PROKON Support Portal

Shell local axes

Joep - 2019-04-03 - 0 Comments - in A03:Frame analysis

Each shell in a model has a local axis. the shell local axes can be made visible by clicking the "Show Element Local Axis" button. This button is on the right-hand side toolbar. The local axis will then be visible on the shell.

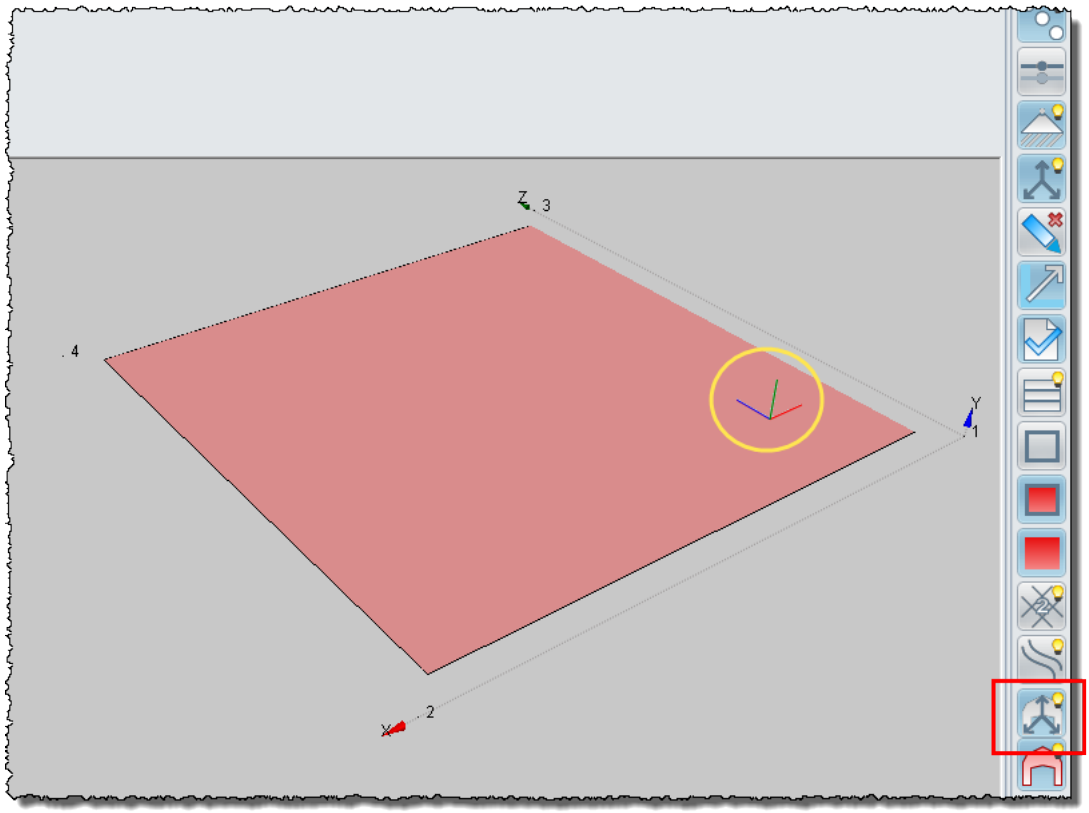


Figure 1: Click the "Show Element Local Axis" button to make the shell local axes visible.

There are 3 different default orientations for shells: (The colours of each individual local axis coincide with the colours of the global axes)

1. The first orientation is for a horizontal shell. When a shell is horizontal – that is, in the global XZ plane - the local x-axis is placed parallel to the global X-axis but points in an opposite direction. The local y-axis is then parallel to the global Z-axis. The local z-axis is perpendicular to the plane, following the right-hand-rule.
2. The second orientation is for a vertical shell. When a shell is vertical, the local y-axis

is placed parallel to the global Y-axis. The local x-axis is placed horizontally, parallel to the XY plane.

