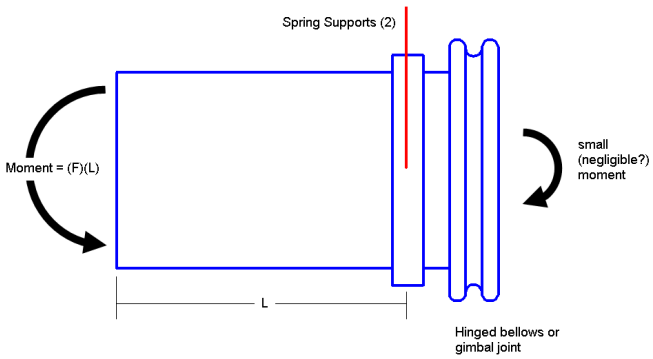
Problem Description

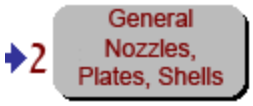
I need to create a model of a large pipe support utilising 3 spring hangers, with a total load of approx 35 tonnes. Generating the ring stiffened support is not a problem as such. My questionsconcern the rod / pin attachments to the support.

Would you please suggest a valid modelling technique to represent a 1.5" diameter shackle pin in a padeye, which is an integral part of my ring support. I am only interested in the welded components, not the spring hanger components.

