Sesam example: JackUpLegContactProblem

Using Presel and SestraGap to analyse contact problem between a simplified deck and a single jackup leg

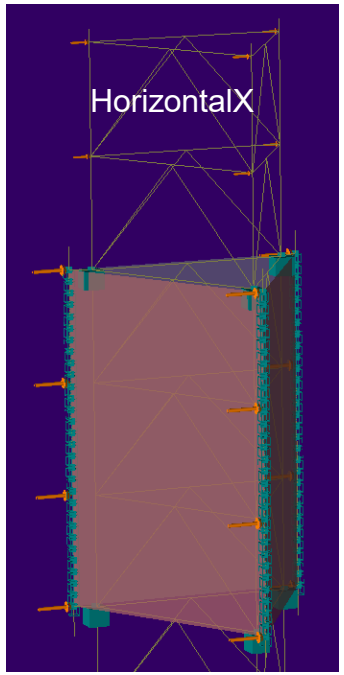
19 January 2022

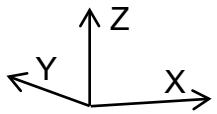
Contact analysis controlled by GeniE

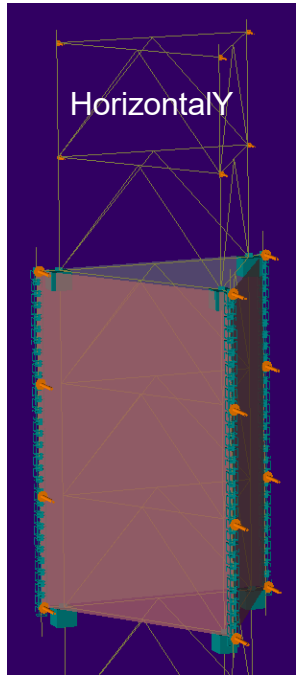
- Note that the present example is based on using the superelement assembly program Presel and the gap/contact analysis program SestraGap (that runs Sestra in the background).
  - This procedure is presently the method for contact analysis in Sesam offering the most general and advanced solution.
  - But as it requires some knowledge in Sesam programs additional to GeniE the user threshold is higher.
- GeniE version 8.3 offers simplified contact analysis which for many cases is adequate.
  - Being fully controlled by GeniE this method is much simpler than the procedure of the present example.
  - Go to a GeniE tutorial in advanced modelling and find an example of transportation analysis with contact problem to learn about contact analysis controlled by GeniE.

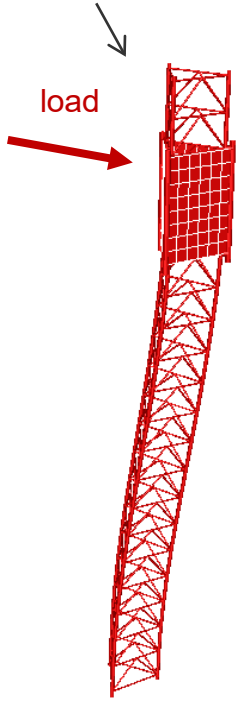
The model created in GeniE

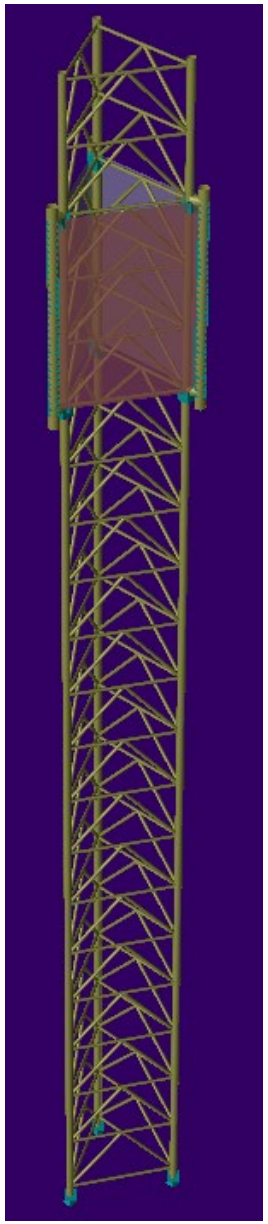
- Single jackup leg with triangular prism as shown to the right
- Triangular prism illudes the jackup deck:
  - Density of the material is high so as to capture deck mass
  - Edges of the prism are fixed rotations about X and Y so as to achieve S-shaped deformation forced by deck
- Bottom of leg (3 points) three translations fixed
- Loads:
  1. HorizontalX
  2. HorizontalY
  3. Gravity











