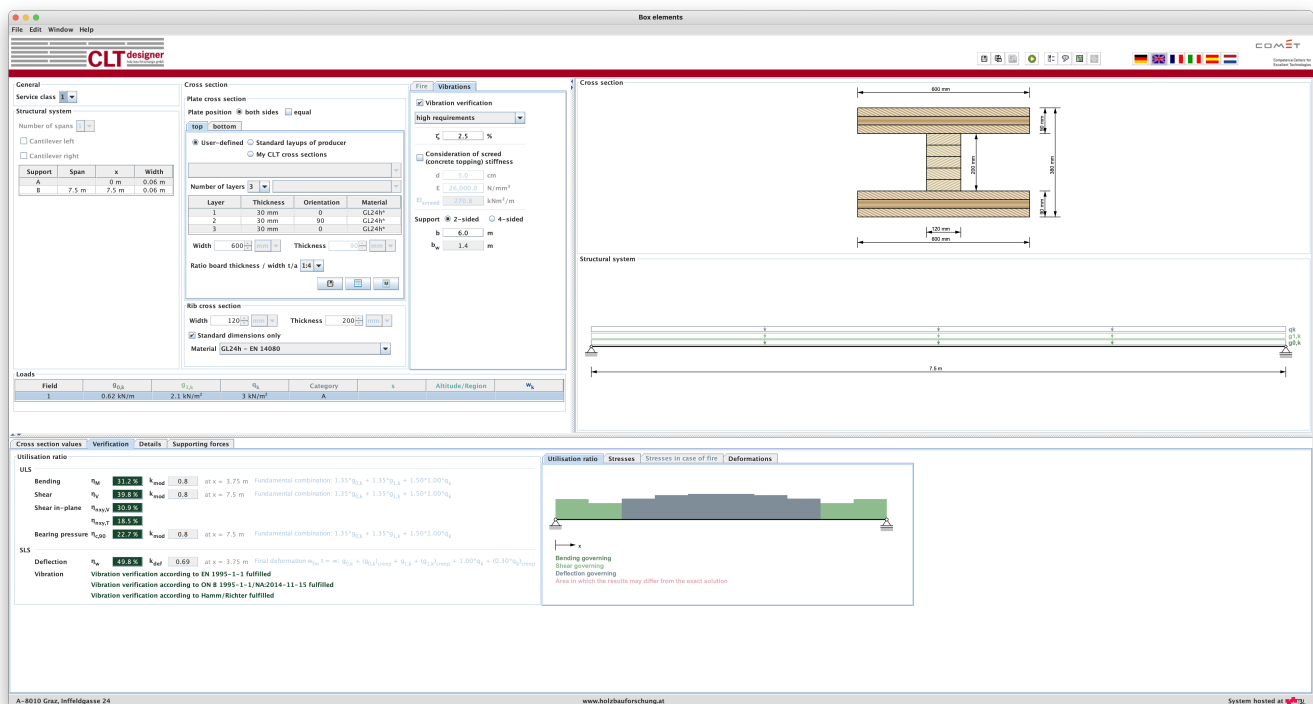


Module "Box elements"



Input data

The input is divided into:

- general information about the project and the considered structural element
- definitions of the structural system
- definitions of the cross section
- input of the loads
- informations about vibration parameters
- calculation options

General

The input field "General" defines the service class. It is only allowed to use CLT elements in areas of service class 1 and 2.

- Service class 1 (interior service condition) is in general consistent with a common utilisation of living spaces.
- Service class 2 (protected exterior service condition) is generally used for open but roofed structures.

General

Service class1

General · 2026/08/14 13:37

Structural system

In this release, only single span girder can be calculated. The supporting width and span (via x-value in the table) can be defined within this input field.

Structural system

Number of spans1

☐ Cantilever left

☐ Cantilever right

Support	Span	x	Width
A		0 m	0.12 m
B	7 m	7 m	0.12 m

Structural system · 2024/10/10 15:05 · Alexandra Thiel

Cross section

The input of the CLT cross section (plate cross section) is the same as for the other Module. However, you can still select whether the panels are the same at the top and bottom.

