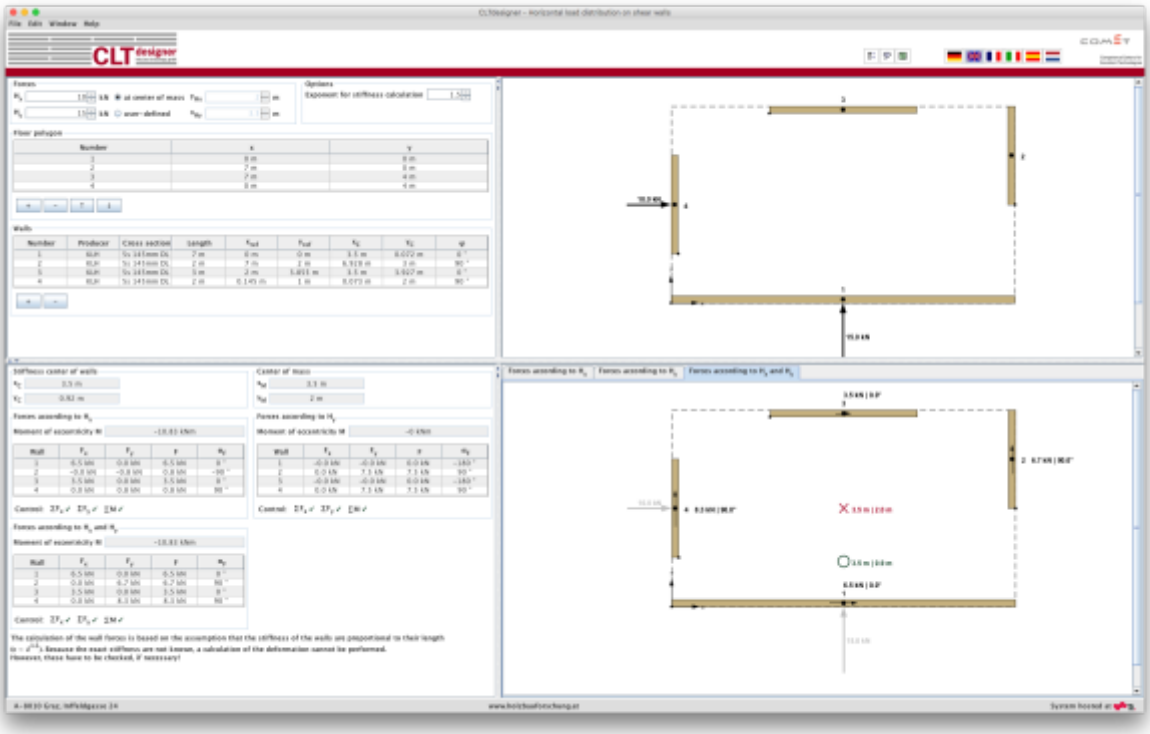
Module "Horizontal load distribution on shear walls"



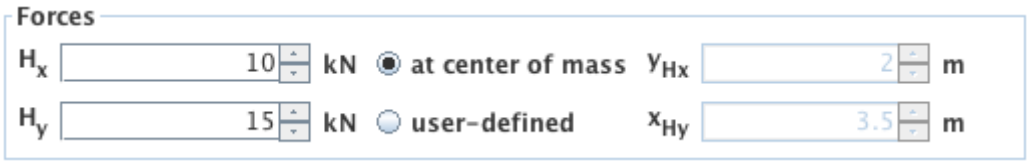
Input data

The input is divided into:

- input of the position and quantity of acting horizontal forces
- input of the floor polygon
- input of the shear walls
- calculation options

Horizontal forces

The quantity of horizontal forces can be specified by entering H_x and H_y in [kN]. The position of the forces can be either user-defined (H_x along the line of action in y_{Hx} and H_y along the line of action in x_{Hy}) or specified at the center of mass. By selecting "at center of mass", the position of the forces will be determined from the polygon of floor.