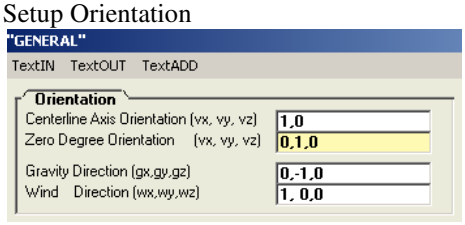


1 Method 1 Simple support

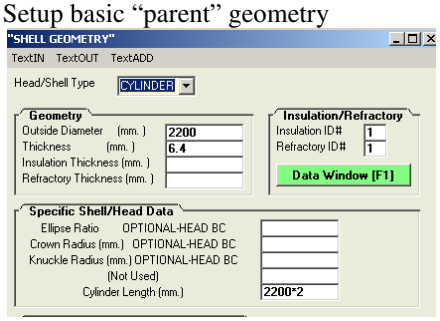
1. Select Template



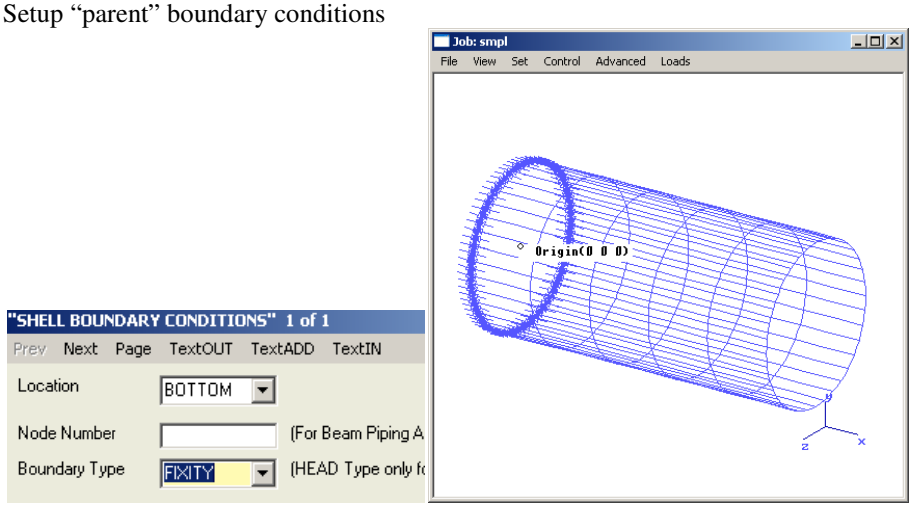
2. Setup Orientation



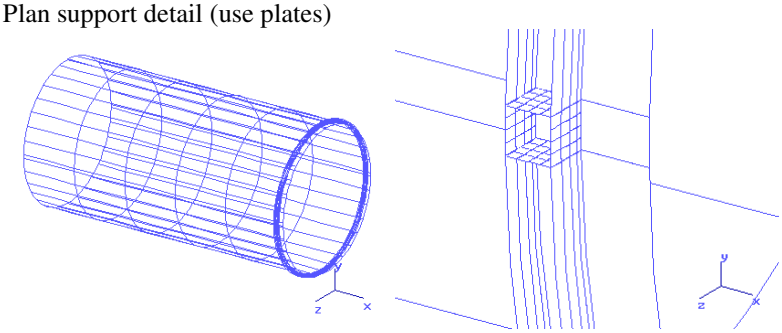
3. Setup basic "parent" geometry



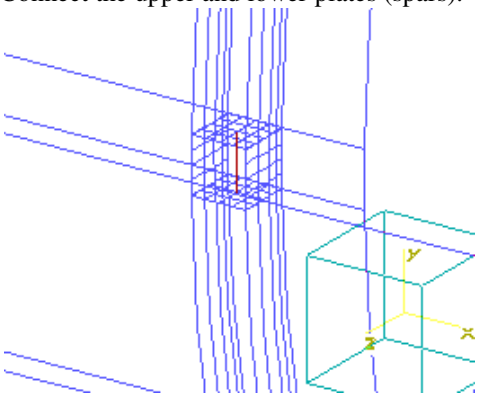
4. Setup “parent” boundary conditions



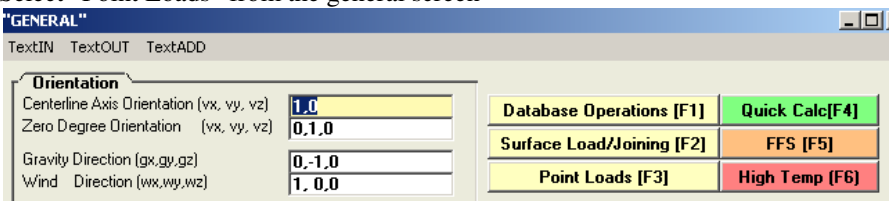
5. Plan support detail (use plates)



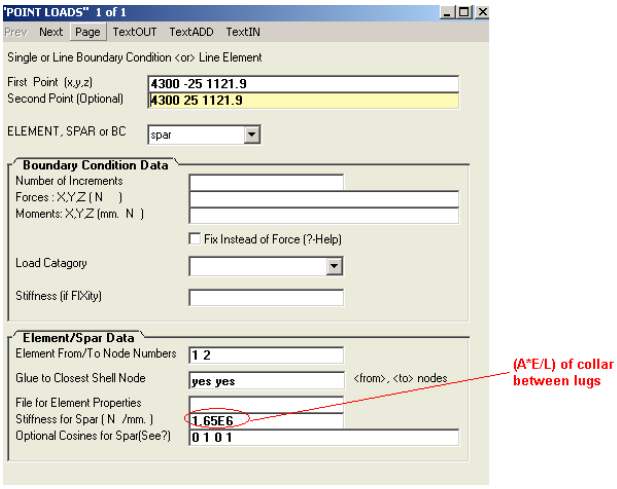
6. Connect the upper and lower plates (spars):



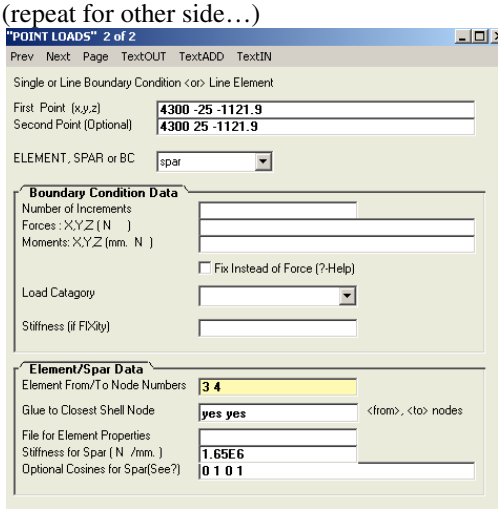
   a. Select “Point Loads” from the general screen