Plate cross section

Plate positionboth sidesequal

Show description

The cross section can be defined by the user or by choosing a typical cross section of a proprietary CLT product. There is also the possibility to save own CLT cross sections in a library. The elements are subdivided by the number of layers.

If a user-defined cross section is entered, the thickness and orientation of each layer can be changed. Furthermore, the material can be changed for all layers. The thickness of each layer has to be within the range of 6.0 mm to 45 mm. In the case of proprietary CLT products, the strength class of lumber and the orientation can be changed. If the orientation is changed, the whole cross section is rotated.

Cross section

☒ User-defined
 ☐ Standard layups of producer
☐ My CLT cross sections

Number of layers

Layer	Thickness	Orientation	Material
1	40 mm	0	GL24h*
2	20 mm	90	GL24h*
3	40 mm	0	GL24h*
4	20 mm	90	GL24h*
5	40 mm	0	GL24h*

Width
 Thickness

Ratio board thickness / width t/a

Beta! Optimise cross section...

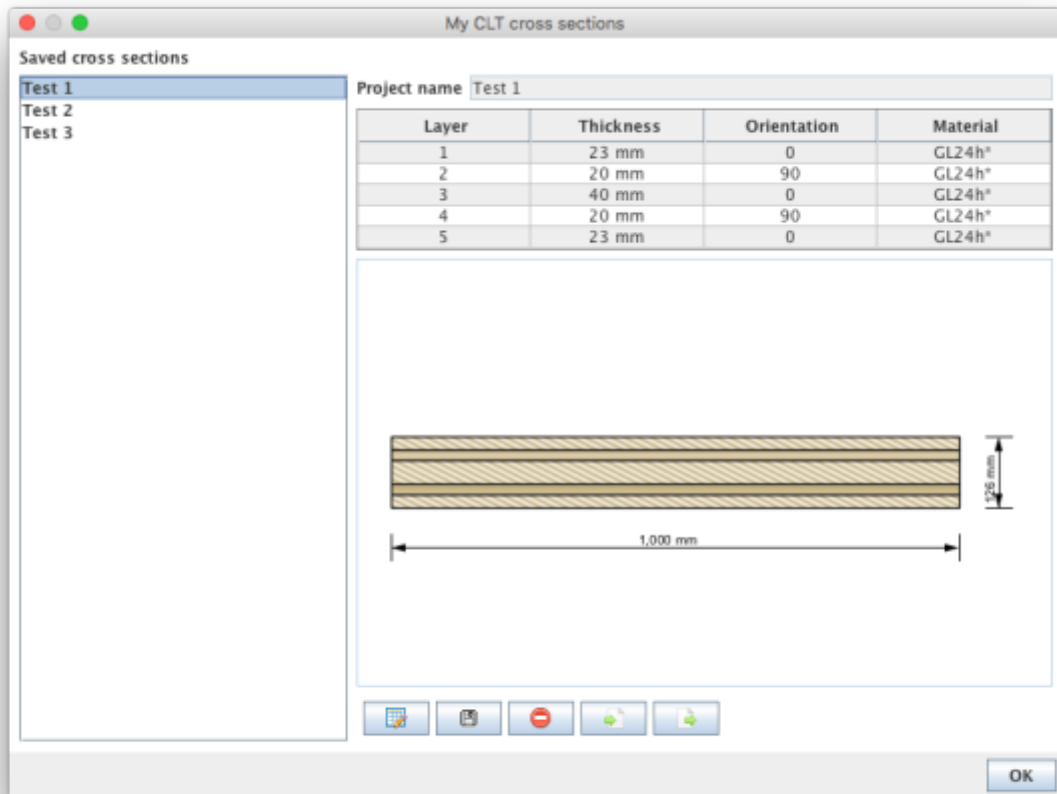
The width of the CLT plate strips can be also defined in this field. The default value is set to 1 m. The thickness of the CLT plate is calculated automatically based on the thickness of the single layers.

The ratio of board thickness to board width can also be changed here. The default setting is 1:4.

My CLT cross sections

By clicking the button  the current cross section can be stored in the library and be retrieved by selecting "My CLT cross sections" later on.

The library can be displayed with the button .