Floor polygon

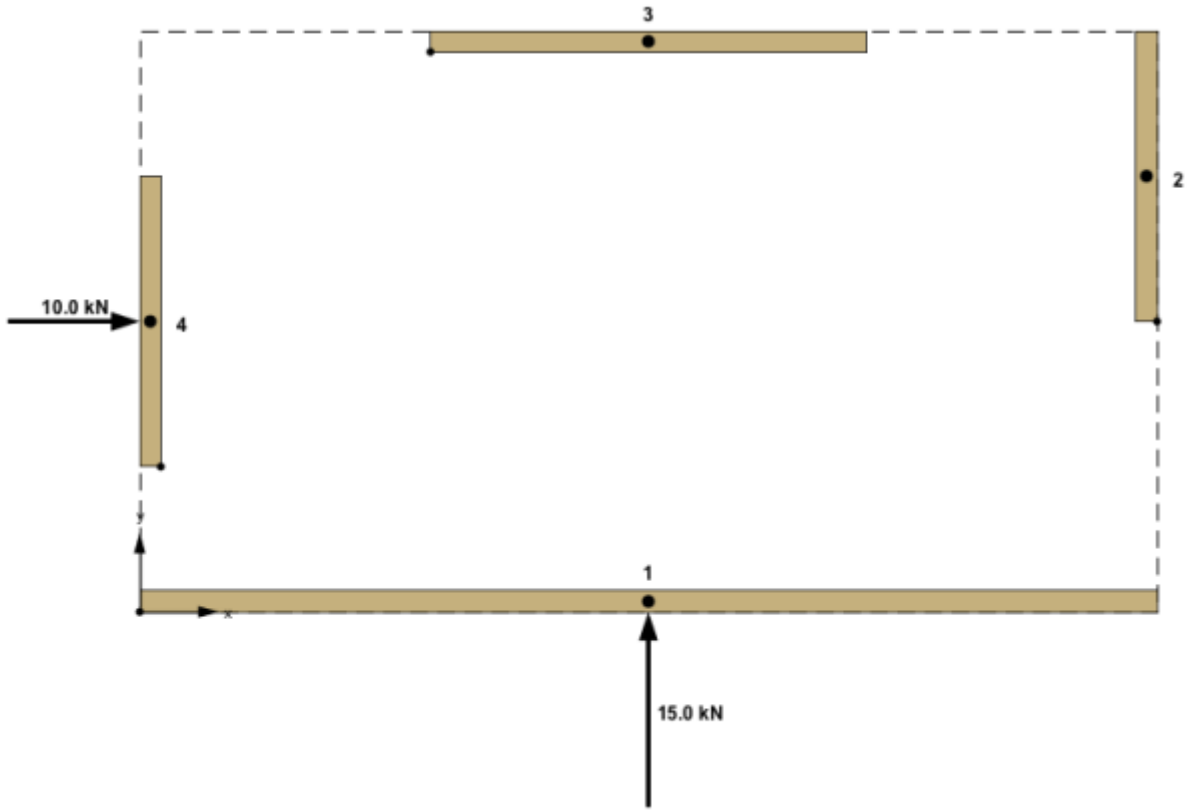
Floor polygon

Number	x	y
1	0 m	0 m
2	7 m	0 m
3	7 m	4 m
4	0 m	4 m

+ - ↑ ↓

The floor is defined by entering the coordinates of the corner points. The sequence of the points must be counterclockwise and there must be no openings. The origin of the draft is shown on the upper-right corner of the window.

- By clicking +, a new corner point is created.
- By clicking -, the selected point will be deleted.
- By clicking ↑, the selected point can be moved up in the sequence.
- By clicking ↓, the selected point can be moved down in the sequence.



Walls

The walls can be defined using the following table. The selection of the cross-section, and thereby of the producer, is in the current calculation neglected since the stiffnesses are calculated in proportion to the wall length. The position of the wall can be defined either by specifying the reference point (in

the draft above, the point is set in the lower left corner at the φ = 0°; x_{ref} and y_{ref}) or by entering the center of mass (x_C and y_C), as well as the angle of rotation φ.

Walls

Number	Producer	Cross section	Length	x_{ref}	y_{ref}	x_C	y_C	φ
1	KLH	5s 145mm DL	7 m	0 m	0 m	3.5 m	0.072 m	0 °
2	KLH	5s 145mm DL	2 m	7 m	2 m	6.928 m	3 m	90 °
3	KLH	5s 145mm DL	3 m	2 m	3.855 m	3.5 m	3.927 m	0 °
4	KLH	5s 145mm DL	2 m	0.145 m	1 m	0.073 m	2 m	90 °

+ -

- By clicking + , a new wall can be created.
- By clicking - , the selected wall will be deleted.

