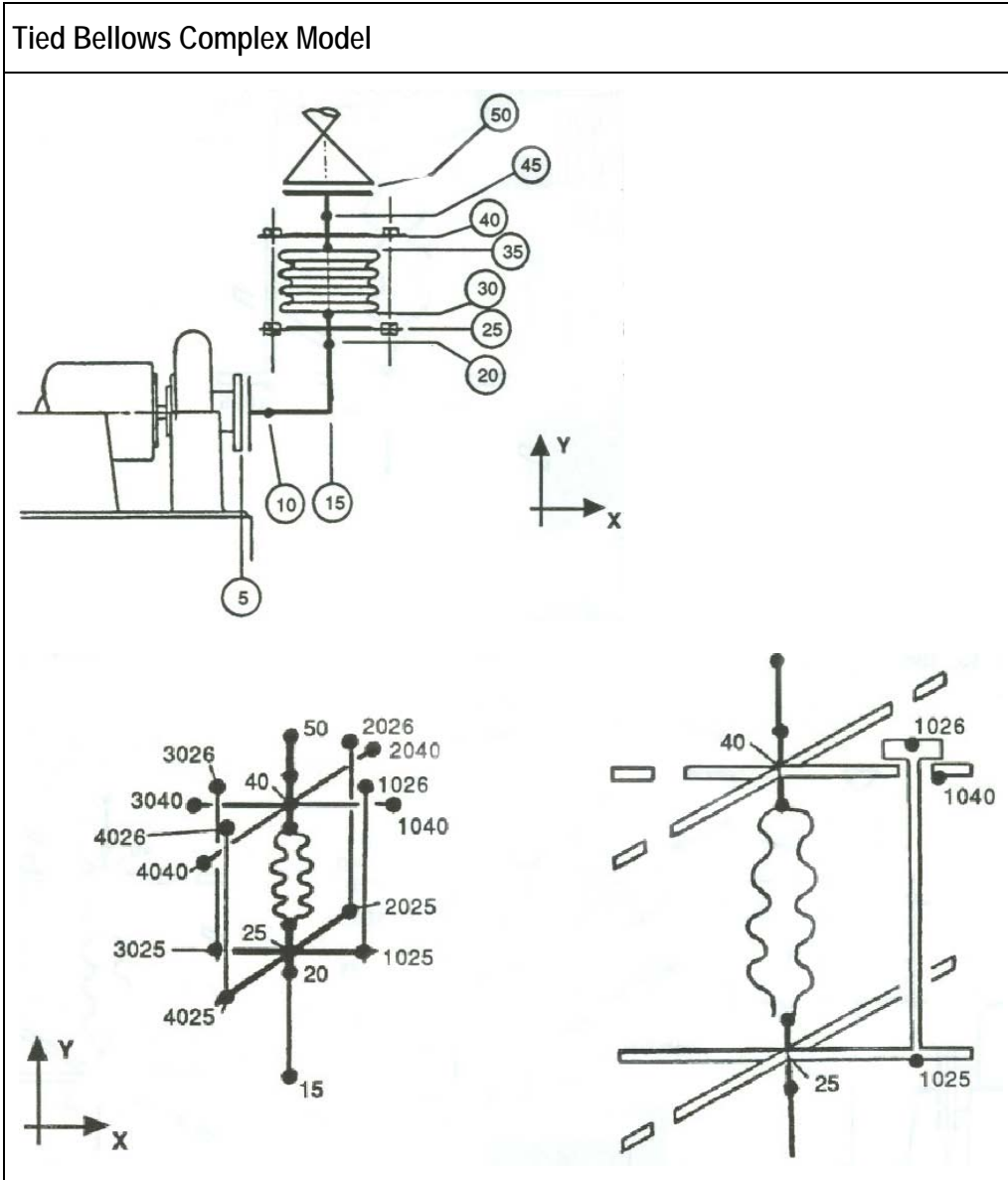


### Tied Bellows Expansion Joint - Complex Model

In the example shown below, the flexible joint is between the nodes 30 and 35. The flanged ends of the joint are modeled as the rigid elements 20 to 30 and 35 to 45. Additional rigid elements, perpendicular to the pipe axis, extend from each flange. The tie bars are 1 inch in diameter. The following nodal layout and input is used to build a comprehensive model of the tied bellows.



Tied Bellows Complex Model-Continued

From: 30  Name  
 To: 35

DX:   
 DY: 1 ft. 9.750 in   
 DZ:

Bend  
 Rigid  
 Expansion Joint

Restraints  
 Hangers  
 Nozzles

From: 25  Name  
 To: 1025

DX: 1 ft. 5.500 in   
 DY:   
 DZ:

Bend  
 Rigid  
 Expansion Joint

Restraints  
 Hangers  
 Nozzles

From: 40  Name  
 To: 1040

DX: 1 ft. 5.500 in   
 DY:   
 DZ:

Bend  
 Rigid  
 Expansion Joint

Restraints  
 Hangers  
 Nozzles

From: 1025  Name  
 To: 1026

DX:   
 DY: 2 ft. 4.750 in   
 DZ:

Bend  
 Rigid  
 Expansion Joint

Restraints  
 Hangers  
 Nozzles

Forces/Moments  
 Uniform Loads  
 Wind / Wave

Offsets

Diameter: 1.0000  
 Wt/Sch: 0.5000

Expansion Joints

Axial Stif: 7500.000  
 Trans Stif: 8500.000  
 Bending Stif:   
 Torsion Stif: 100000.00  
 Effective ID: 28.625

Weightless rigid elements extend from the flange centerline to the outside edge of the flanges where the tie rods are attached. Only 2 of eight element inputs shown.

Restraints

Node: 1026 CNode: 1040  
 Type: +Y Gap:   
 Stif:  Mu:

Node: 1026 CNode: 1040  
 Type: RX Gap:   
 Stif:  Mu:

Node: 1026 CNode: 1040  
 Type: RZ Gap:   
 Stif:  Mu:

Tie Rod will usually be at ambient temperature, but it is important to specify this correctly.