- The edit mode can be entered by clicking on . Currently, only the name of the stored cross section can be changed.
- With  the changes are saved.
- With  the chosen cross section in the sidebar can be removed from the library.
- With  cross sections from a csv file can be imported.
- With  the cross sections from the library can be exported to a csv file.

Syntax of the csv file

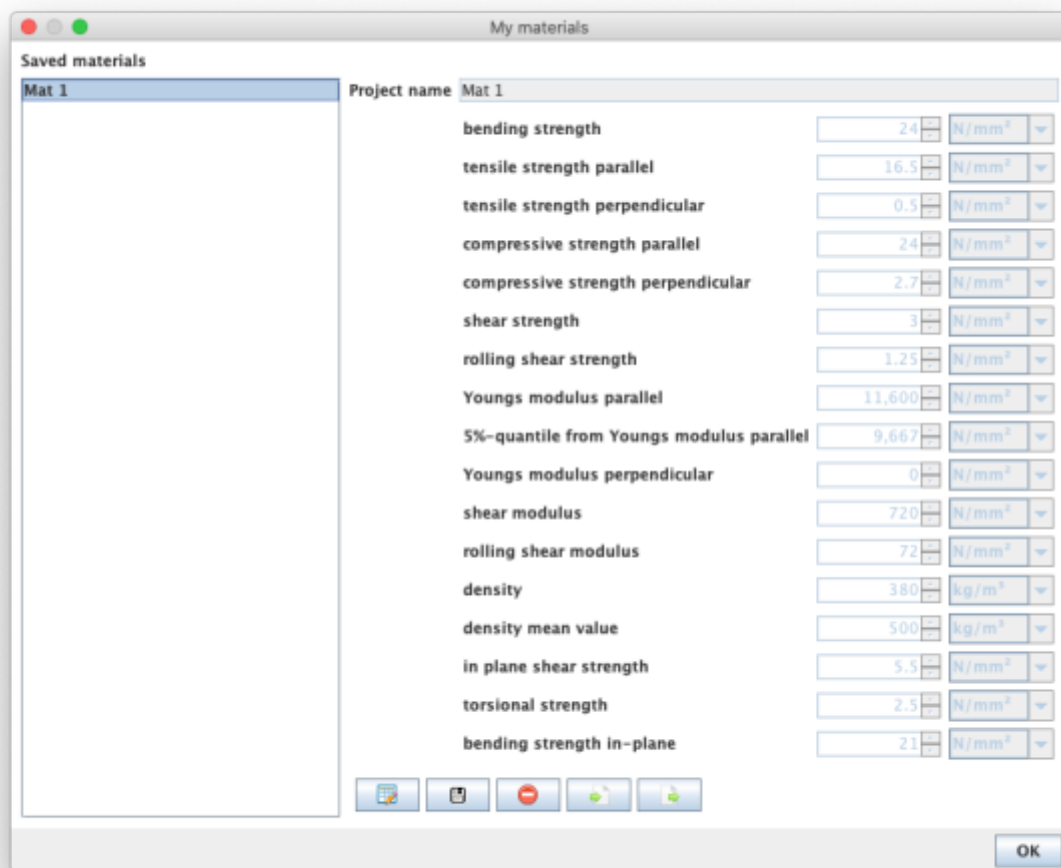
name;number of layers n ;layer thickness in [m] t_1 to t_n ;orientation of the layers o_1 to o_n (0 or 90);name of material

Example:

Test layup;5;0.03;0.02;0.02;0.02;0.03;90;0;90;0;90;GL24h*

My materials

With the button  the material library can be displayed.



- With  the edit mode can be entered.
- With  the changes are saved.
- With  the chosen material in the sidebar can be removed from the library.
- With  materials from a csv file can be imported.
- With  the materials from the library can be exported to a csv file.

Syntax of the csv file

1. row: description of the parameters
 2. row: units of the parameters
 3. row: value
- delimiter: ";"

Example:

```
Name;f_m,k;f_t,0,k;f_t,90,k;f_c,k;f_c,90,k;f_v,k;f_r,k;E_0;E_0,05;E_90;G;G_r;rho_k;rho_mean;f_v,k,IP;f_T,k;f_m,k,IP
;N/mm2;N/mm2;N/mm2;N/mm2;N/mm2;N/mm2;N/mm2;N/mm2;N/mm2;N/mm2;N/mm2;N/mm2;N/mm2;kg/m3
;kg/m3;N/mm2;N/mm2;N/mm2
Mat 1;24;16.5;0.5;24;2.7;3;1.25;11600;9667;0;720;72;380;500;5.5;2.5;21
```

The user-defined materials are then displayed in the material selection list.