Options

In the current version, the stiffness of the wall systems c is calculated proportional to the wall length ($c \sim \ell^{exp}$). The exponent exp can be specified here.

Options

Exponent for stiffness calculation 1.5

Results and output

Output of the stiffness center of walls and center of mass

Stiffness center of walls

x_C 3.5 m

y_C 0.92 m

Center of mass

x_M 3.5 m

y_M 2 m

Output of the forces acting on the walls

The output is given separately for the acting forces H_x and H_y and the combination $H_x + H_y$. The output comprises the moment, resulting from the load eccentricity, as well as the forces acting on each wall defined with their components x and y (F_x and F_y) and also the resulting force F at the angle α_F. As a control, the sum of the forces in x and y direction, as well as the sum of the moments are verified as well.

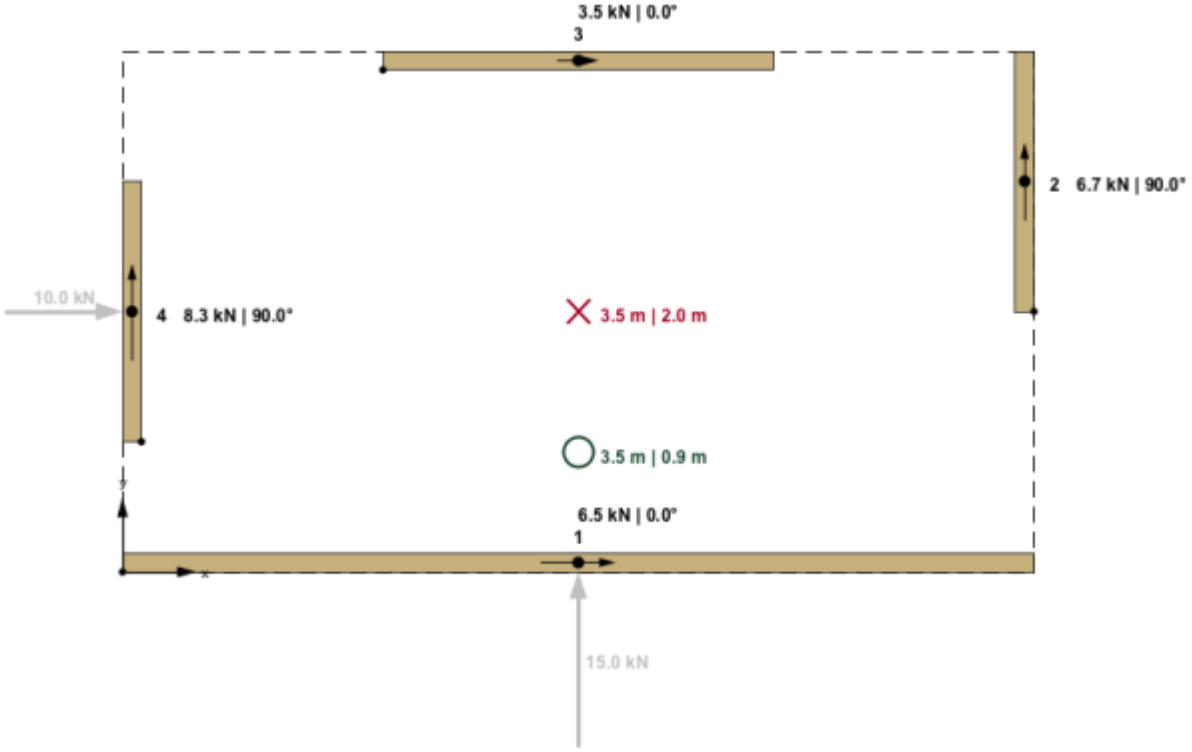
Forces according to H_x and H_y

Moment of eccentricity M −10.83 kNm

Wall	F_x	F_y	F	α_F
1	6.5 kN	0.0 kN	6.5 kN	0 °
2	0.0 kN	6.7 kN	6.7 kN	90 °
3	3.5 kN	0.0 kN	3.5 kN	0 °
4	0.0 kN	8.3 kN	8.3 kN	90 °

Control: ΣF_x ✓ ΣF_y ✓ ΣM ✓

A graphic representation of the results is also divided into H_x, H_y and H_x + H_y and can be seen in the lower right corner of the window.



Implemented calculation methods

Modeling as rigid floor plate and walls as extensional springs