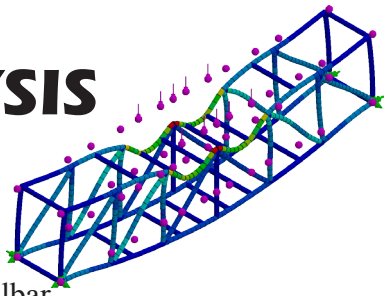
Beam Joints ANALYSIS



A. New Study.

Step 1. If necessary, open your **Beam1** part file.

Step 2. Click **Simulation** Simulation on the Command Manager toolbar.

Step 3. Click the **drop down** of **Study Advisor** Study Advisor on the Simulation toolbar and click **New Study**.

Step 4. In the Study Property Manager:
under Name, **Fig. 1**
key-in **Beam Joints**
under Type
select **Static**
click OK .

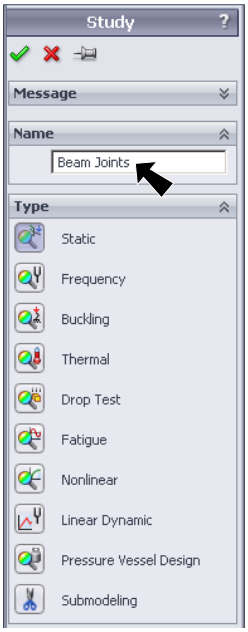


Fig. 1

B. Fixture.

Step 1. Click **Isometric** on the Standard Views toolbar. (**Ctrl-7**)

Step 2. Click the **drop down** of **Fixtures Advisor** Fixtures Advisor on the Simulation toolbar and click **Fixed Geometry**.

Step 3. In the Fixture Property Manager:
under Standard, **Fig. 2**
select **Immovable**
in the Joints field
click the **bottom corner joints** on Beam, **Fig. 3**
click OK .

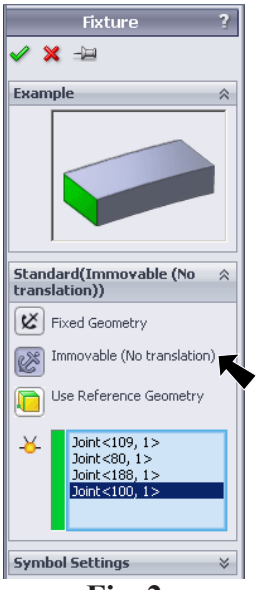


Fig. 2

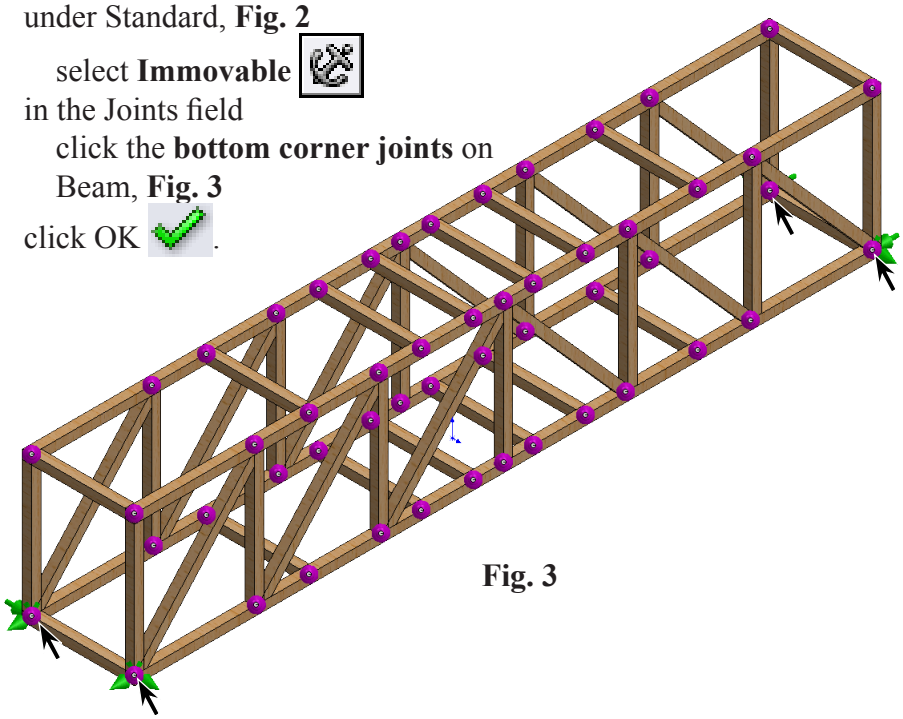
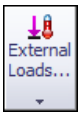


