

Cable analysis

esas.12

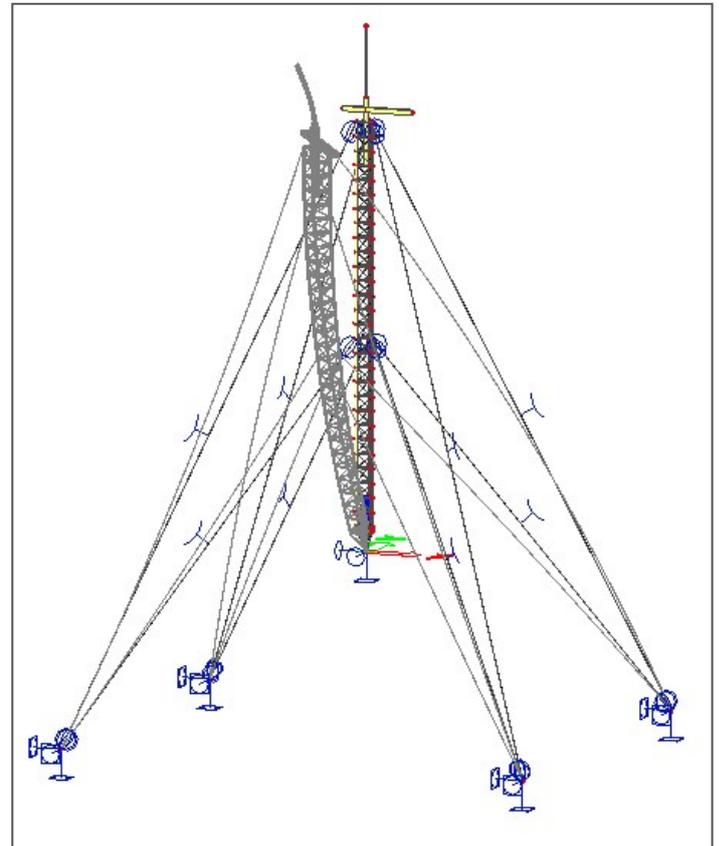
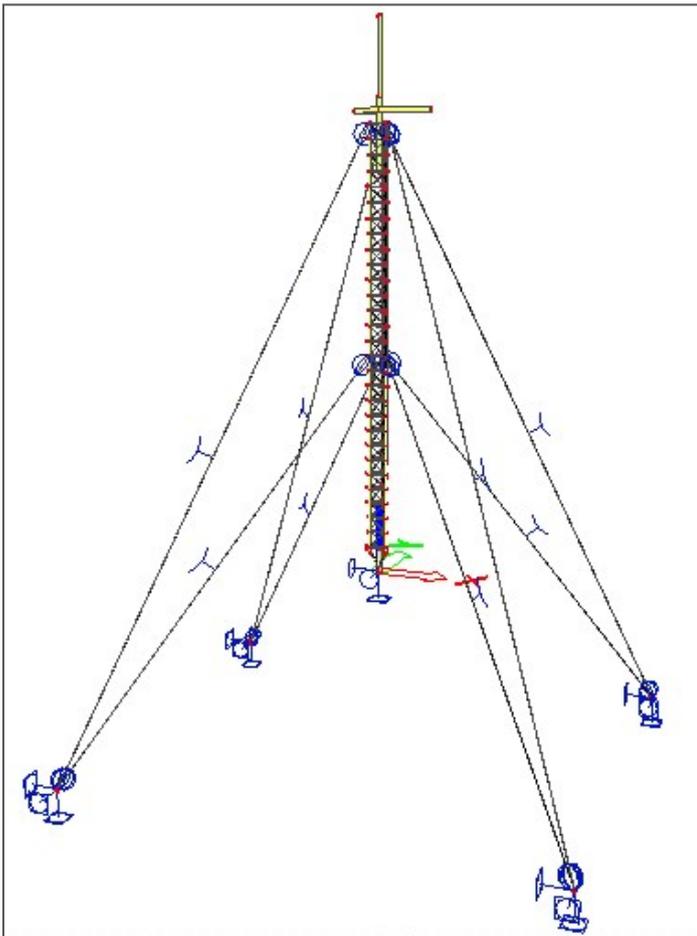
A cable element is an element with almost no bending stiffness. Using cable analysis module, this is taken into account during the calculation of members for which the cable property has been added.

Highlights

The cable can be defined as straight or slack. For slack cables, the initial curved shape is calculated for self weight of the cable or another user input distributed load

A value of initial prestressing can be added to cable properties

Geometrical non linear analysis of cables uses Newton-Raphson method which is suitable for large displacement calculation



Two cable elements can be modelled:

- straight cable (pre-stressed element)
- slack cable.

Straight cables

Only the pre-stressing force must be input for a straight cable.

Note: Proper settings must be made in Project Setup dialogue, Functionality tab. Options Initial stress, Nonlinearity, Beam local nonlinearity and 2nd order calculation must be selected.

