2D - Truss Analysis

A truss is special beam element that can resist axial deformation only. For this lecture we are going to create the truss shown in figure (1).

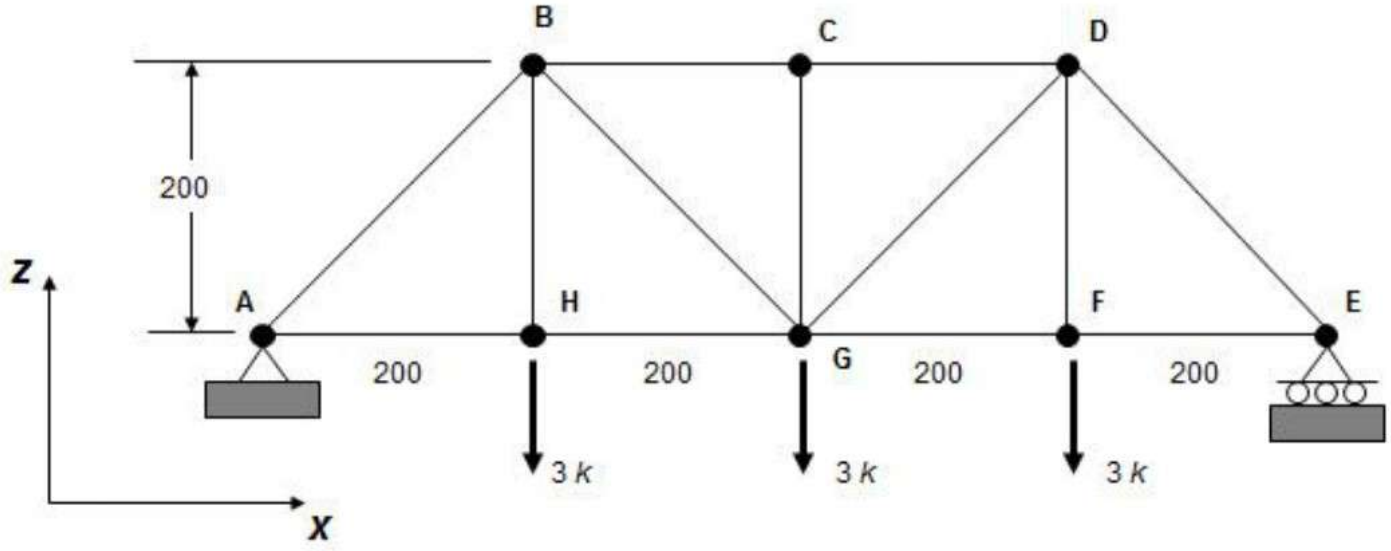


Figure (1)

Note: All lengths in centimeter units, and the forces in kN.

⇨ Start by making the sketch On the front plane, as shown in figure (2)

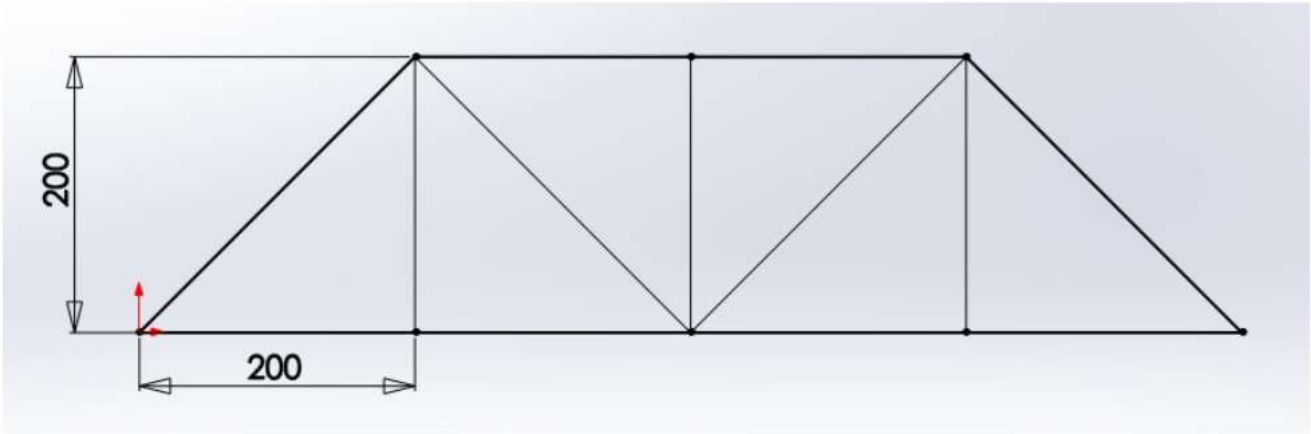


Figure (2)

⇨ Exit the sketch

⇨ Make a structure from Weldments as show in figure (3)