Beta! Optimise cross section...

With the help of this tool, the possible layouts can be determined for the given system and load situation. The optimization can be restricted with regard to producers, number of layers or by means of limits for the panel thickness. Furthermore, outer cross layers or double layers can be included or excluded. With the option "Vibration verification according to EN" the base document is included in the vibration check or not.

Printed on 2026/09/11 09:38

selected parameter the calculation may take a little longer.

The possible setups are then displayed in the table and the selected setup can be transferred to the main window by clicking the "Choose the selected cross section" button.

[Cross section](#) · 2026/08/14 13:37

The rib cross-section (rectangular cross-section made of glulam or solid wood) is defined by entering the height and width of the rib and selecting the material. If "Standard dimensions only" is selected, the dimensions for the nearest standard cross-section are set.

Rib cross section

Width Thickness

☒ Standard dimensions only

Material

Loads

The input is the same as for the Module "CLT-Plate 1D - Continuous beam", but limited to distributed loads.

[Show description](#)

The loads are divided into the dead load (weight of the plate) ($g_{0,k}$), permanent loads ($g_{1,k}$), imposed load (q_k), snow load (s_k) and wind load (w_k). This classification is necessary to automatically carry out calculations for different load case combinations.

The plate weight is calculated automatically. The calculation method can be selected in the settings/preferences window. The default calculation method is in accordance with ON B 1991-1-1. A unit weight of 5.5 kN/m³ is assumed in the calculation. However, the unit weight may also be calculated using:

- calculation based on the mean value of density of the chosen material
- calculation based on a user-defined density

When entering the imposed loads, one of the following categories has to be chosen:

- A: Areas for domestic and residential activities
- B: Office areas
- C: Areas where people may congregate (with the exception of areas defined under category A, B and D)
- D: Shopping areas
- E: Areas for storage and industrial activities
- F: Traffic and parking areas for light-duty vehicles
- G: Traffic and parking areas for medium-duty vehicles
- H: Roofs

When entering the snow load, the country code or an altitude above sea level where the structure will

be located has to be specified:

- < 1000 m
- > 1000 m
- FIN, IS, N, S

Concentrated loads can be entered in the second table. The position can be defined whether by the local or global x-coordinate.

Loads

Field	$g_{0,k}$	$g_{1,k}$	q_k	Category	s	Altitude/Region	w_k
1	0.785 kN/m	2.1 kN/m ²	3 kN/m ²	A			
2	0.785 kN/m	2.1 kN/m ²	3 kN/m ²	A			
3	0.785 kN/m	2.1 kN/m ²	3 kN/m ²	A			

Field	x_{global}	x_{local}	$G_{1,k}$	Q_k	Category	S	Altitude/Region	W_k
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+

-

Loads · 2026/08/14 13:37

Loads · 2024/10/10 15:05 · Alexandra Thiel

Fire

In this module, currently no structural fire design is possible.

Fire · 2024/10/10 15:05 · Alexandra Thiel

Vibrations

The tab "Vibrations" allows for vibration verification.

Fire

Vibrations

☒ Vibration verification

normal requirements

ζ 3.0 %

☒ Consideration of screed (concrete topping) stiffness

d 6.0 cm

E 26,000.0 N/mm²

EI_{screed} 468 kNm²/m

Support ☐ 2-sided ☒ 4-sided

b 5.0 m

b_w 3.13 m

For the vibration verification the following specifications are of importance:

- high or normal requirements? This choice will have an influence on the limit values.
- modal damping factor
- consideration of the screed (concrete topping) stiffness
 - thickness of the screed (concrete topping)
 - modulus of elasticity of the screed (concrete topping)
- support (2-sided or 4-sided)
- room width b perpendicular to the load carrying direction