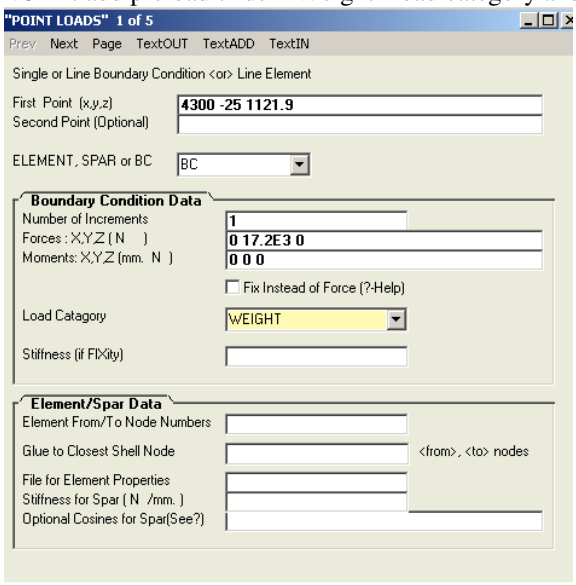
b.



(repeat for other side…)



7. Add spring loads to bottom lug(s)
   NOTE: add preload under "Weight" load category and the hot loads under "Operating" load category.

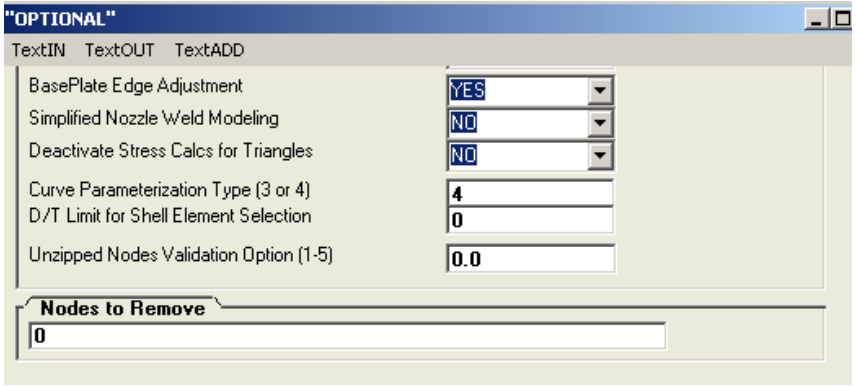


Notes:

The above method creates a stress singularity at the ends of the "spar" elements (step 6 above). The user can choose to ignore these high stresses, or can use the following template options to "turn off" the stresses in the singularity:

Option 1: turn off the stress calculation for the lugs connected by the spars (qty = 2 in this example). This is by far the simplest option.

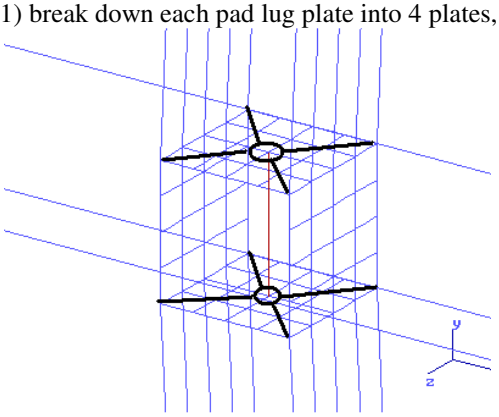
Option 2: enter the actual node numbers at the ends of the spars in the Optional Screen.



2 More sophisticated support

The drawback to method 1 is that the stress in the lug at the point of contact is too simplified to provide a detailed stress distribution in the "pad lugs".

Modify the models of the 2 "pad lugs" as follows:
1) break down each pad lug plate into 4 plates, creating a hole in the center.



2) connect each of the 8 curved edges using the "surface load/joining" screen under "general" or by creating 4 new curved plates. Use a thickness equal to the thickness of the compression collar.

3) apply loads to the curved hole edges of the bottom pad lug using the "surface load/joining" screen. As before, input loads for both the installed and operating conditions.