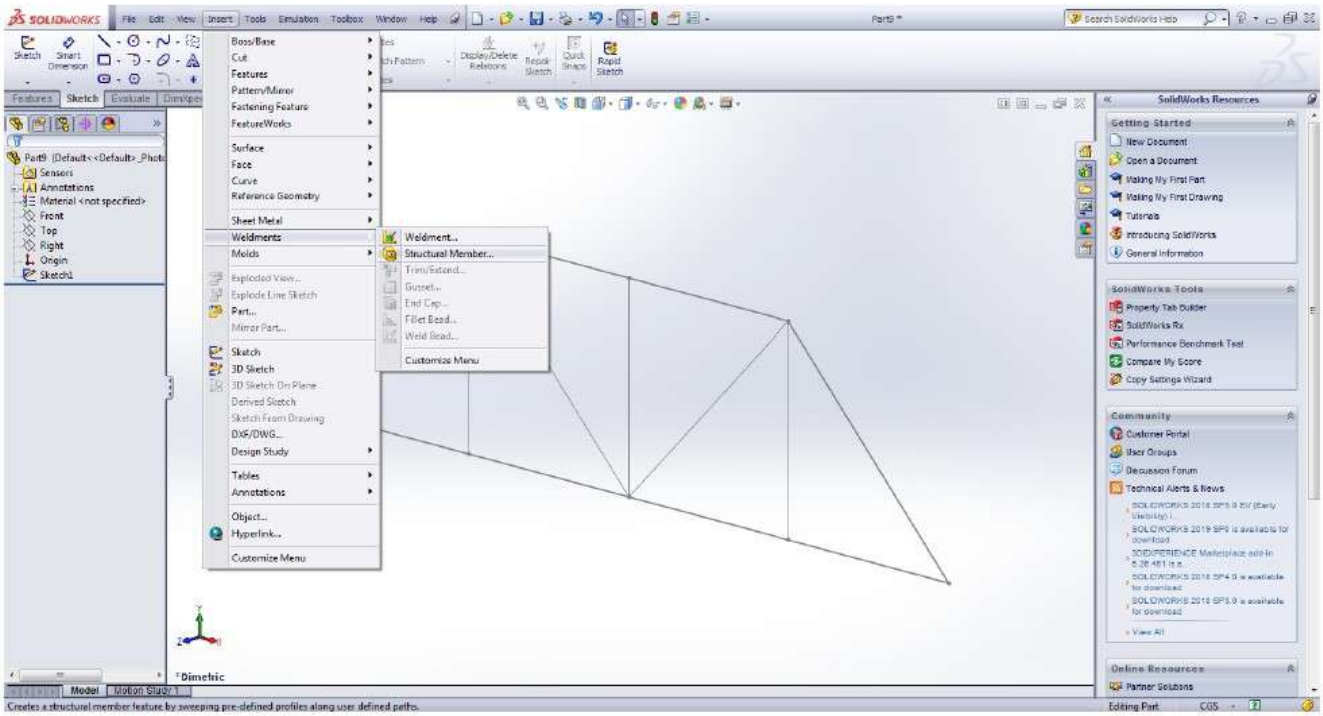


Figure (3)

- ⇨ Set the type as Pipe
- ⇨ Set the size to be 33.7 × 4.0, as shown in figure (4)

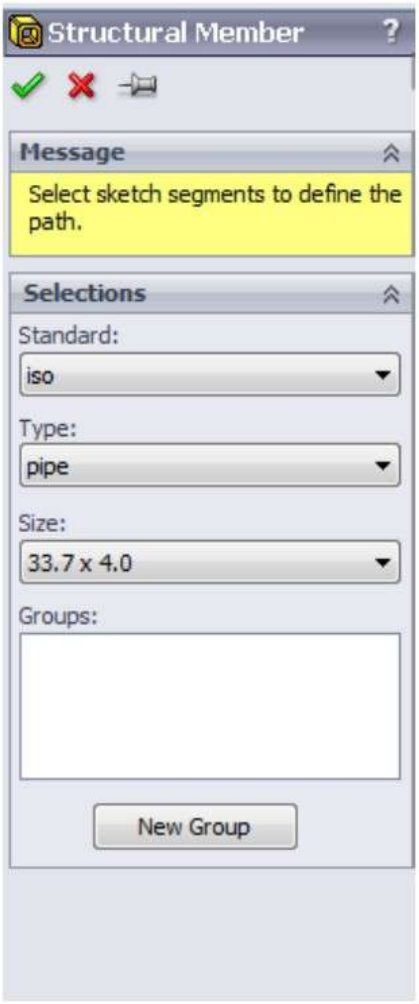


Figure (4)

⇨ Select the external segments of the sketch as shown in figure (5)