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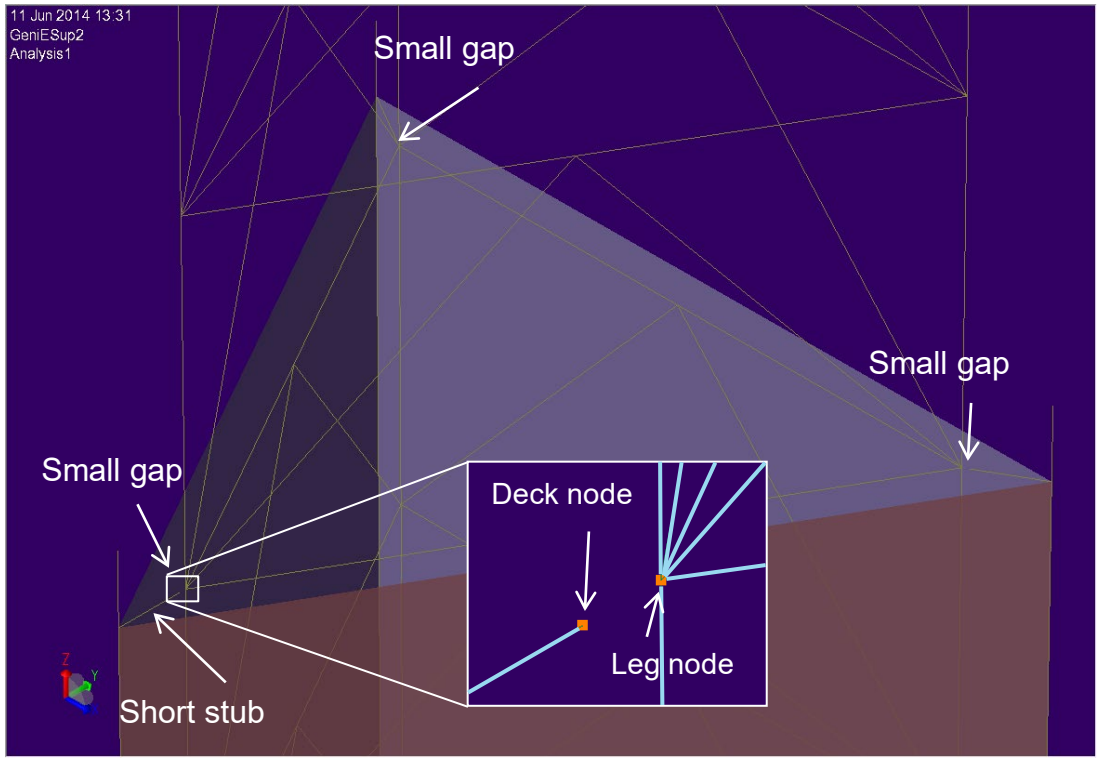
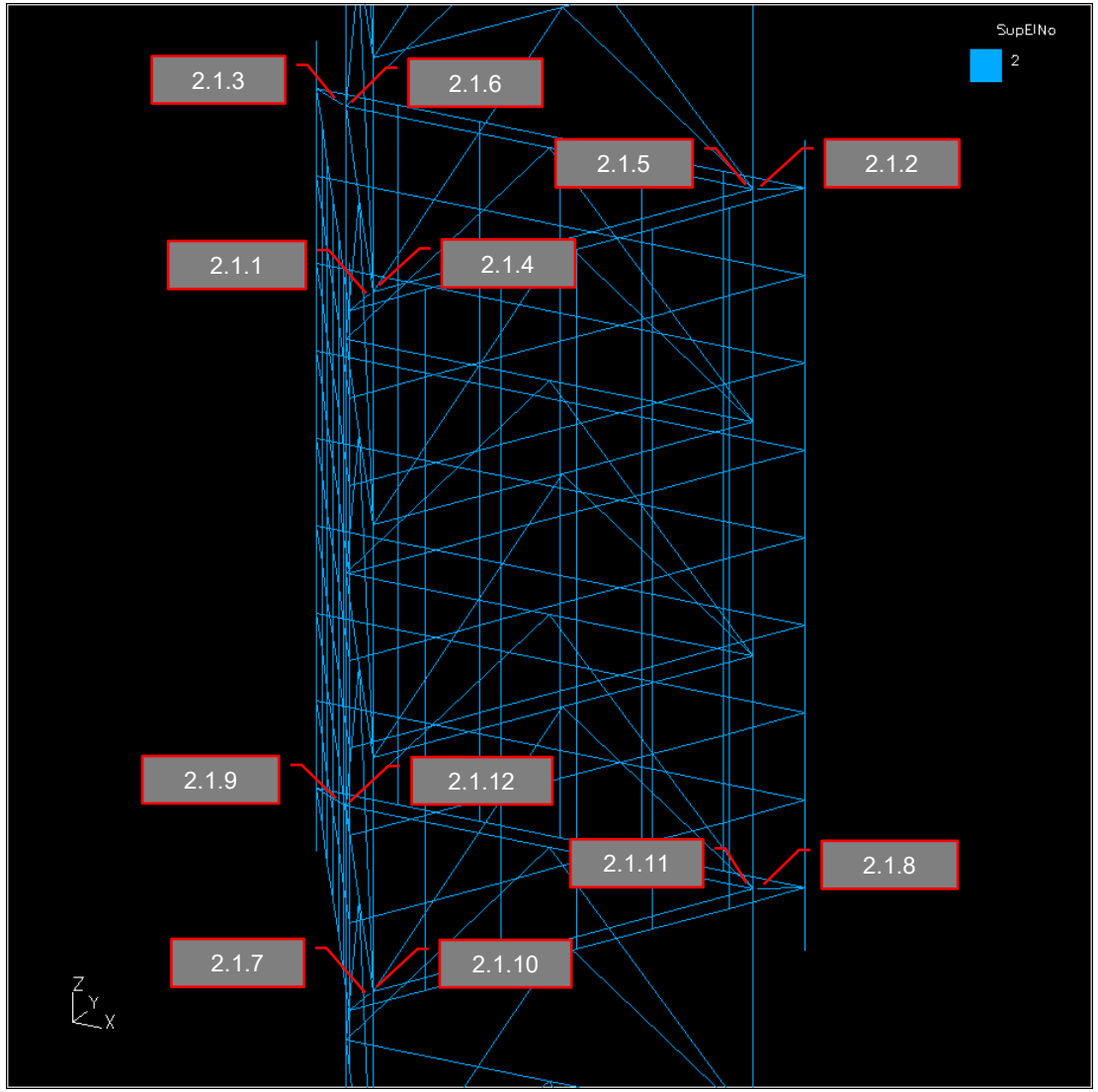
The analyses in Sestra