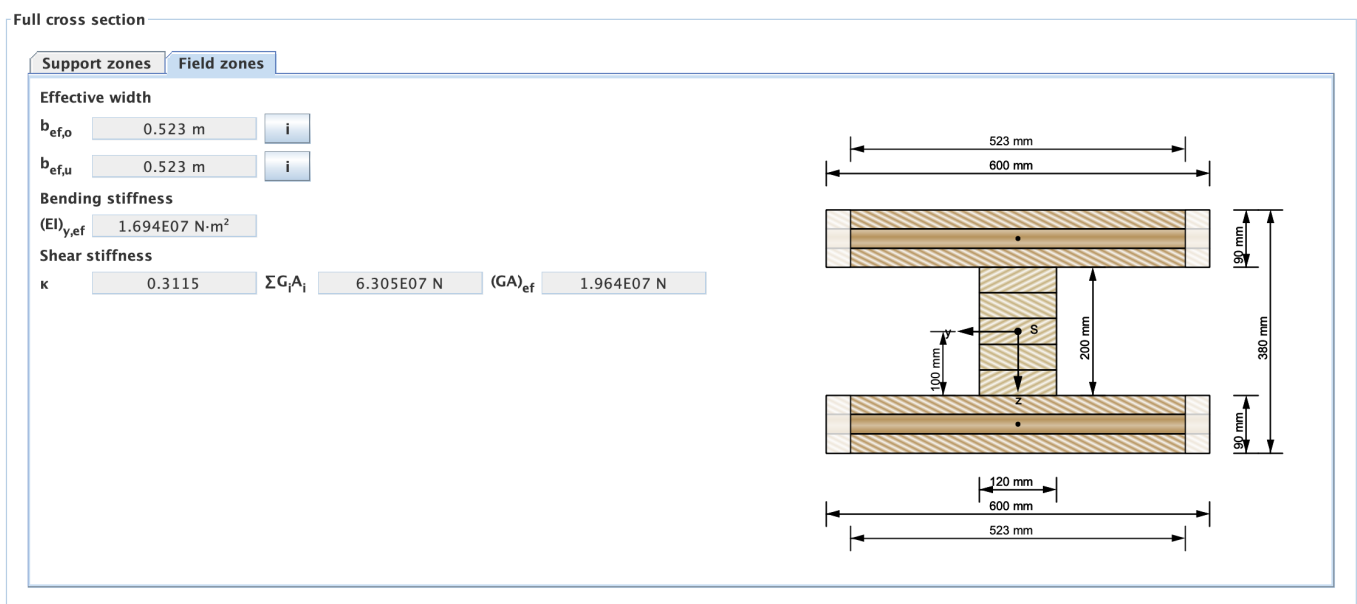
The effective width b_w of the chosen cross section used by the stiffness criteria will be specified.

Vibrations · 2026/08/14 13:37

Results and Output

Cross section values

On the tab "cross-section values", the effective width, the center of gravity as well as the bending and shear stiffness of the T-beam at the supports and in between are shown.



The button can be used to display the stiffness values of the CLT panel, the glulam beam and the shear spring, which are the input parameters for determining the effective width.

