

Problem D

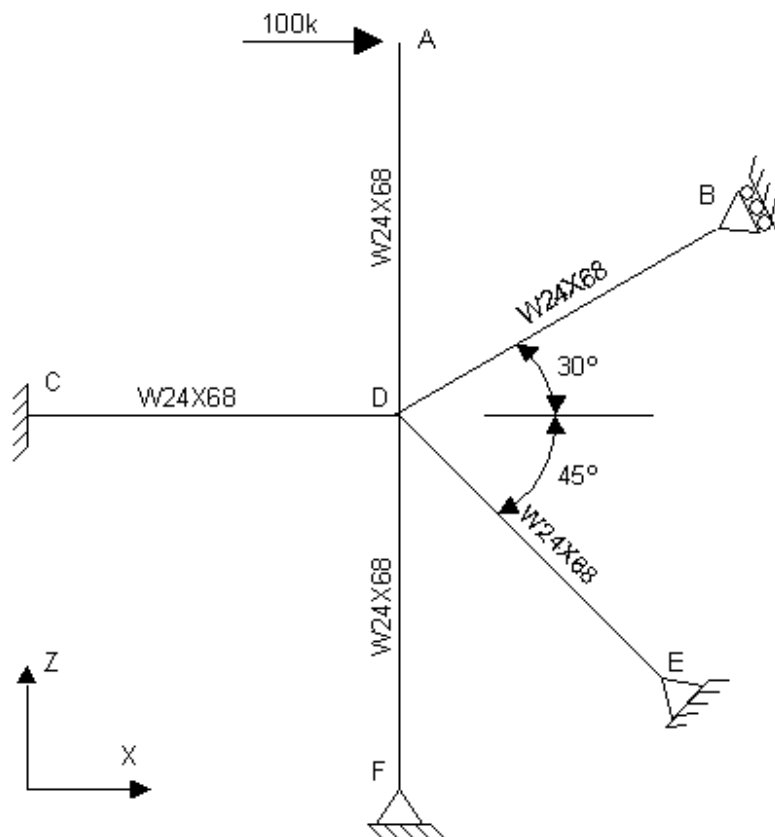
Inclined Supports

Steel

$E=29000$ ksi, Poissons Ratio = 0.3
All members are 10 feet long.

To Do

Determine support reactions.
Determine X-direction displacements
at joints A and B.

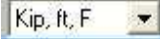


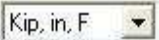
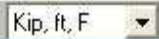





CSI Solution Demonstrates Use of These Features


- Radial Replication
- Rotated Support


Problem D Solution

1. Click the **File** menu > **New Model** command to display the **New Model** form.

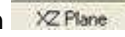

2. Click the drop-down box to set the units to .
3. Click on the **Beam** button  to display the **Beam** form. In that form:
 - Type **2** in the *Number of Spans* edit box.
 - Type **10** in the *Span Length* edit box.
 - Uncheck the *Restraints* box.
 - Click the **OK** button.
4. Click the “X” in the top right-hand corner of the 3-D View window to close it.
5. Click the **Set Display Options** button  (or the **View menu > Set Display Options** command) to display the **Display Options for Active Window** form. In that form:
 - Check the *Labels* box in the *Frames/Cables/Tendons* area.
 - Click the **OK** button.
6. Click the drop-down box in the status bar to change the units to .
7. Click the **Define menu > Materials** command to display the **Define Materials** form.
8. Click on STEEL in the *Materials* area to highlight it (select it), and then click the **Modify/Show Material** button to display the **Material Property Data** form. In that form:
 - Verify **29000** is entered in the *Modulus of Elasticity* edit box.
 - Verify **.3** is entered in the *Poisson's Ratio* edit box.
 - Accept the other default values.
 - Click the **OK** buttons on the **Material Property Data** and **Define Materials** forms to exit all forms.
9. Click the drop-down box in the status bar to change the units to .
10. Select line objects 1 and 2.
11. Click the **Assign menu > Frame/Cable/Tendon > Frame Sections** command to display the **Frame Properties** form.
12. Highlight **W24X68** in the *Frame Sections* area and click the **OK** button.
13. Click the **Show Undeformed Shape** button  to remove the displayed section assignments.
14. Select line object 2 by clicking on it.
15. Click the **Edit menu > Replicate** command to display the **Replicate** form. In that form:
 - Click the *Radial Tab*.