The local z-axis is perpendicular to the plane of the shell. Facing the shell, the z-axis will point to the viewer if the shell is defined anti-clockwise and away from the viewer if defined in a clockwise direction.

1. The third orientation is when the shell is neither horizontal or vertical. For this case, the x-axis is placed horizontally, or parallel to the XZ plane. The local y-axis is placed in the plane of the shell, in an upward direction. The local z-axis is perpendicular to the shell, following the right-hand rule.

The orientation of a shell local axis can be changed from its default orientation. The shell input table has a column named "*Align local Y to: Nodes(s)/X/Y/Z*" (Figure 2).

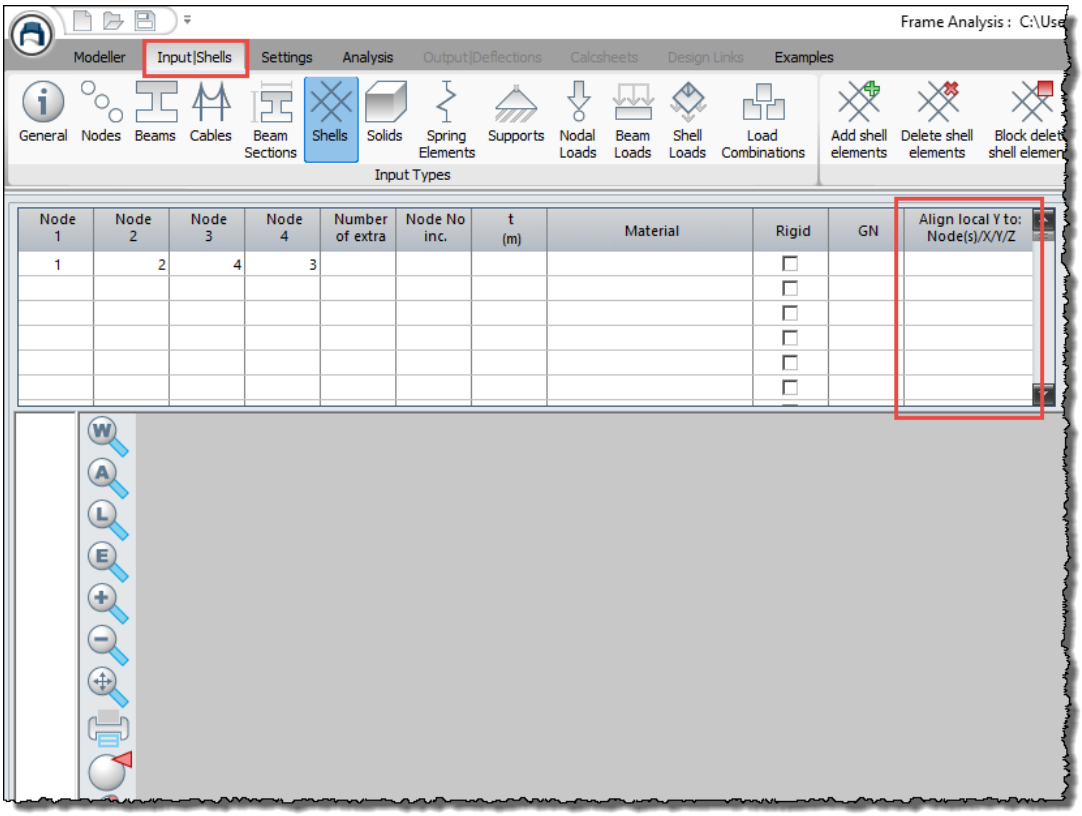


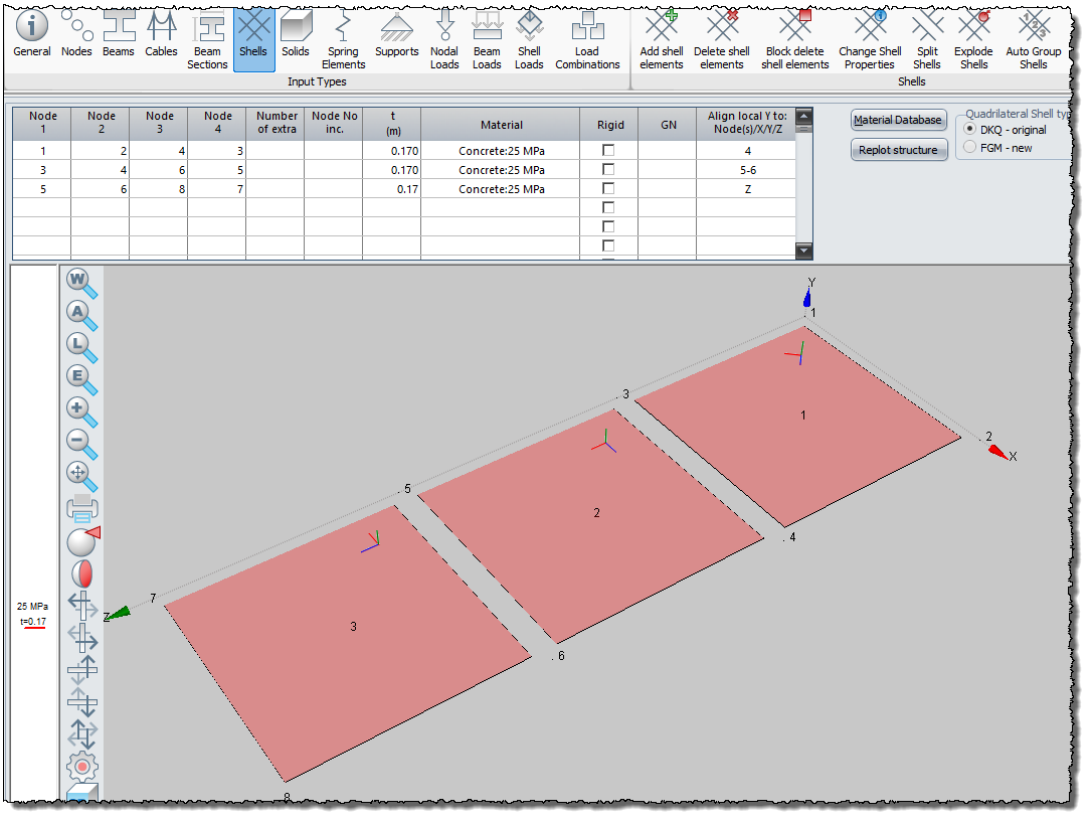
Figure 2: Shell input table.

The shell local axis orientation can be changed in three ways:

1. Type a node number into the above-mentioned column. The local y-axis will be rotated to point to the entered node number.
2. Type two node numbers into the column. The local y-axis will be rotated to be parallel with a line connecting the entered nodes.
3. Type a letter (X, Y or Z) into the column. The local y-axis will be rotated to be parallel

with the entered global axis (X, Y or Z).

In figure 3, each of the three shells is aligned with the methods stated above. With shell No.1, the local y-axis rotated to point at node 4. With shell No.2, the local y-axis is rotated to be parallel with a line connecting nodes 4-6. With shell No.3, the local y-axis is rotated to be parallel with the global Z-axis. (Note that the rotation of the local axes happens around the local z-axis, and the local x-axis remains in the plane of the shell, perpendicular to the local y-axis.)



Node 1	Node 2	Node 3	Node 4	Number of extra	Node No inc.	t (m)	Material	Rigid	GN	Align local Y to: Node(s)/X/Y/Z
1	2	4	3			0.170	Concrete:25 MPa	☐		4
3	4	6	5			0.170	Concrete:25 MPa	☐		5-6
5	6	8	7			0.17	Concrete:25 MPa	☐		Z

Figure 3: Local axis orientation changed.

The orientation of the shell local axes can have an influence on the analysis when, for example, a concrete analysis is done. The concrete cover to the rebar in a specific direction is matched to either the local x- and y-axes.