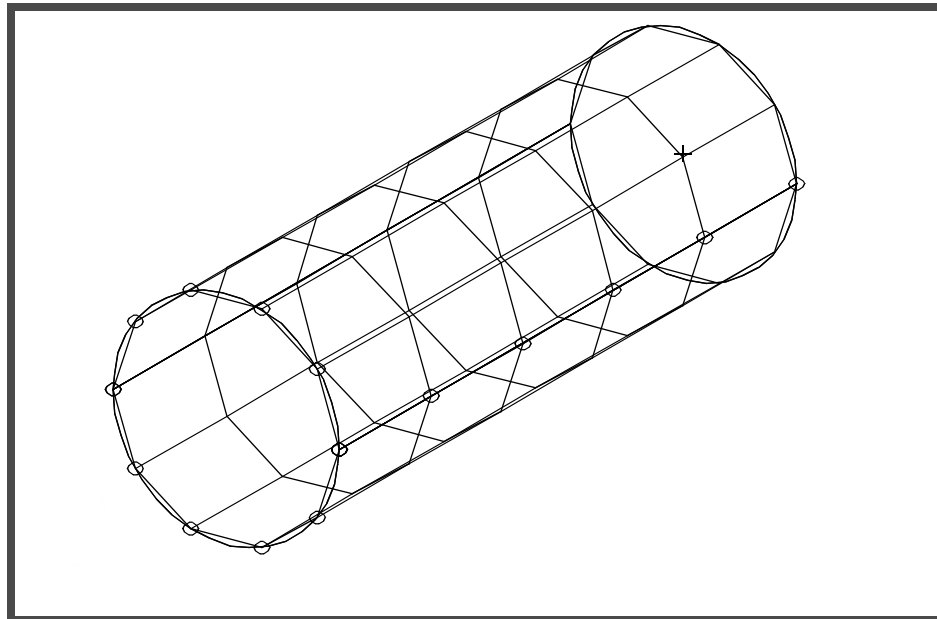

WORKSHOP 33

Modal Analysis of Interpolation Constraint Elements and CONM2



Objectives:

- Utilize the analysis model created in a previous exercise.
- Run an MSC.Nastran modal analysis with rigid elements.
- View analysis results.
- Modify the existing model. Replace rigid elements with interpolation constraint elements.
- Run an MSC.Nastran modal analysis again.
- View analysis results.

Model Description:

The goal of this example is to examine the effect of rigid and interpolation constraint elements. The rigid element, RBE2, will maintain a circular cross section at the rigid end of the tube, while the interpolation constraint elements, RBE3, are used to distribute either loading or mass.