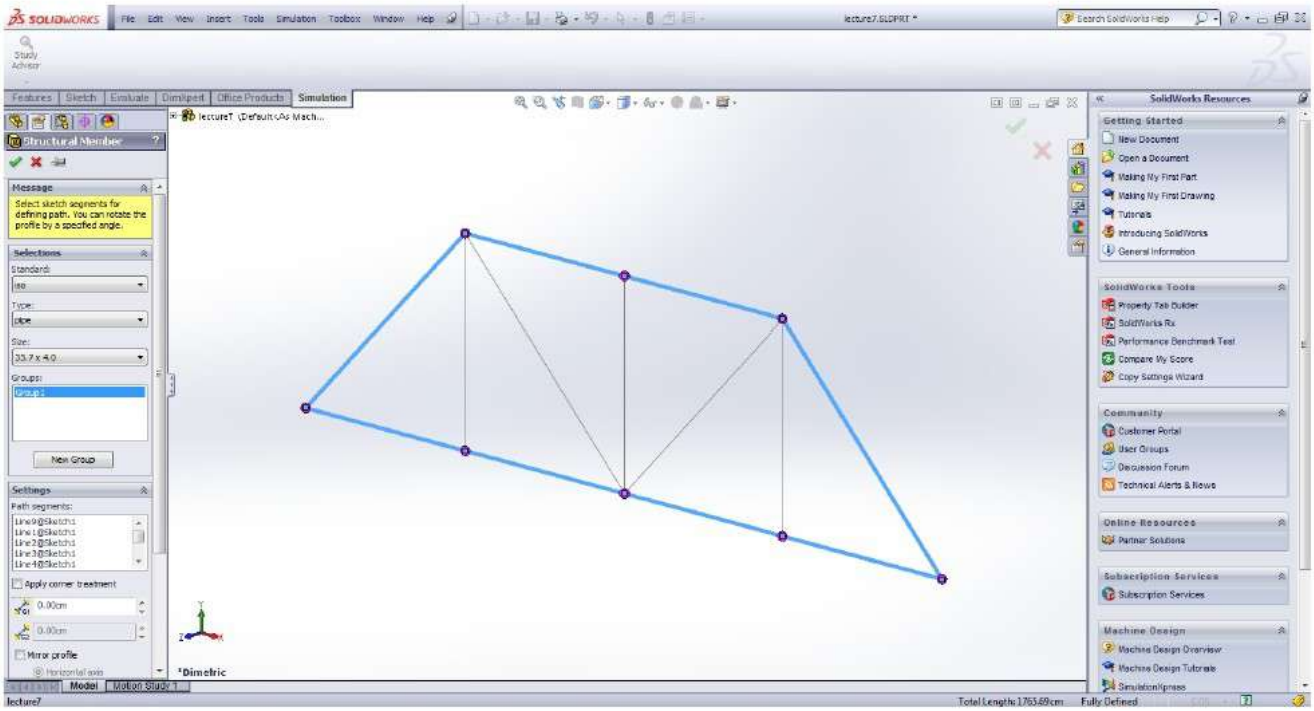


Figure (5)

⇨ Select new group, in the same window

⇨ In Group 2 select the vertical segments, as shown in figure (6)

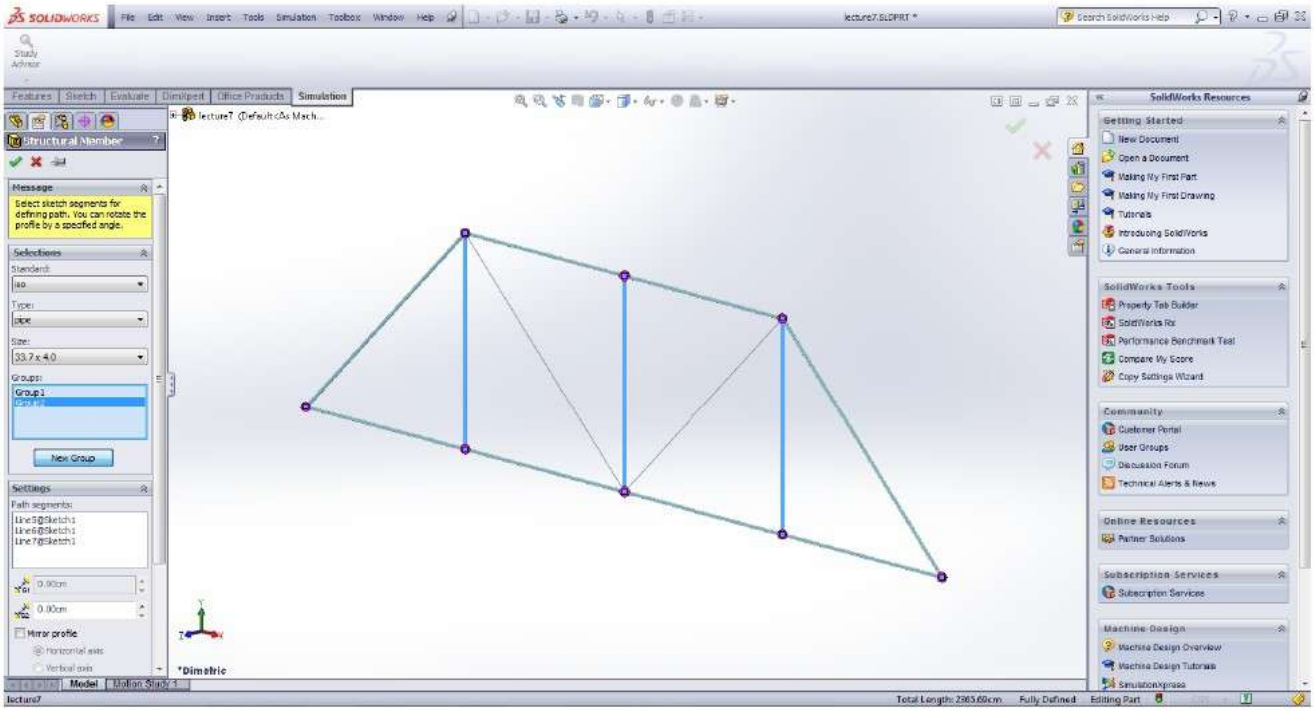


Figure (6)

