V1

Composite Column

The application V1 allows the calculation of composite columns with a constant cross section in accordance with the simplified E method specified by DIN 18800 Part 5 or in accordance with EC 4 + NAD (Germany).

The application performs verifications of the load bearing capacity, the serviceability and the fire safety. The user can calculate columns over a single or several storeys with any type of supports. For the quick and easy input of hinged and cantilever columns, corresponding input assistants are available.

Material

The materials are pre-defined independently of the cross section. Several options are available for the selection of the concrete, the reinforcing steel as per DIN 1045-1 and the profile steel as per DIN EN 1025 1994-03. It is assumed that the material parameters are constant on the entire system. The input of user-defined materials is not implemented.

Composite cross sections

The user can define the following composite cross sections:

- Rectangular concrete cross sections with cast-in I-profile steel
- Encased I profiles
- Concrete-filled rectangular or round pipes

The user can arrange the reinforcement in the concrete cross section in a symmetrical layout. When entering the reinforcement, the user can decide whether the reinforcement should be included in the calculation also in the cold state. Under fire exposure, the reinforcement is always included and increases the load bearing capacity in this case.

System

The system is composed of sections that form a straight set of members with a constant cross section. The user can define supporting conditions at any point of the straight set of members. In addition to the standard systems

- hinged column
- cantilever with appended hinged columns
- frame column

the user can define general columns over several storeys with the help of this option.

Supports

In addition to the definition of two translational and two rotational degrees of freedom, the user can specify whether the support in question is a storey floor.
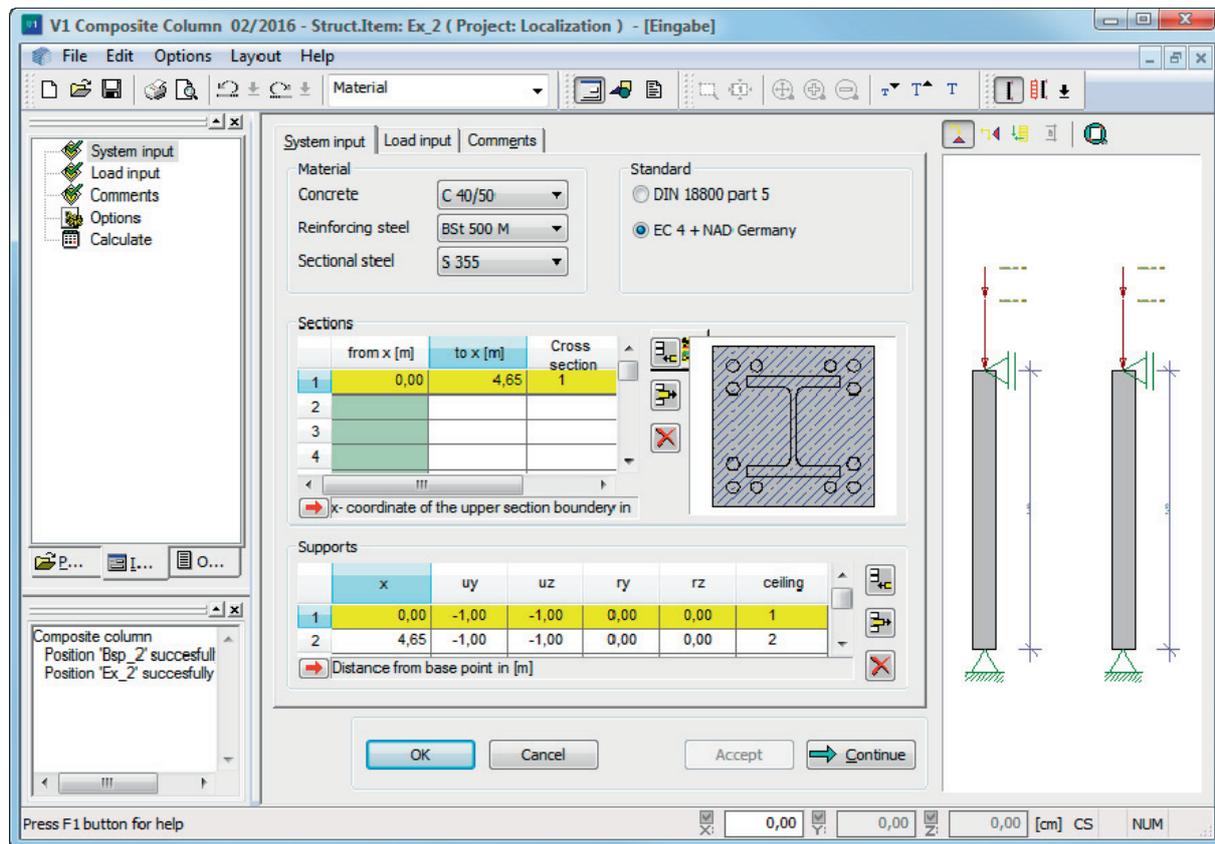
Optionally available are:

- No storey floor
- Storey floor with restraining effect
- Storey floor without restraining effect

This option is particularly relevant for the examination of the behaviour under fire exposure and is only included in the structural safety verification under fire exposure.

Loads

V1 allows the definition of

- variable horizontal line loads
- vertical and horizontal concentrated loads
- moments around the cross sectional axes

All loads are characteristic actions. Therefore, they are entered without safety factor.

Appended hinged column

You can define several hinged columns that apply at the same column point. The height of different columns may vary in any way. You can also define negative loads that apply to the hinged columns and negative heights. Appended hinged columns are taken into account as equivalent loads in

accordance with DIN 1880, Part 2 E (525).

Calculation

- The design values for the structural safety and serviceability verifications are assessed automatically by the application in line with the relevant design situation.
- The elastic calculation of the internal forces in a second order analysis takes imperfections via inclusion of the failure mode and creep and shrinkage effects into account.
- The user can control the calculation workflow via a great number of parameters. This allows the quick and easy design of various types of composite columns.

Verifications

- Structural safety verifications in the cold state, separately for the normal and the accidental design situation.
- Structural safety verifications under fire exposure of concrete-filled round and rectangular pipes
- Serviceability verifications

Standard systems

In order to render the input of standard systems such as hinged and cantilever columns as easy and efficient as it is with our other software applications for columns, an input dialog is available that reduces the input work to the parameters necessary for the respective system and facilitates the definition considerably.

Options for program

Calculation parameters | Dimensions

Calculation

Maximum length of $\qquad$ 0,11 m

☐ Take-off effect of permanent loads consider
☑ Simplified combination rules use

Analysis acc. to DIN 18800-5 / EC4

Proof with scheduled centric compression
◉ acc. to European buckling stress curves
◯ acc. to th. II.o. w. eff. gcom. imperfections

Amplitude of the eff. geometrical imperfections
☐ Default - z   46,5 cm
☐ Default - y   46,5 cm

Fire-resistance grading   R90

OK | Cancel | Apply | Help

Affixed hinged column

	x [m]	Direction	Vertical force	H [m]	GammaF
1	4,65	1	100,00	4,65	1,00
2	4,65	1	100,00	2,30	1,00
3	4,65	1	100,00	6,00	1,00
4	0,00				
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					

Coordinate

100,00 kN   100,00 kN   100,00 kN

OK | Cancel