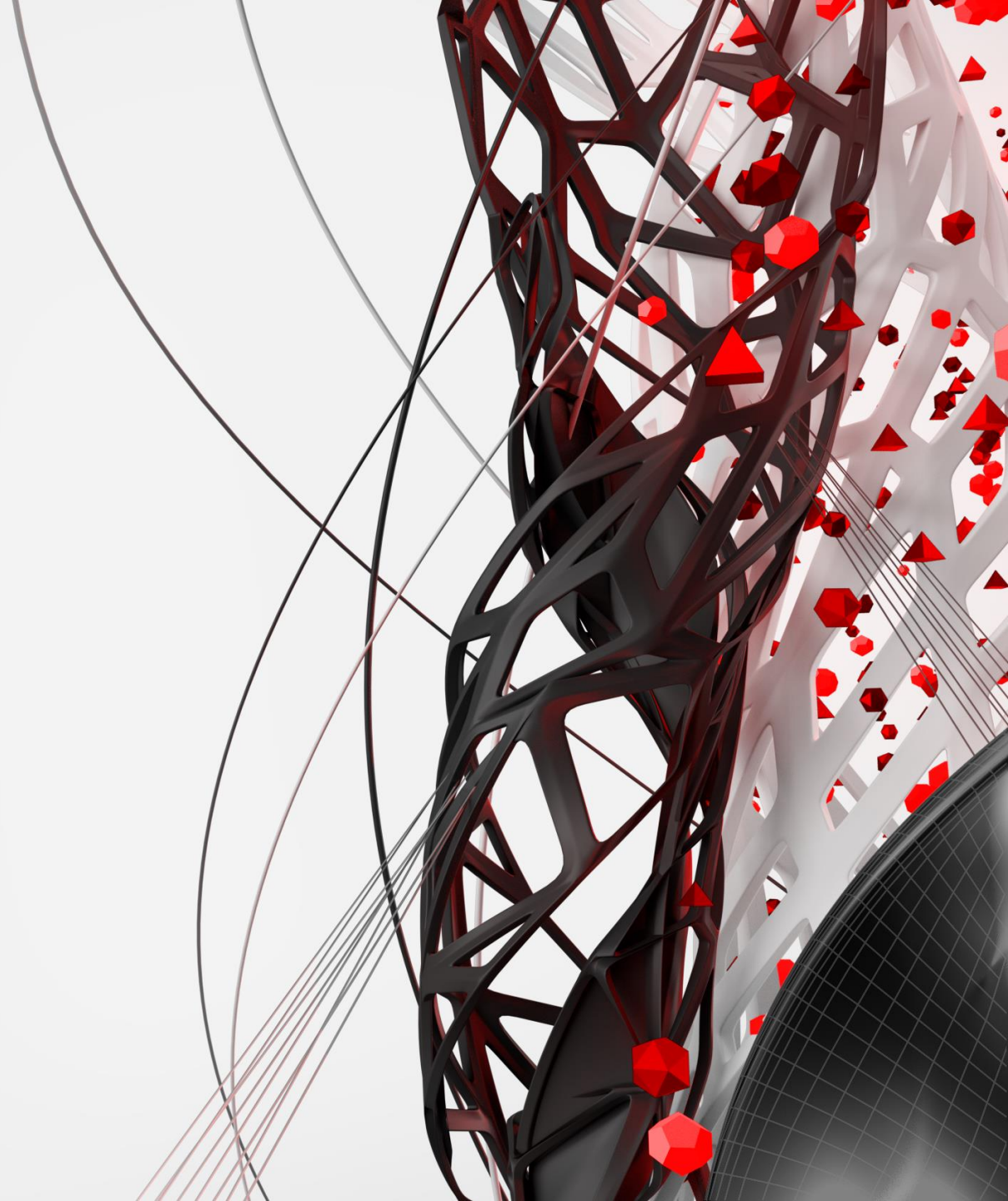




CABLE280 element

Roberto Silva

SIMULATING THE FUTURE



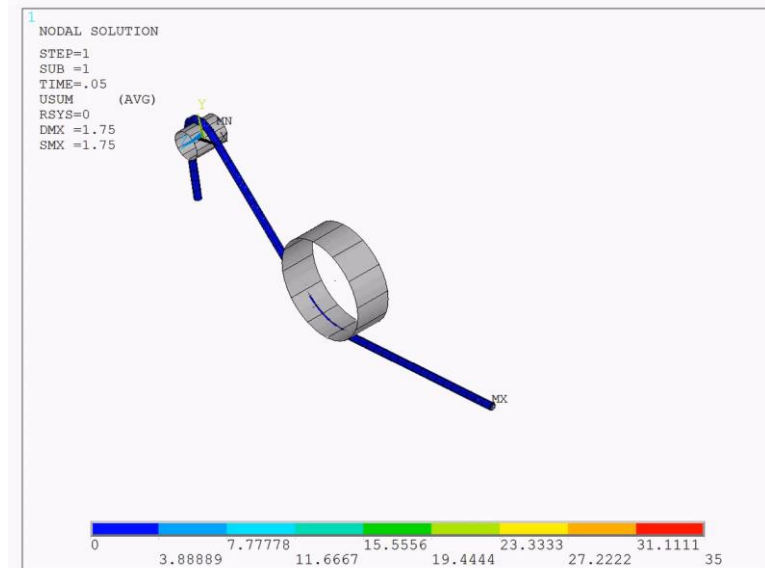
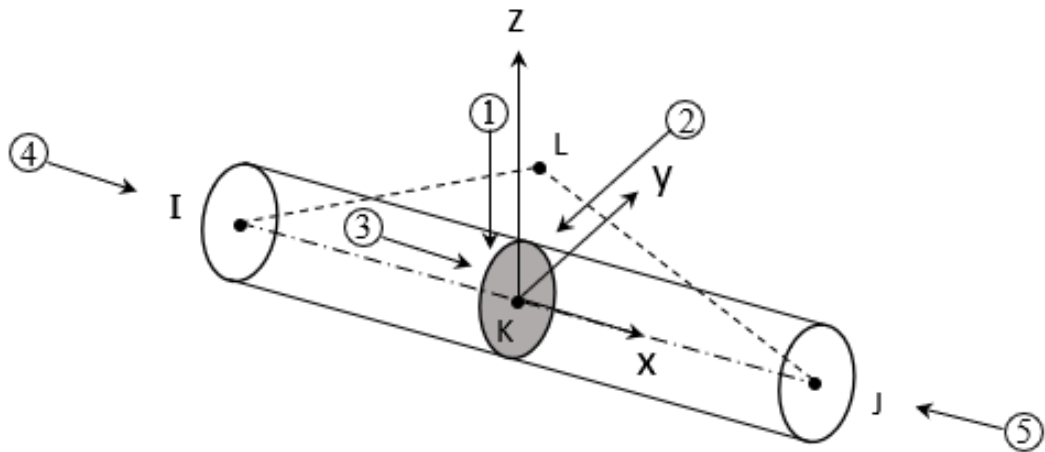
CABLE280 element

Quadratic three-node linear element in 3D space, with 3 translational DOFs.

Implemented in 2020R1 (MAPDL only); available in Workbench Mechanical in 2021R1.

Mixed displacement-force formulation, providing good mesh convergence and accurate solution.

Suitable for moderate to extremely slender tension-only cable structures.



CABLE280 element

Guidelines for using CABLE280 in Workbench:

- In geometry, Model Type = Cable;
- Cable area defined by cross section;
- Quadratic behavior internally defined for cable bodies;
- Only one element per cable body, regardless of mesh refinement;
- Large Deflection must be used;
- If Linear behavior is manually defined, a tension-only LINK180 element is used (if NLGEOM,ON);
- Initial state may be applied, but not required for stable solution (unlike LINK180).

Definition	
<input type="checkbox"/> Suppressed	No
Stiffness Behavior	Flexible
Coordinate System	Default Coordinate System
Reference Temperature	By Environment
Cross Section	Circle
Treatment	None
Model Type	Cable

Solver Controls	
Solver Type	Program Controlled
Weak Springs	Off
Solver Pivot Checking	Program Controlled
Large Deflection	On
Inertia Relief	Off
Quasi-Static Solution	Off

CABLE280 element

Although CABLE280 is tension-only, it includes a small compressive stiffness, which is required for robust nonlinear solution.

Defined by SECCONTROL, , , , , CV3 (default value of 1e-5).

Viscous regularization is used to overcome difficulties when cable switches from tension to compression (or vice-versa).

Based on a viscous regularization factor μ , associated to stiffness before regularization K and after regularization K_v .