Figure 33.1

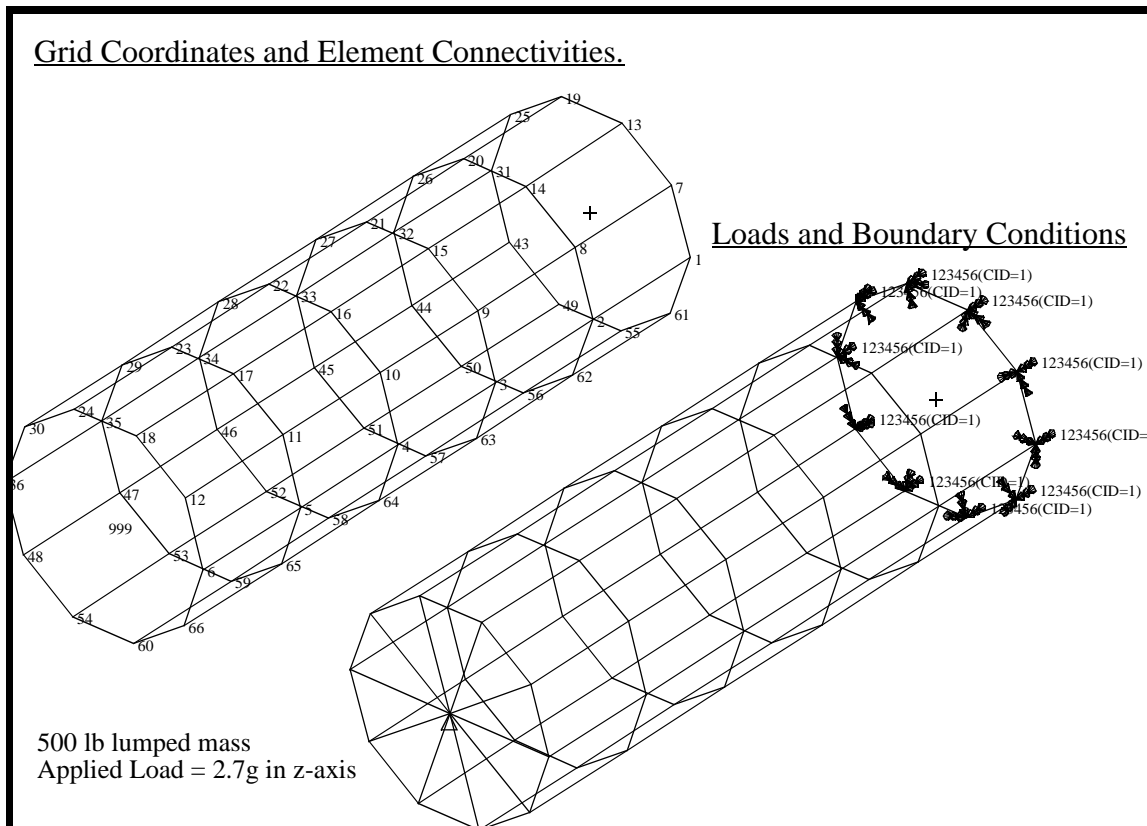


Table 33.1 - Material Properties

Radius:	15 in
Thickness:	0.125 in
Length:	90 in
Youngs Modulus:	10E+06 lbs/in²
Poisson's Ratio:	0.3
Density:	0.101 lbs/in³

Exercise Procedure:

1. Start up **MSC.Nastran for Windows 4.0** and open the model from WORKSHOP 36.

Change the directory to **C:\Temp**

Open Model File:

rigid

OK

2. Without making any modifications to the model, run a modal analysis with rigid elements and recover the first 5 modes.

File/Export/Analysis Model...

Analysis Format/Type:

2..Normal Modes/Eigenvalue

OK

File Name:

modal_rbe2

Write

Additional Info:

Run Analysis

Advanced...

Method ID:

1

Lanczos

Under *Eigenvalues and Eigenvectors*, input the following:

Number Desired:

5

Mass:

Coupled

OK

Problem ID:

Modal Analysis of RBE2

OK

Under *Output Requests*, unselect all except:

Displacement

OK

Under *PARAM*, enter the following:

WTMASS

0.00259

OK

When asked if you wish to save the model, respond **Yes**.

Yes

When the MSC.Nastran manager is through running, MSC.Nastran will be restored on your screen, and the *Message Review* form will appear. To read the messages, you could select **Show Details**. Since the analysis ran successfully, we will not bother with the details this time.

Continue

- Review the results.

List/Output/Query...

Under the *Output Set*, use the drop down menu to view all relevant eigenvalues.

Output Set:

2.. Mode 1 28.14921 Hz

3.. Mode 2 28.14921 Hz

4.. Mode 3 154.1341 Hz

5.. Mode 4 176.1793 Hz

6.. Mode 5 176.1793 Hz

Cancel

- Turn all labels off.

View/Options... <F6>

Quick Options...

Labels Off

Under Draw, deselect **Constraint**.

Constraint

Done

OK

5. Now, review the deformed shape.

View/Select... <F5>

Deformed Style:

Deform

Contour Style:

None - Model Only

Deformed and Contour Data...

