

D12

Collar Beam Roof

The D12 application allows the calculation of conventional collar beam roofs with sway/non-sway collar beams as well as rafter roofs.

Standards

- DIN EN 1995
- ÖNORM EN 1995
- BS EN 1995
- UNI EN 1995/NTC
- EN 1995
- DIN 1052

System

- The roof halves may have different pitches.
- The inferior purlins may be located at different height levels.
- The left and right building halves may differ in width.
- Horizontal sway and non-sway supports.

- Collar beam connection:
 - single-piece cross-section: nailed cleats
 - two-piece cross section: fastening with nails or special dowels
- Rafter base:
 - notch
 - cleat with nails
 - cleat with connectors
- Purlin support:
 - kerf
 - cleat

Loads (actions)

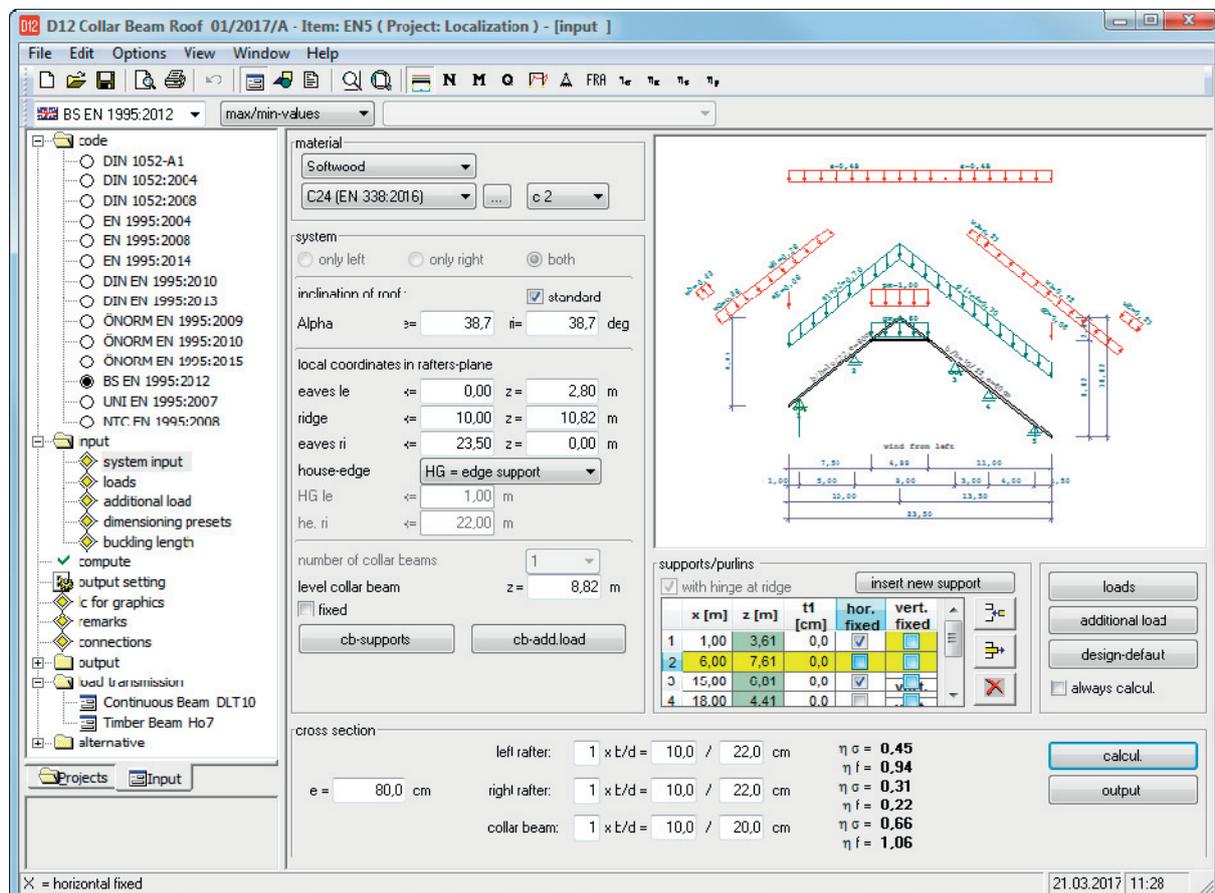
Permanent roof loads, finishing loads, snow loads, man loads and additional loads such as loads by dormers, replacement etc. wind pressure, wind suction, wind uplift.

Calculation

The general, asymmetrical and sway collar beam roof is treated as a framework system from a structural point of view. Deformation due to axial force and the effects of the real pre-defined supporting conditions are taken into account.

The bearing forces are exactly determined in the framework calculation. Due to constraints caused by axial force effects, horizontal bearing components might occur even if only vertical external loading applies.

The application selects automatically the superpositions under the assumption of a favourable rafter cross section.



The support reactions are represented independently of a superposition rule by the result values of the action groups and an informal cumulative maximum value. As typical with the EN standard, a new combination based on these values is required for the connected structural components.

The stress resistance and cross breaking strength are verified in compliance with DIN 1052 or EN 1995-1.

The resistance to uplift caused by wind suction is verified with the help of the force coefficients c_{pe1} as per DIN 1055 or EN 1991.

In accordance with DIN 1052, creep deformations can optionally be taken into account.

If the calculation is performed as per DIN 1052:2008 or EN 1995-1, creep deformation is automatically taken into account in the combinatorial analysis via the creep coefficient k_{def} .

In the stability verifications, continuous supports against lateral buckling and continuous lateral supports are assumed as a standard and the effective length in the rafter level is limited to $0.9 \cdot$ the length of the structural component.

The user can optionally customize these border conditions.

Design defaults

Optional:

- Proof of wind suction
- Earthquake combinations
- Fire design

The values for the permissible span/cantilever deflection (referred to the length L) recommended by the selected standard are set by default in the respective verifications. The user can customize these values as required.

As the negative deflection of short cantilevers is decisive for the design result in most cases, the user can eliminate this effect by checking the option "Positive deflection only".

The influence of creep in the state of deflection can optionally be taken into account with DIN 1052:1996.

Up to seven options are available for the determination of the effective lengths.

- For each superposition, the corresponding effective lengths are calculated from the eigenvalue solution for each individual member. However, excessive effective lengths might result for members under low axial force due to numerical problems.

- In these cases, the user can specify a maximum limit for the effective length.
- Optionally, he/she can preset a separate effective length for each individual members.
- Alternatively, the effective length can be set to the bar or component length or a default value.

Anti-tipping protection

Anti-tipping protection provided by roof battens is permissible according to DIN 1052 P1 10.4, if the roof span is ≤ 15 m, the rafter spacing is ≤ 1.5 m and the ratio of the cross section's height and width is ≤ 4 .

Anti-tipping protection with board formwork is permissible if g/q is < 0.5 , the roof span is ≤ 12.5 m and the rafter spacing is ≤ 1.25 m

Load transfer

The bearing loads can be transferred to the Frilo applications DLT – Continuous Beam and HO7 – Timber Beam.