Stiffness values for calculating the effective width on top

Plate stiffness

c_x

696,000 kN/m

c_y

348,000 kN/m

c_{xy}

40,647 kN/m

K_{CLT}

679 kN·m

Rib stiffness

EA

386,400 kN

EI

2,524 kN·m²

Stiffness of the shear spring

k

840,000 kN/m²

OK

Summary of the results

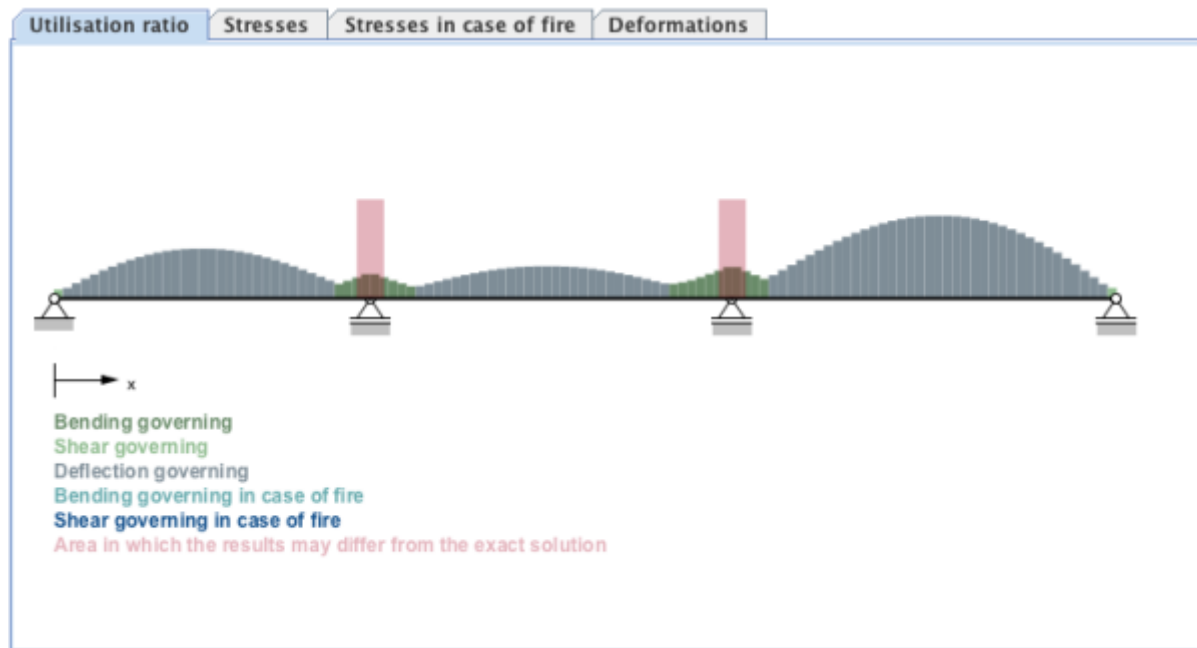
The summary of the results is analogous to the Module "CLT-Plate 1D - Continuous beam".

[Show description](#)

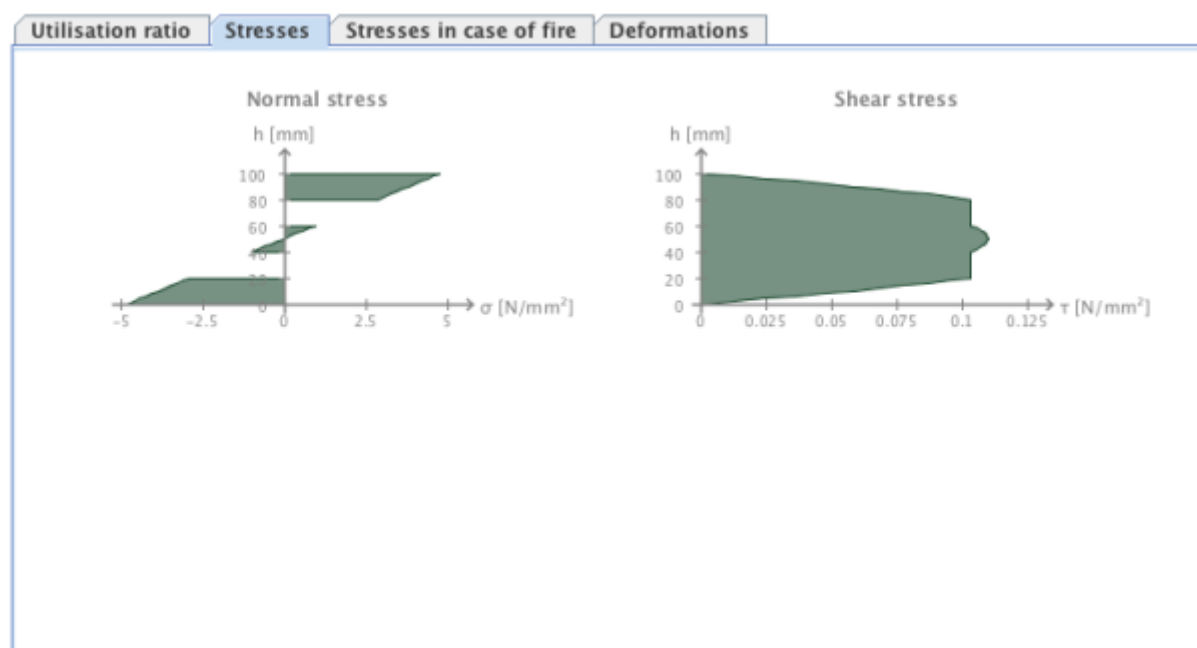
A summary of the verifications can be retrieved via the tab "Verifications". The utilisation ratios for various limit states are colour-coded indicating if the verification is fulfilled (green), not fulfilled (red) or a more accurate verification is needed (yellow). The locations of the maximum utilisation ratio and the governing combinations are compiled in the same way.