1. SingleSuperElLinearAnalysis
   - Single model with no contact problem, i.e. full connection leg-deck
2. SingleSuperElContactProblem – single model with contact definition leg-deck:
   - Small gap between leg and short stub being part of deck prism
   - Contact defined between leg node and deck node
   - Difference in X and Y displacement between the two nodes is restricted to 5 cm:
     - $X_{deck} - 5cm < X_{leg} < X_{deck} + 5cm$
     - $Y_{deck} - 5cm < Y_{leg} < Y_{deck} + 5cm$
   - Z displacements are set to be equal
3. TwoSuperElContactProblem
   - As 2 above but leg and deck split into two superelements

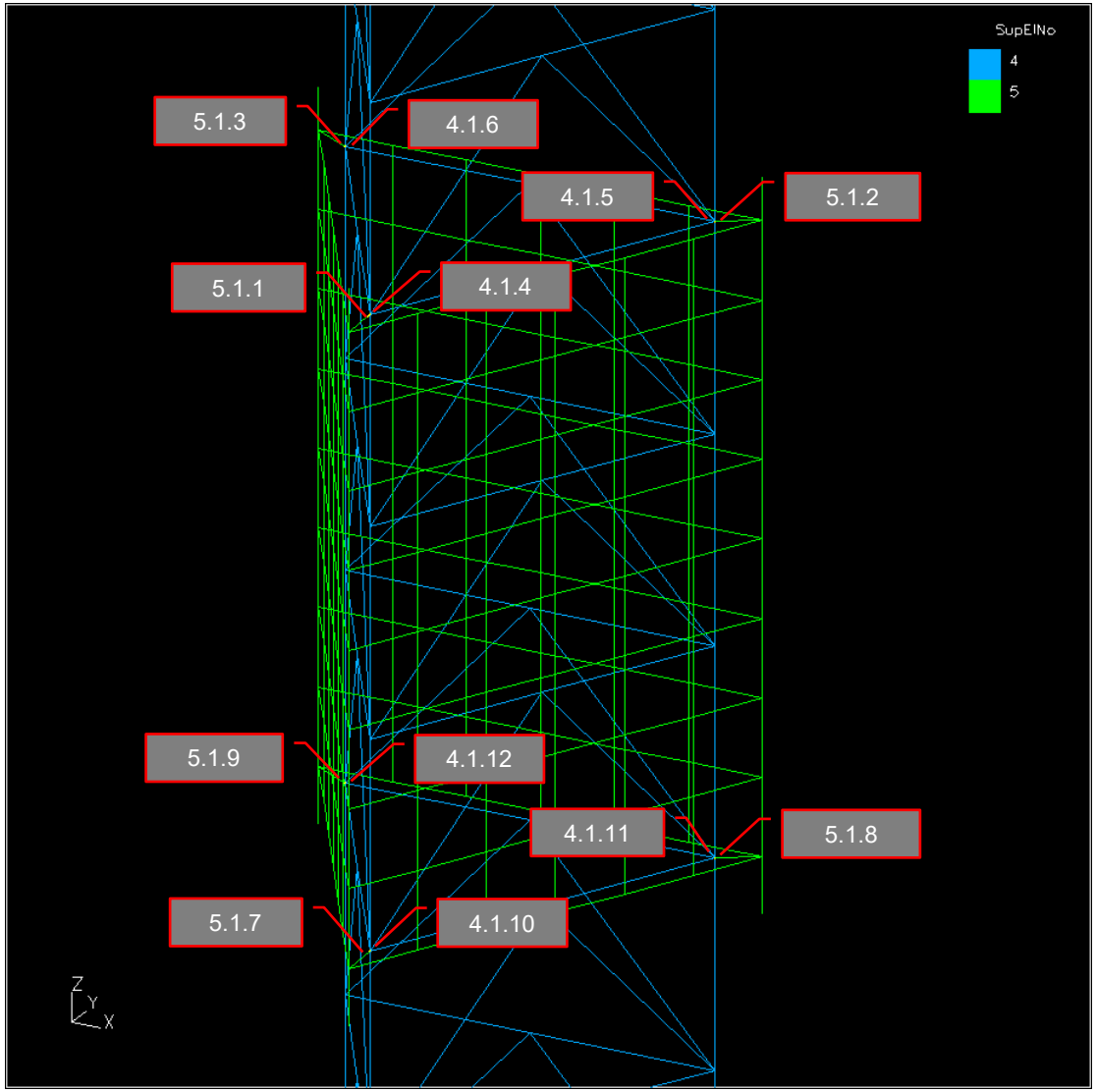


Presel: Node number triplets of SingleSuperElContactProblem

- Contact information is defined in Presel referring to nodes
- Nodes are identified in Presel by node number triplets
- Node number triplet:
  - Superelement number
  - Superelement index (= 1 unless superelement is repeated)
  - Node number
- Displayed in Presel as three numbers separated by dots as shown to the right

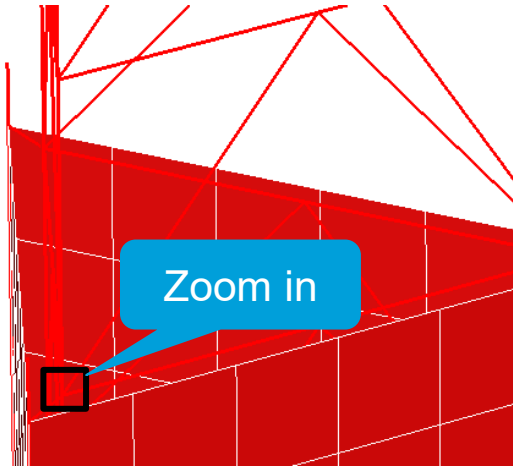


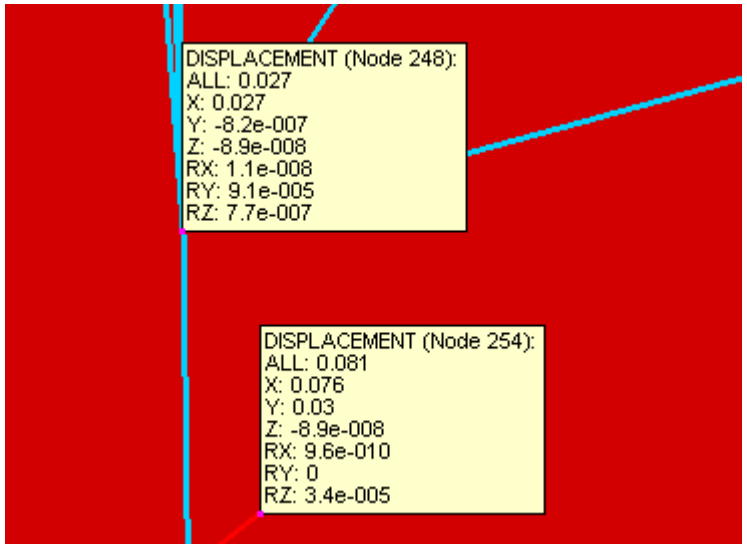
Presel: Node number triplets of TwoSuperElContactProblem



Verify displacements of contact nodes in Xtract

- Switch off expanded beams
- Zoom in on one of the sets of contact nodes
- Select DISPLACEMENTS > ALL
- Show deformed model
- Set model deformation absolute scaling to 1
- Ctrl+click the contact nodes to label them
- Verify that difference in X and Y displacements for the two nodes is less than 0.05
- To the right is shown result case 1 for case SingleSuperElContactProblem
- Verify for all contact nodes and all result cases for both cases





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