Under *Data Selection*, select **Displacement** from the drop down menu:

Category:

1..Displacement

Under *Output Set*, select from the drop down menu as follows:

Output Set:

2.. Mode 1 28.14921 Hz

Under *Output Vectors*, select from the drop down menu as follows:

Deformation:

1..Total Translation

OK

OK

Notice that the rigid end section still remained circular.

HINT: You may want to use the icons on the tool bar to rotate the model for better viewing angle.

Now repeat step 5 to view the mode shapes for modes 2-5.

6. Finally, reset the graphics back to undeformed.

View/Select... <F5>

Deformed Style:

None - Model Only

OK

View/Rotate... <F8>

Isometric

OK

7. Now, replace the rigid element with an interpolation element. First, delete **Element 1000**, the RBE2 element.

Delete/Model/Element...

ID:

1000

OK

NOTE: Be sure you select the RBE not the COMM2.

Answer **Yes**, when asked “OK to Delete 1 Selected Element(s)?”.

Yes

8. Refresh graphics.

View/Redraw <Ctrl+D>

9. Now define the interpolation constraint element.

Model/Element...

Type...

Other Elements:

Rigid

OK

Under *Independent*, input the following:

Node:

999

DOF:

TX

TY

TZ

Under *Interpolation*, input the following:

<input checked="" type="checkbox"/> <i>Factor:</i>	<input type="text" value="1"/>
<i>DOF:</i>	<input checked="" type="checkbox"/> TX
	<input checked="" type="checkbox"/> TY
	<input checked="" type="checkbox"/> TZ

Under *Nodes to Average*, input the following:

<input type="text" value="Nodes..."/>	
<input type="text" value="Method^"/>	
	<input type="text" value="On Curve"/>
< Select end curve >	
<input type="text" value="OK"/>	
<input type="text" value="OK"/>	
<input type="text" value="Cancel"/>	

10. Now, resubmit the analysis.

File/Export/Analysis Model...

<i>Analysis Format/Type:</i>	<input type="text" value="2..Normal Modes/Eigenvalue"/>
<input type="text" value="OK"/>	

Change the directory to **C:\Temp**.

<i>File Name:</i>	<input type="text" value="modal_rbe3"/>
<input type="text" value="Write"/>	
<i>Additional Info:</i>	<input checked="" type="checkbox"/> Run Analysis
<input type="text" value="Advanced..."/>	
<i>Method ID:</i>	<input type="text" value="1"/>
	<input checked="" type="radio"/> Lanczos

Under *Eigenvalues and Eigenvectors*, input the following:

<i>Number Desired:</i>	<input type="text" value="5"/>
------------------------	--------------------------------

Mass:

Coupled

Problem ID:

Under *Output Requests*, unselect all except:

Displacement

Under *PARAM*, enter the following:

WTMASS

When asked if you wish to save the model, respond **Yes**.

When the MSC.Nastran manager is through running, MSC.Nastran will be restored on your screen, and the *Message Review* form will appear. To read the messages, you could select **Show Details**. Since the analysis ran smoothly, we will not bother with the details this time.

- To review the results.

List/Output/Query...

Under the *Output Set*, use the drop down menu to view the second set of eigenvalues.

Output Set:

-
-
-

10..Mode 4 49.3491 Hz

11..Mode 5 58.62375 Hz

Cancel

12. Now, review the deformed shape.

View/Select... <F5>

Deformed Style:

Deform

Deformed and Contour Data...

Under *Data Selection*, select **Displacement** from the drop down menu:

Category:

1..Displacement

Under *Output Set*, select from the drop down menu as follows:

Output Set:

7..Mode 1 28.0637 Hz

OK

OK

Repeat the previous steps to view mode shapes for modes 2~5.

Notice that the end section does not remain circular anymore. This is particularly true for modes 3, 4 and 5.

This concludes this exercise.

File/Save

File/Exit