Cross section values		Verification		Details		
Utilisation ratio						
ULS						
Bending	η_M	28.3 %	k_{mod}	0.8	at x = 7.5 m	Fundamental combination: $1.35 \cdot q_{0,k} + 1.35 \cdot q_{1,k} + 1.50 \cdot 1.00 \cdot q_k$
Shear	η_V	13 %	k_{mod}	0.8	at x = 7.5 m	Fundamental combination: $1.35 \cdot q_{0,k} + 1.35 \cdot q_{1,k} + 1.50 \cdot 1.00 \cdot q_k$
Bearing pressure	$\eta_{c,90}$	5 %	k_{mod}	0.8	at x = 7.5 m	Fundamental combination: $1.35 \cdot q_{0,k} + 1.35 \cdot q_{1,k} + 1.50 \cdot 1.00 \cdot q_k$
SLS						
Deflection	η_w	75.8 %	k_{def}	0.85	at x = 9.83 m	Final deformation $w_{tot,fin} \overset{!}{=} \infty: q_{0,k} + (q_{0,k})_{creep} + q_{1,k} + (q_{1,k})_{creep} + 1.00 \cdot q_k + (0.30 \cdot q_k)_{creep}$
Vibration	Vibration verification according to DIN 1052 fulfilled					
	Vibration verification according to EN 1995-1-1 fulfilled					
	Vibration verification according to ON B 1995-1-1/NA:2009-07 fulfilled					
	Vibration verification according to Hamm/Richter fulfilled					
	Vibration verification according to modified Hamm/Richter fulfilled					
Utilisation ratio in case of fire						
ULS						
Bending	$\eta_{M,fi}$	15.7 %	k_{mod}	1.0	at x = 7.5 m	Accidental combination: $q_{0,k} + q_{1,k} + 0.30 \cdot q_k$
Shear	$\eta_{V,fi}$	6.1 %	k_{mod}	1.0	at x = 7.5 m	Accidental combination: $q_{0,k} + q_{1,k} + 0.30 \cdot q_k$