⇨ Select New group, in the same window

⇨ In Group 3 select the two segments the make the letter V in the medial, as shown in figure (7)

⇨ Click OK

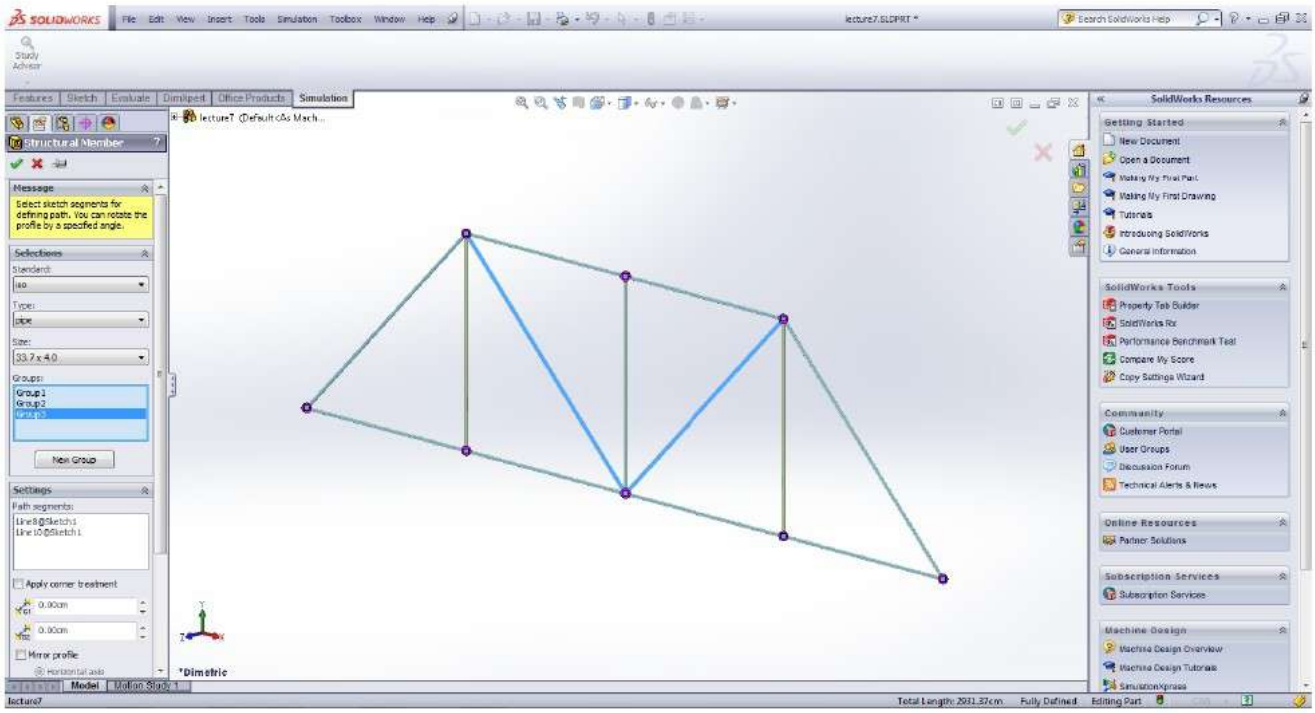


Figure (7)

- ⇨ Select New Static Study
- ⇨ Set the materials to Alloy Steel
- ⇨ Select all the segments
- ⇨ Right click and select edit definition, as shown in figure (8)