Fig. 3

C. Force.

Step 1. Click the **drop down** ▾ of **External Loads** 

on the Simulation toolbar and click **Force**.

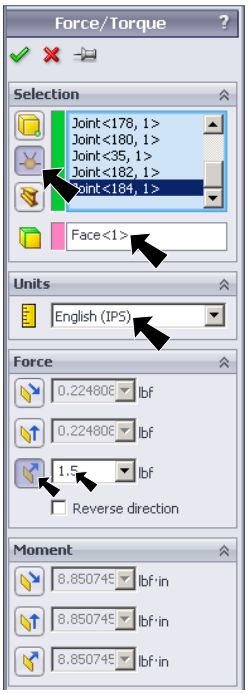


Fig. 4

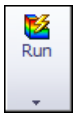
Step 2. In the Force/Torque Property Manager set:
under Units
select **English**
under Force
select **Normal to Plane** 
set **Force Value 1.5**
under Selection, **Fig. 4**
select **Joints** 
click in For Direction field, **Fig. 4**
click **top face of a horizontal member**, **Fig. 5**
click in the Vertices, Reference Points for Force field
click the **10 joints across middle**, **Fig. 5**
(by selecting the Normal to Plane before selecting Joints we can see Force icon as we select)

click OK  .

Fig. 5

Note: 1.5 lbs. applied per Joint = total load of 15 lbs.

D. Run.

Step 1. Click **Run** 

on the Simulation toolbar.

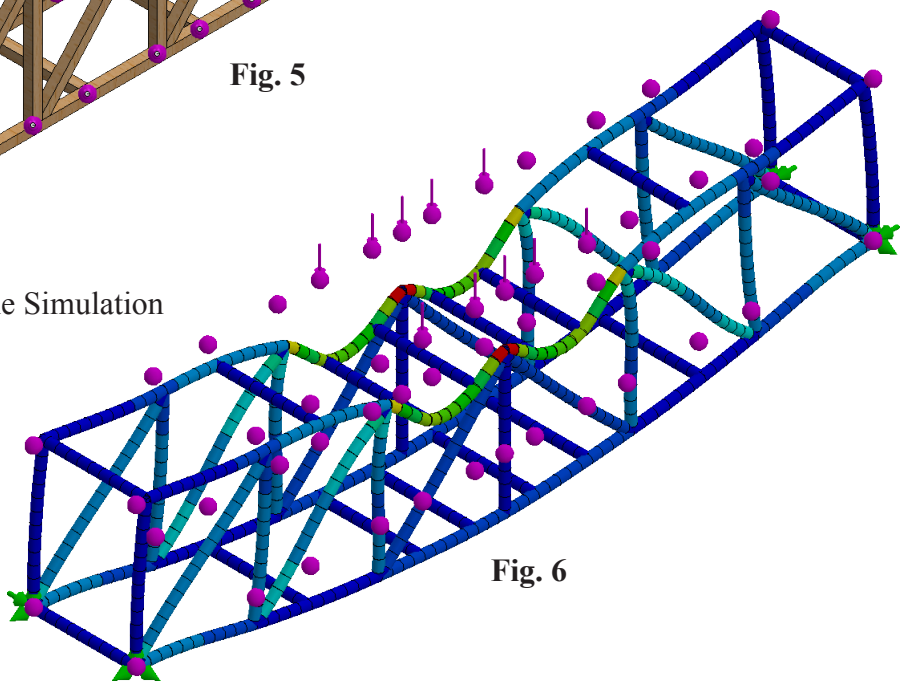


Fig. 6

E. Results - Factor of Safety.

Step 1. **Right click Results folder** in the Simulation Study Tree and click **Define Factor Of Safety Plot**, **Fig. 7**.