Slack cables

In addition to pre-stressing force, additional parameter must be defined for slack cable. The cable is subject to additional load: either (i) self-weight load, or (ii) a general load acting under the given angle and having identical

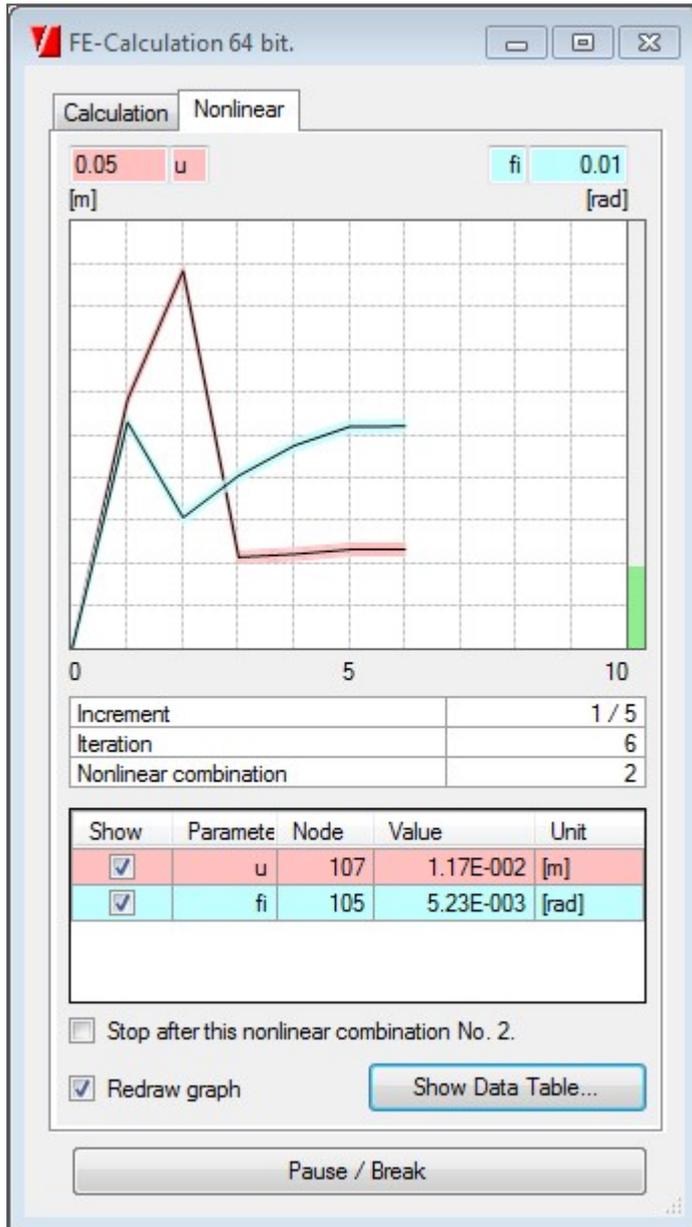
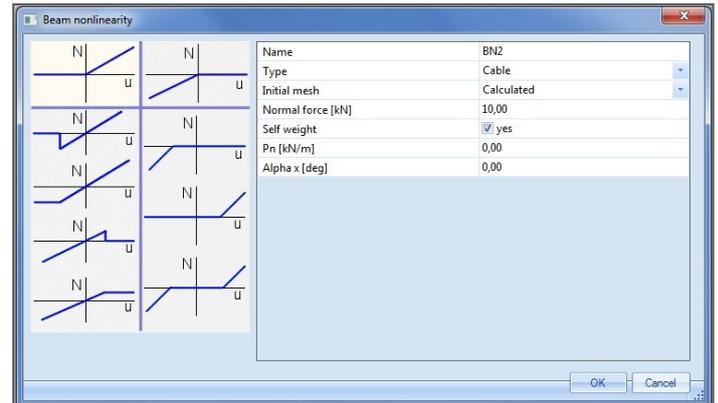
orientation as the local rotation axis fix of the 1D member. These parameters are used to determine the slack of the cable in a particular direction. All calculations are carried out on the "deformed" structure. That means that the final deformation of a cable is calculated from this "slack" shape and not from the ideal straight shape of 1D member.

Technical background

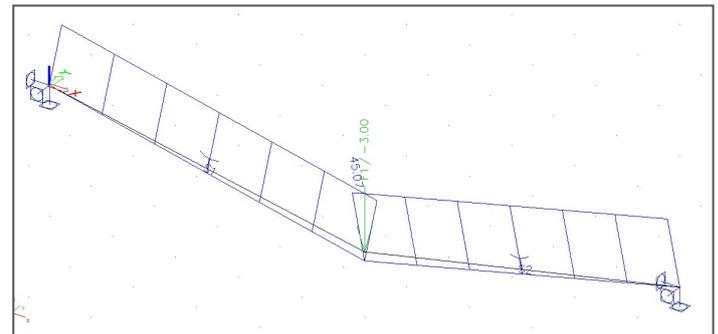
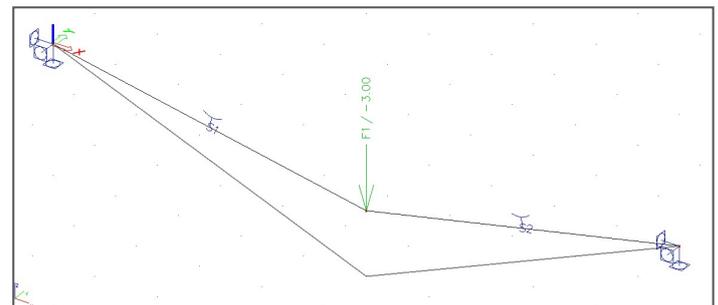
No special finite element is used for this type of analysis. Regular 1D member element is used, but its flexural stiffness is very, very small. Small shear forces that appear during the iterative calculation appear are deleted.

Note: Proper settings must be made in Project Setup dialogue, Functionality tab. Options Initial stress, Nonlinearity, and 2nd order calculation must be selected. Option Beam local nonlinearity does not have to be ON; it would lead to unnecessary lengthening of calculation.

Note: ONLY Newton-Raphson method can be used for this type of analysis. Timoshenko method MUST NOT be applied for analysis of slack cables.



When inserted into the model, a 1D member with this type of nonlinearity is marked by the following symbol (remember that in order to see the symbol, view parameters must be adjusted to show model data).



Required modules

esas.10