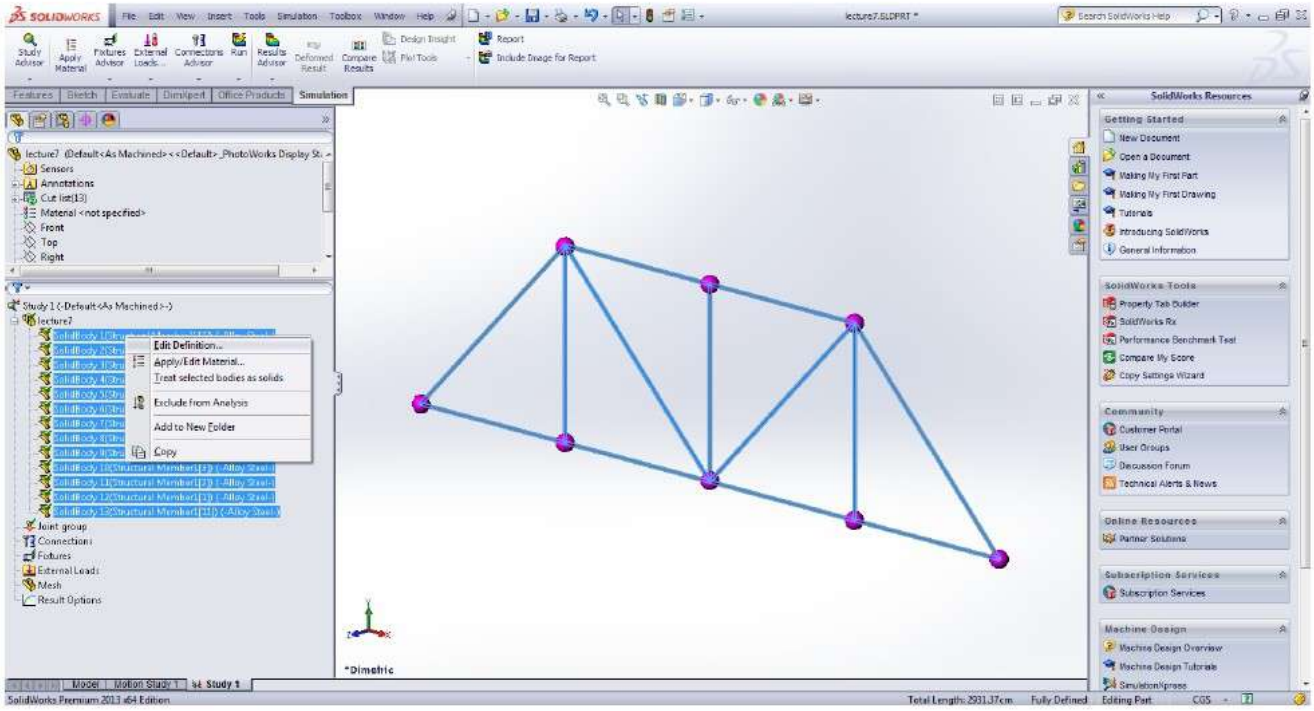


Figure (8)

⇨ Change the type to Truss and click OK, as shown in figure (9)

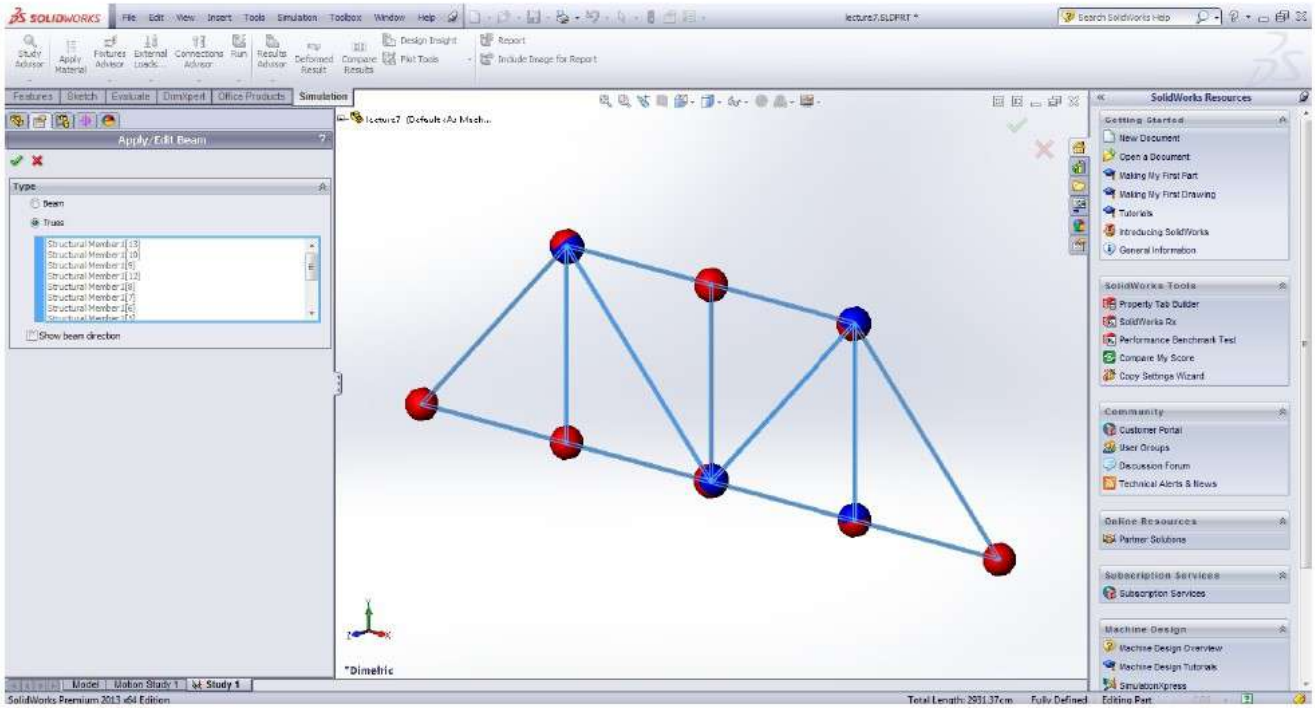


Figure (9)

⇨ Right click on fixtures and select fixed geometry
⇨ Select the bottom left joint
⇨ Select Immovable (No translation), as shown in figure (10)