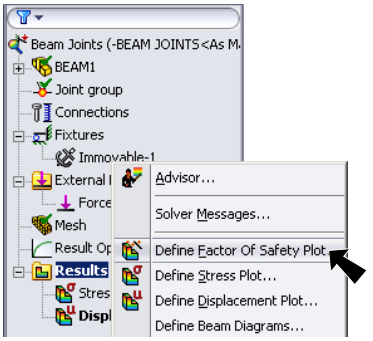


Fig. 7

Step 2. In the Factor of Safety Property Manager **Step 1**, **Fig. 8**

click **Next**  .

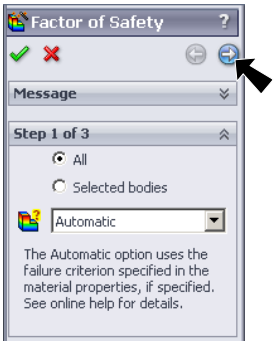


Fig. 8

Step 3. In the Factor of Safety Property Manager **Step 2**, **Fig. 9**

set **Multiplication factor 1**

click **Next**  .

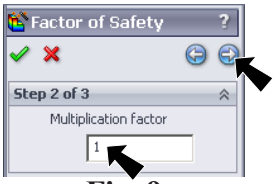


Fig. 9

Step 4. In the Factor of Safety Property Manager **Step 3**, **Fig. 10**

select **Areas below factor of safety**

note **Minimum factor of safety 1.3584**

your FOS might be slightly different

click OK  .

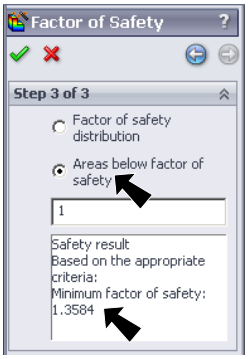


Fig. 10

Step 5. View the FOS plot. The blue members indicates greater than FOS.

Step 6. Next, we will change load using formula

current FOS x current Force = safe load

or 1.3584 x 1.5 lbs. = 2.037 lbs.

Try 2.037 lbs. of force.

F. Edit Force.

Step 1. **Double click Force1** in the Simulation Study Tree to display the Force Property Manager, **Fig. 11**.

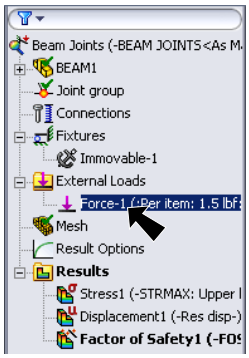


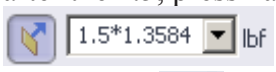
Fig. 11

Step 2. In the Force/Torque Property Manager set:

under Force, **Fig. 12**

Force Value 2.037

Tip: Key-in *1.3584 in the Force Value field after the 1.5, press Tab key and let SW do the math



click OK  .

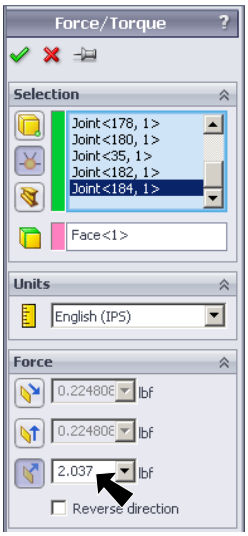
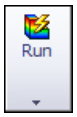


Fig. 12

Note: 2.037 lbs. applied per Joint = total load of 20.37 lbs.

G. Run.

Step 1. Click **Run** 

on the Simulation toolbar.