- Choose the *Parallel to Y* option in the *Rotate About Line* area.
 - Verify that **0** is entered in both the *X* and *Z* edit boxes in the *Intersection of Line with XZ Plane* area. Note it will rotate about the *Y*-axis at the origin.
 - Type **1** in the *Number* edit box in the *Increment Data* area.
 - Type **45** in the *Angle* edit box in the *Increment Data* area.
 - Click the **OK** button.
16. Select line object 2 by clicking on it.
17. Click the **Edit menu > Replicate** command to display the **Replicate** form. In that form:
- Click the *Radial* tab.
 - Type **90** in the *Angle* edit box in the *Increment Data* area.
 - Click the **OK** button.
18. Select line object 2 by clicking on it.
19. Click the **Edit menu > Replicate** command to display the **Replicate** form. In that form:
- Click the *Radial* tab.
 - Type **270** in the *Angle* edit box in the *Increment Data* area.
 - Click the **OK** button.
20. Select line object 2 by clicking on it.
21. Click the **Edit menu > Replicate** command to display the **Replicate** form. In that form:
- Click the *Radial* tab.
 - Type **330** in the *Angle* edit box in the *Increment Data* area.
 - Click the **OK** button.
22. Select line object 2 by clicking on it.
23. Press the Delete key on the keyboard to delete this member.
24. Click the **Restore Full View** button  to re-size the drawing.
25. Click the **Set Display Options** button  (or the **View menu > Set Display Options** command) to display the **Display Options for Active Window** form. In that form:
- Check the *Labels* box in the *Joints* area.
 - Uncheck the *Labels* box in the *Frames/Cables/Tendons* area.
 - Click the **OK** button.
26. Select joint 4.

27. Click the **Assign menu > Joint > Local Axes** command to display the **Joint Local Axis** form. In that form:
 - Type **-45** in the *Rotation about Y'* edit box.
 - Press the **OK** button.
28. Select joint 7.
29. Click the **Assign menu > Joint > Local Axes** command to display the **Joint Local Axis** form. In that form:
 - Type **-120** in the *Rotation about Y'* edit box.
 - Press the **OK** button.
30. Select joint 1.
31. Click the **Assign menu > Joint > Restraints** command to display the **Joint Restraints** form. In that form:
 - Check all six boxes in the *Restraints in Local Directions* area.
 - Click the **OK** button.
32. Select joints 4 and 5.
33. Click the **Assign menu > Joint > Restraints** command to display the **Joint Restraints** form. In that form:
 - In the *Restraints in Local Directions* area uncheck the three Rotation boxes and leave the three Translation boxes checked.
 - Click the **OK** button.
34. Select joint 7.
35. Click the **Assign menu > Joint > Restraints** command to display the **Joint Restraints** form. In that form:
 - In the *Restraints in Local Directions* area, uncheck the *Translation 1* box and leave the *Translation 2* and *Translation 3* boxes checked.
 - Click the **OK** button.
36. Select joint 6.
37. Click the **Assign menu > Joint Loads > Forces** command to display the **Joint Forces** form. In that form:
 - Type **100** in the *Force Global X* edit box in the *Loads* area.
 - Click the **OK** button.
38. Click the **Show Undeformed Shape** button  to remove the displayed joint force assignments.

39. Click the **Set Display Options** button  (or the **View menu > Set Display Options** command) to display the **Display Options for Active Window** form. In that form:
- Uncheck the *Labels* box in the *Joints* area.
 - Click the **OK** button.
40. Click the **Analyze menu > Set Analysis Options** command to display the **Analysis Options** form.



- In that form click the **Plane Frame XZ Plane** button  to set the available degrees of freedom.
 - Click the **OK** button.
41. Click the **Run Analysis** button  to display the **Set Analysis Cases to Run** form. In that form:
- Highlight (select) *MODAL* in the *Case Name* list and click the **Run/Do Not Run Case** button.
 - Verify that the *DEAD* analysis case is set to *Run* in the *Action* list.
 - Click the **Run Now** button to run the analysis.
42. When the analysis is complete check the messages in the **SAP Analysis Monitor** window (there should be no warnings or errors) and then click the **OK** button to close the window.
43. Right click on the joints labeled A and B in the problem statement to see their displacements.
44. Click the **Display menu > Show Forces/Stresses > Joints** command to display the **Joint Reaction Forces** form. In that form:
- Verify that the *Reactions* option is selected in the *Type* area.
 - Click the **OK** button.
45. The reactions are displayed on the screen. If the text is too small to read, you can zoom in, or you can change the minimum font size as described in the note below.

Note: To change the minimum font size, click the **Options menu > Preferences > Dimensions/Tolerances** command. In the *Minimum Graphic Font Size* edit box, input a new size, for example 5 or 6 points. Click the **OK** button.