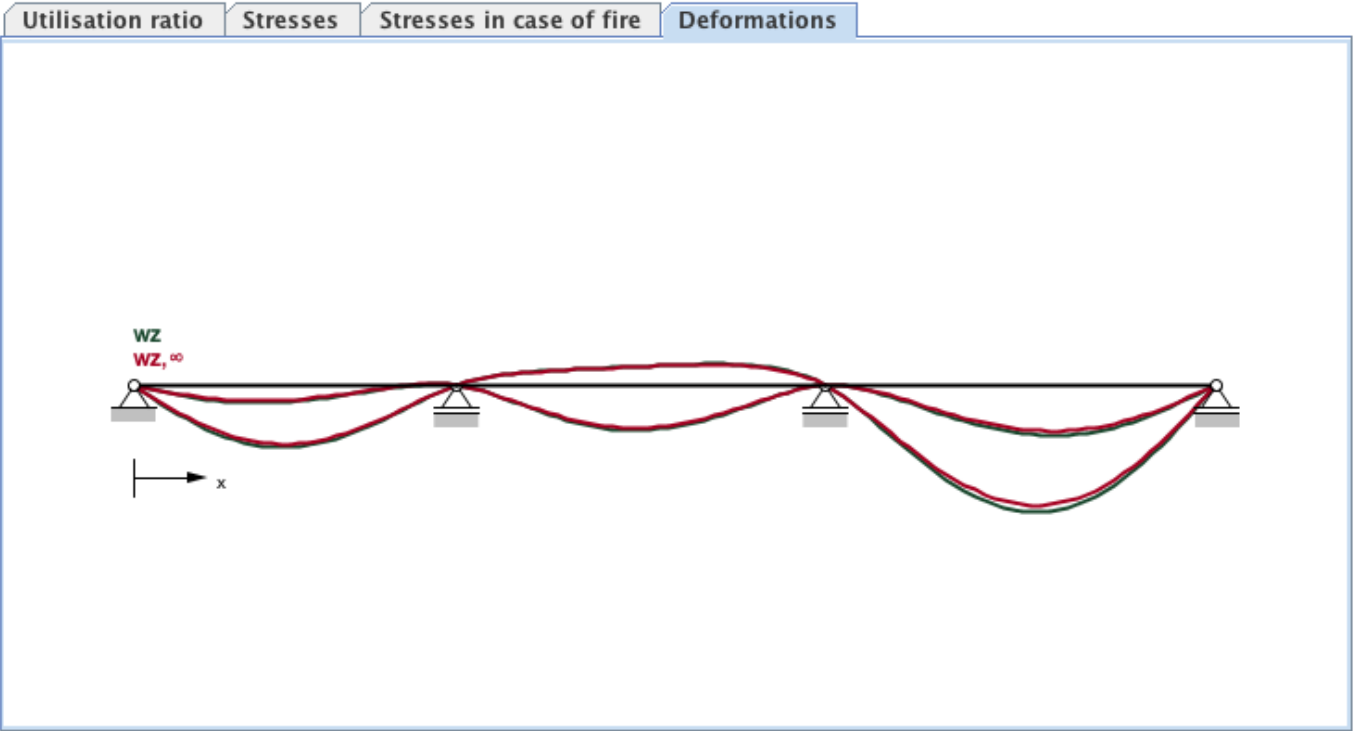
The tab "Utilisation" shows the distribution of the governing utilisation ratios along the beam. Areas in which the results may differ from the exact solution are marked here.



The tab "Stresses" shows the governing stresses resulting from the ULS verification. If a structural fire design was carried out, the governing stresses in case of fire are shown in the tab "Stresses in case of fire"



The tab "Deformations" shows the deformed system or the envelope given by the minimum and maximum deformation resulting from the governing SLS verification.



Summary of the results · 2026/08/14 13:37

However, there are differences for ULS - shear, since for the CLT-flange also the in-plane shear has to be considered.

Utilisation ratio					
ULS					
Bending	η_M	70 %	k_{mod}	0.8	at x = 5.0 m Fundamental combination: $1.35 \cdot g_{0,k} + 1.35 \cdot g_{1,k} + 1.50 \cdot 1.00 \cdot q_k$
Shear	η_V	70.4 %	k_{mod}	0.8	at x = 10.0 m Fundamental combination: $1.35 \cdot g_{0,k} + 1.35 \cdot g_{1,k} + 1.50 \cdot 1.00 \cdot q_k$
Shear in-plane	$\eta_{nxy,V}$	33.4 %			
	$\eta_{nxy,T}$	20 %			
Bearing pressure	$\eta_{C,90}$	96 %	k_{mod}	0.8	at x = 10.0 m Fundamental combination: $1.35 \cdot g_{0,k} + 1.35 \cdot g_{1,k} + 1.50 \cdot 1.00 \cdot q_k$
SLS					
Deflection	η_w	67.7 %	k_{def}	0.69	at x = 5.0 m Final deformation $w_{fin} \text{ t} = \infty$: $g_{0,k} + (g_{0,k})_{creep} + g_{1,k} + (g_{1,k})_{creep} + 1.00 \cdot q_k + (0.30 \cdot q_k)_{creep}$
Vibration	Vibration verification according to DIN 1052 is not fulfilled or more accurate verification is needed				
	According to EN 1995-1-1 a more accurate verification is needed!				
	Vibration verification according to ON B 1995-1-1/NA:2014-11-15 not fulfilled				
	Vibration verification according to Hamm/Richter not fulfilled				
	Vibration verification according to modified Hamm/Richter not fulfilled				

Summary of the results · 2024/10/10 15:05 · Alexandra Thiel

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