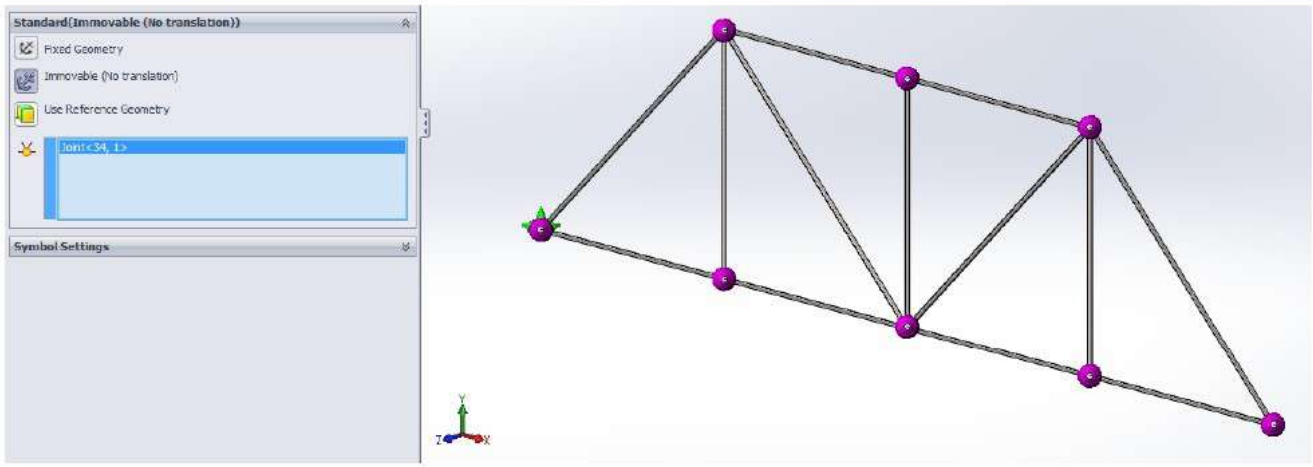


Figure (10)

- ⇨ Right click on fixtures and select fixed geometry
- ⇨ Select the bottom right joint
- ⇨ Select Use Reference Geometry
- ⇨ Use the front plane as reference
- ⇨ Make the translation only parallel to the x-axis, as shown in figure (11)
- ⇨ Click OK

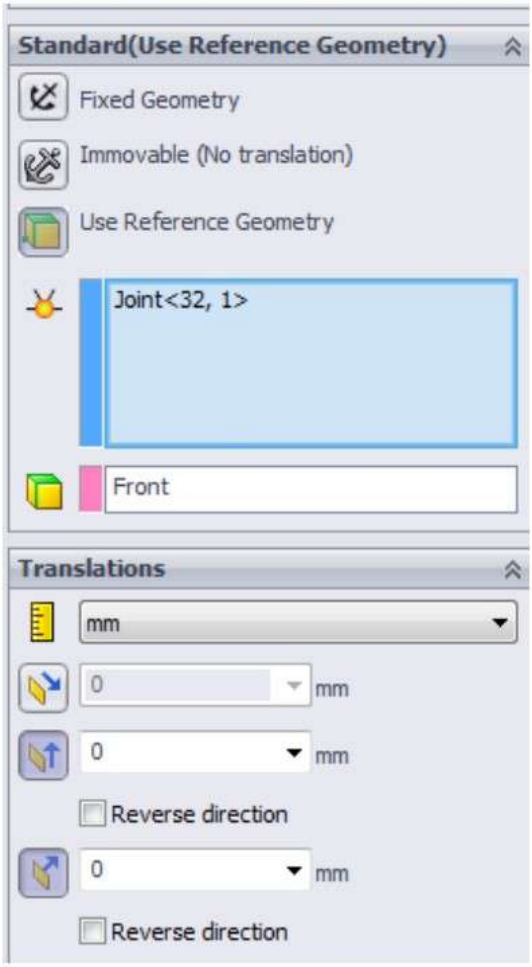


Figure (11)

- ⇨ Right click on fixtures and select fixed geometry
- ⇨ Select the joint in the middle
- ⇨ Select Use Reference Geometry
- ⇨ Use the front plane as reference
- ⇨ Stop the translation in the third dimension (z-axis), as shown in figure (12)
- ⇨ Click OK

