

Problem G

Frame With Support Displacement

Steel

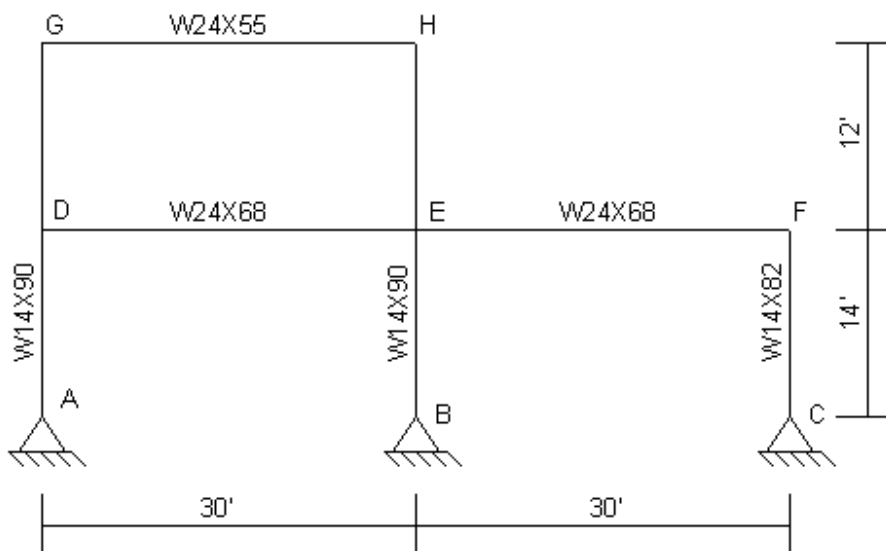
$E = 29000$ ksi, Poissons Ratio = 0.3

Pinned base

All beam-column connections are rigid

To Do

Determine support reactions due to a 1" downward displacement of joint B.

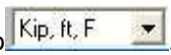


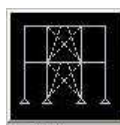
CSI Solution Demonstrates Use of These Features

- New Model from Template
- Support Displacement

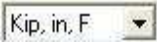
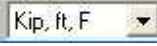


Problem G Solution




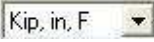
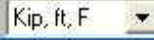


1. Click the **File menu > New Model** command to display the **New Model** form.

2. Click the drop-down box in the status bar to change the units to .

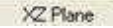



3. Click on the **2D Frames** button  to display the **2D Frames** form. In that form:

- Select *Portal* in the *2D Frame Type* drop-down list.
 - Type **14** in the *Story Height* edit box.
 - Type **30** in the *Bay Width* edit 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 drop-down box in the status bar to change the units to .
6. Click the **Define menu > Materials** command to display the **Define Materials** form. Highlight the STEEL material and click the **Modify/Show Material** button to display the **Material Property Data** form. In that form:
- Verify that the Modulus of Elasticity is 29000 and Poisson’s ratio is 0.3.
 - Click the **OK** buttons on the **Material Property Data** and **Define Materials** forms to close the forms.
7. Click the drop-down box in the status bar to change the units to .
8. 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.
9. Select frame elements 6 and 10. Press the delete key on the keyboard to delete these elements.
10. Click the **Define menu > Coordinate Systems/Grids** command to display the **Coordinate/Grid Systems** form. In that form:
- Highlight (select) *GLOBAL* in the *Systems* list box.
 - Click the **Modify/Show System** button to display the **Define Grid** form. In that form:
 - In the *Display Grids as* area of the form, ensure that the *Ordinates* option is selected.
 - For *Grid ID z3*, click in the *Ordinate* cell (it should read 28) and type **26** to change the ordinate location from 28 to 26.
 - Check the *Glue To Grid Lines* check box.
 - Click the **OK** buttons on the **Define Grid** and **Coordinate/Grid Systems** forms to close the forms.
11. Select line object 8.
12. Click the **Assign menu > Frame/Cable/Tendon > Frame Sections** command to display the **Frame Properties** form. In that form:
- Click on *W24X55* in the *Properties* area to highlight it.
 - Click the **OK** button.
13. Click the **Show Undeformed Shape** button  to remove the displayed frame section assignments and redisplay the line object labels.

14. Select line objects 7 and 9.
15. Click the **Assign menu > Frame/Cable/Tendon > Frame Sections** command to display the **Frame Properties** form. In that form:
 - Click on *W24X68* in the *Properties* area to highlight it.
 - Click the **OK** button.
16. Click the **Show Undeformed Shape** button  to remove the displayed frame section assignments and redisplay the line object labels.
17. Select line objects 1 through 5.
18. Click the **Assign menu > Frame/Cable/Tendon > Frame Sections** command to display the **Frame Properties** form. In that form:
 - Click on *W14X90* in the *Properties* area to highlight it.
 - Click the **OK** button.
19. Click the **Show Undeformed Shape** button  to remove the displayed line object assignments.
20. 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.
21. Click the drop-down box in the status bar to change the units to .
22. Select joint 4 (labeled B in the problem statement).
23. Click the **Assign menu > Joint Loads > Displacements** command to display the **Ground Displacements** form. In that form:
 - Type **-1** in the *Translation Global Z* edit box.
 - Click the **OK** button.
24. Click the drop-down box in the status bar to change the units to .
25. Click the **Show Undeformed Shape** button  to remove the displayed joint displacement assignments.
26. 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.
27. 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.
28. 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.
29. 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.
30. 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.
31. The reactions are displayed on the screen.

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