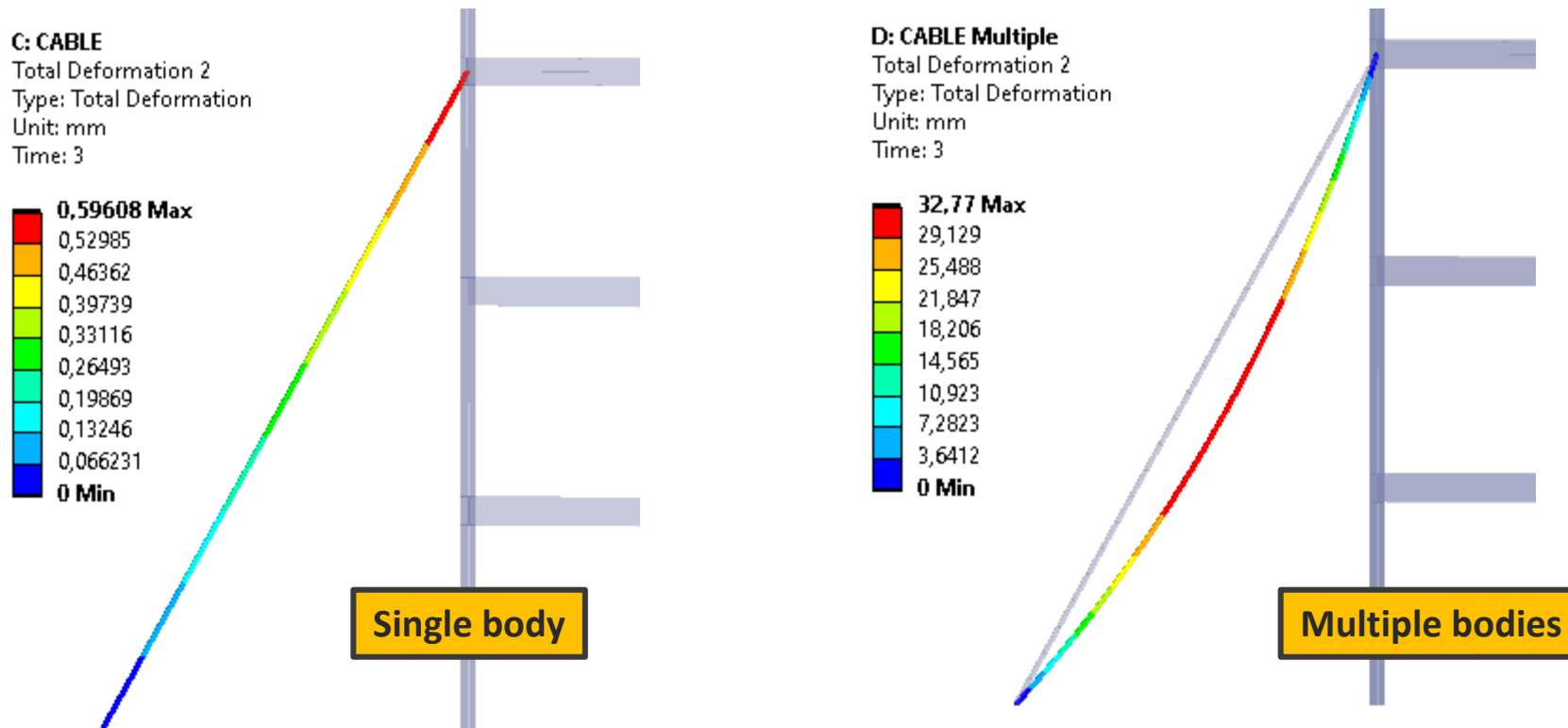
$$\frac{dK_v}{dt} = \frac{K - K_v}{\mu}$$

Defined by SECCONTROL, , , , , CV4 (default value of 0.05).

CABLE280 element

In Workbench, bodies defined as cables are meshed with one element only, regardless of mesh control settings.

For better representation of contacts and “sagging”, multiple bodies must be used.



CABLE280 element

Questions checked with Ansys (*replies in red*):

- Mesh refinement (is it possible to use more than one element?) = *registered as enhancement, to be implemented in future versions.*
- Cable-surface guidelines and recommendations (Line segments / Node on edge contact type, cable radius representation?) = *use Nodes on Edge contact, large Pinball radius, Offset to represent cable radius and Smoothing for Target Geometry Correction.*
- Axial force results (small tension force even in compression?) = *a near-zero tension may appear, due to regularization. Large values in example were caused by gravity load.*



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