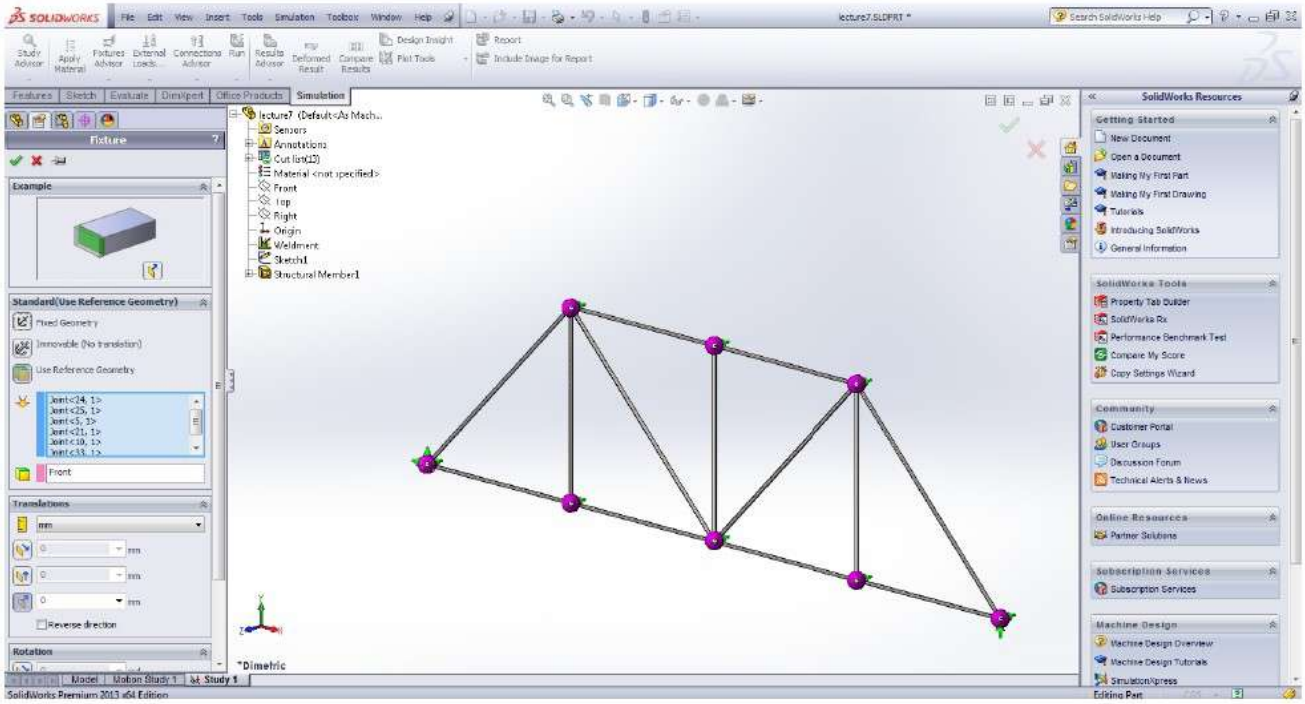


Figure (12)

- ⇨ Right click on loads and select Force
- ⇨ Select joint
- ⇨ Select the three middle joint
- ⇨ Set the front plane as reference
- ⇨ Set the vertical force into 3000 N, as shown in figure (13) and make sure of the force direction as shown in figure (1) by clicking on Reverse direction

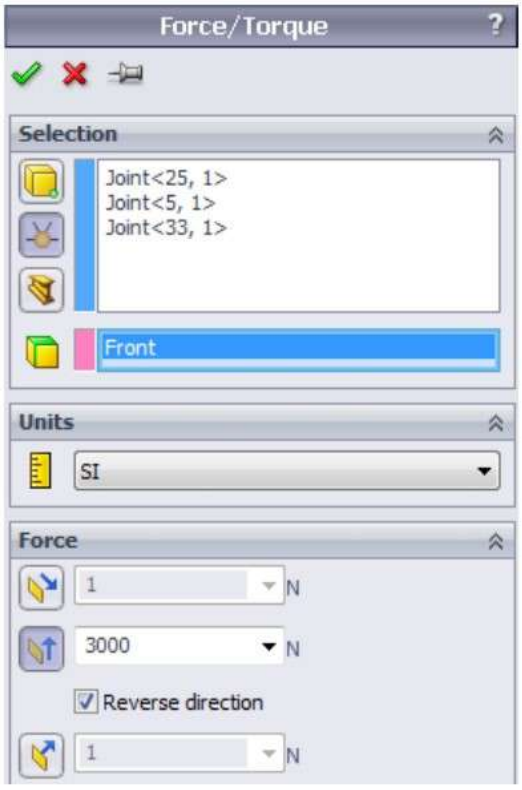


Figure (13)

- ⇨ Right click on Mesh and select Mesh and Run
- ⇨ The results should be as shown in figure (14)