H. Confirm Factor of Safety = 1.

Step 1. **Double click Factor of Safety1** in the Simulation Study Tree to display the Factor of Safety1 plot, **Fig. 13**.

Step 2. **Double click Factor of Safety1** in the Simulation Study Tree to display the Force Property Manager, **Fig. 13**.

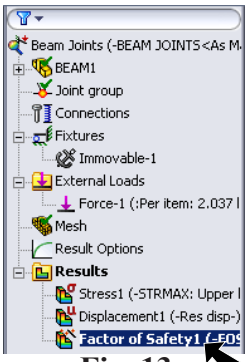


Fig. 13

Step 3. In the Factor of Safety Property Manager, **Fig. 14**

Step 1 click **Next**

Step 2 click **Next**

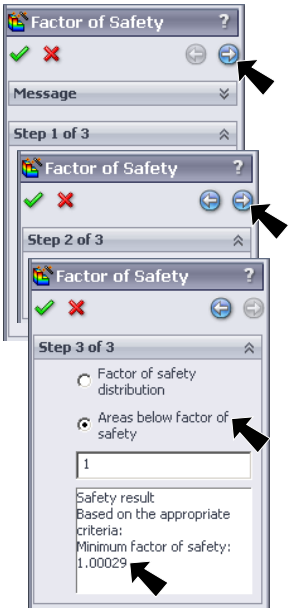


Fig. 14

Step 4. In the Factor of Safety Property Manager **Step 3**, **Fig. 14**
select **Areas below factor of safety**
note **Minimum factor of safety 1.00029**
your FOS might be slightly different
click OK .

I. Efficiency.

Step 1. Click Tools Menu > Mass Properties.

Step 2. Make note of **Mass in grams** in the Mass Properties dialog box and close dialog , **Fig. 15**.

Step 3. Use formula **total load in lbs. x 4.54 / Structure Mass in grams = Efficiency**

20.37 x 4.56 / 4.54 = **20.45**

Step 4. Save. Use **Ctrl-S**.

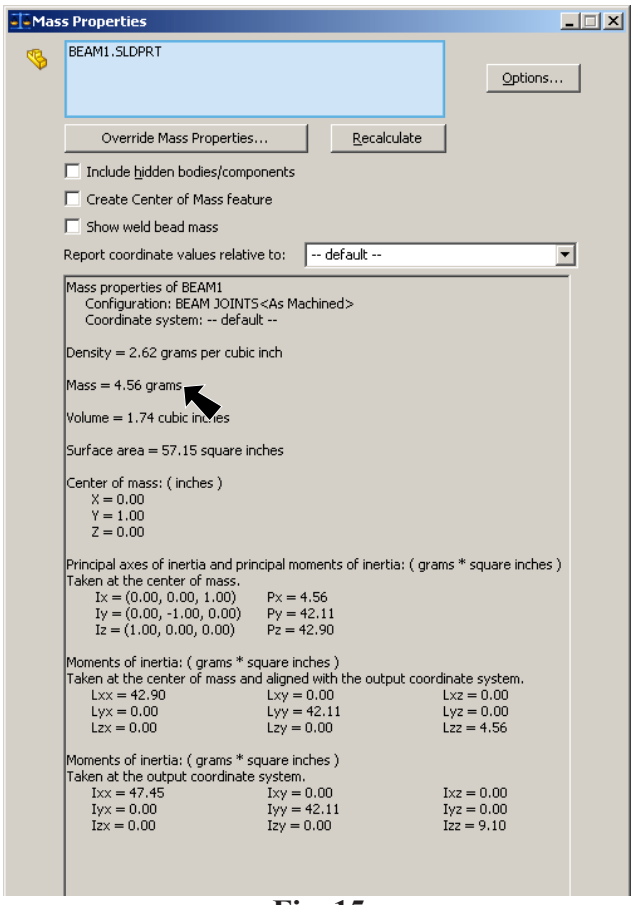


Fig. 15