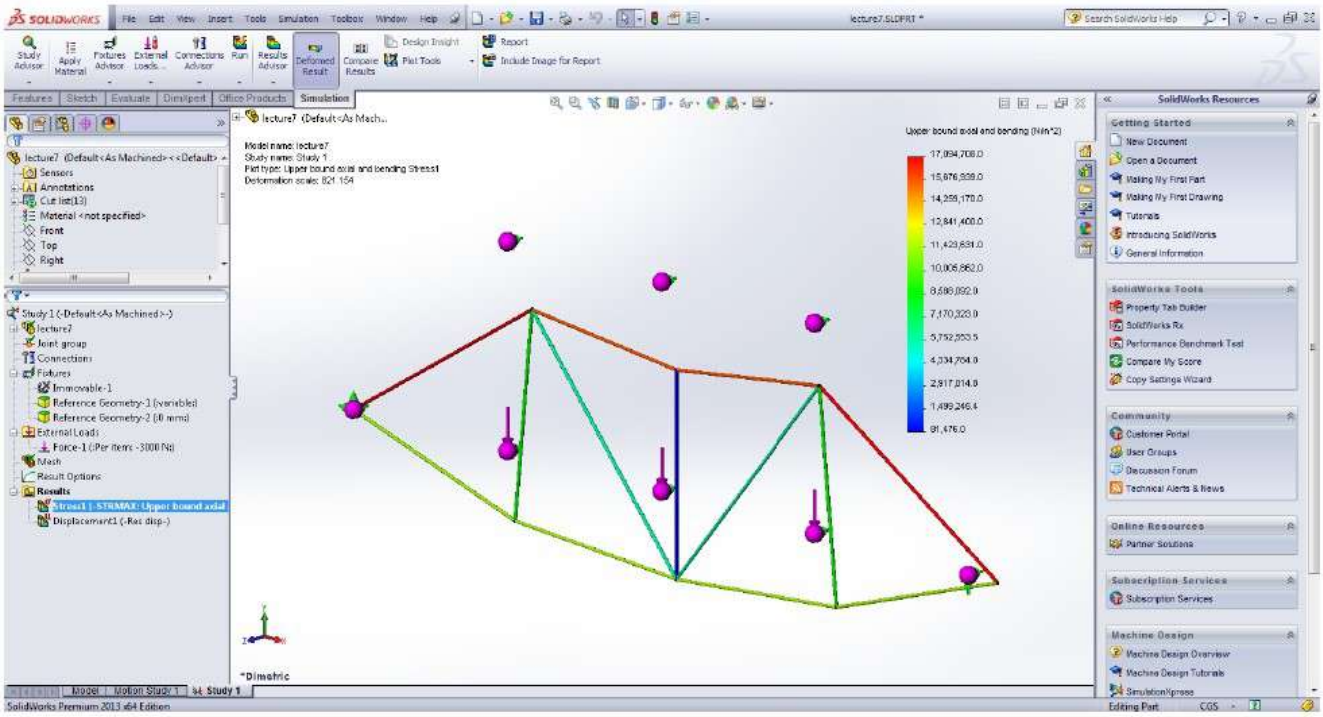
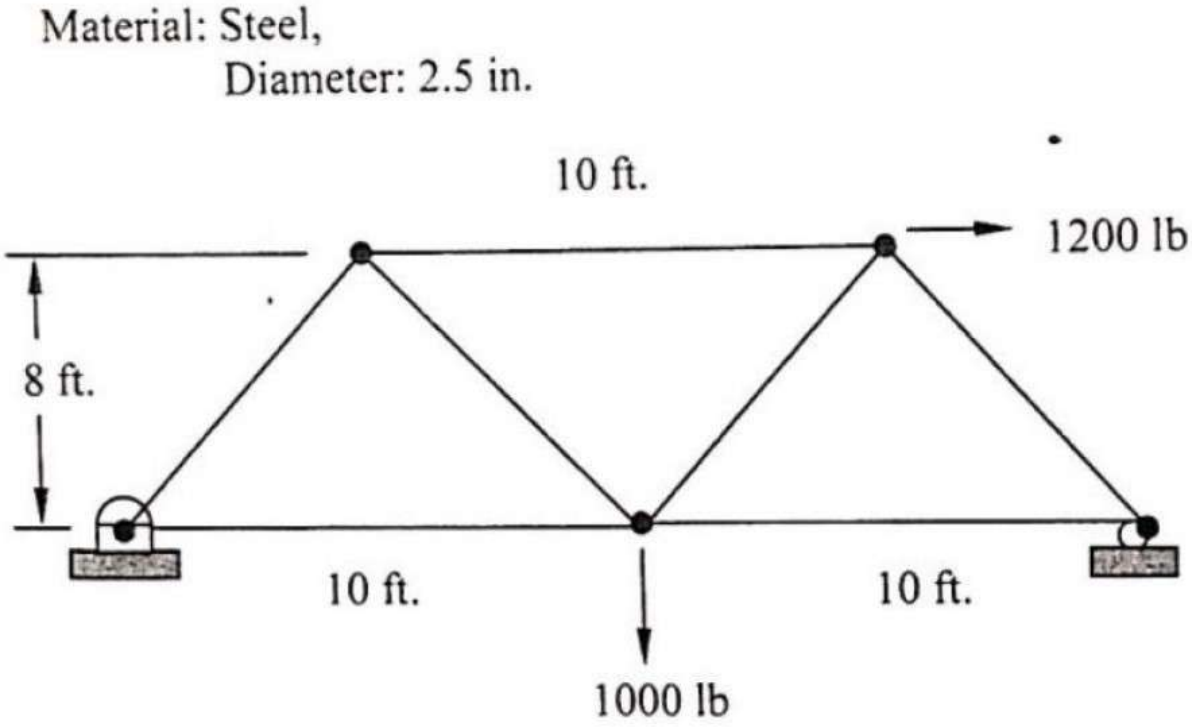

Model name: lecture7
Study name: Study 1
Plot type: Upper bound axial and bending Stress1
Deformation scale: 821.164
Upper bound axial and bending (N/m^2)
17,094,708.0
15,976,939.0
14,859,170.0
13,741,400.0
12,623,631.0
11,505,862.0
10,388,092.0
9,270,323.0
8,152,553.5
7,034,784.0
5,917,014.5
4,799,245.5
3,681,476.0
*Dimetric
Model
Motion Study 1
Study 1

Figure (14)

H.W


Material: Steel,
Diameter: 2.5 in.
10 ft.
1200 lb
8 ft.
10 ft.
10 ft.
1000 lb