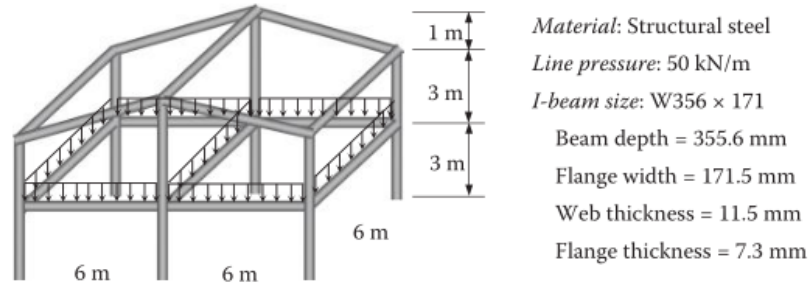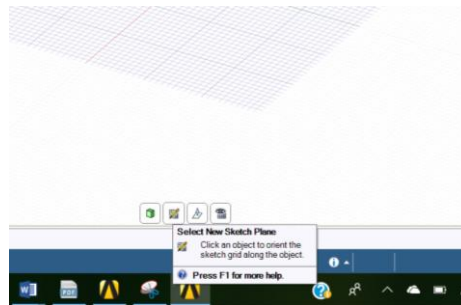Space Frame

Problem Description: Steel framing systems provide cost-effective solutions for low-rise buildings. They have high strength-to-weight ratios, and can be prefabricated and custom-designed. Consider the following two-storey building constructed with structural steel I-beams. Determine the deformations and the stresses in the frame when a uniform load of 50 kN/m is applied on the second floor as shown below.
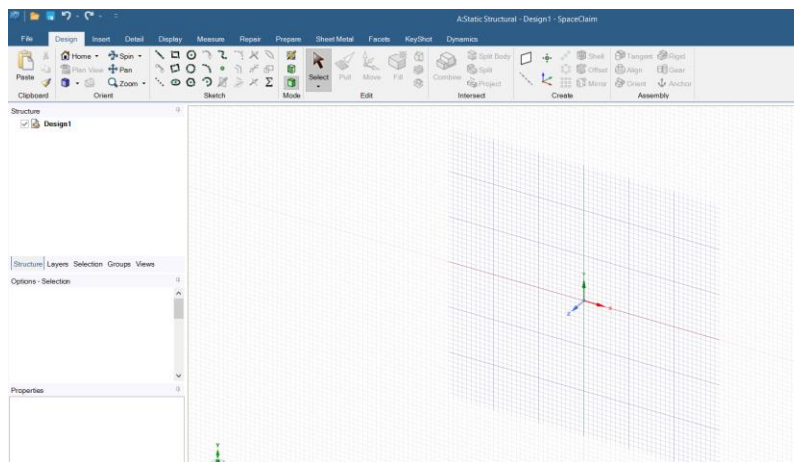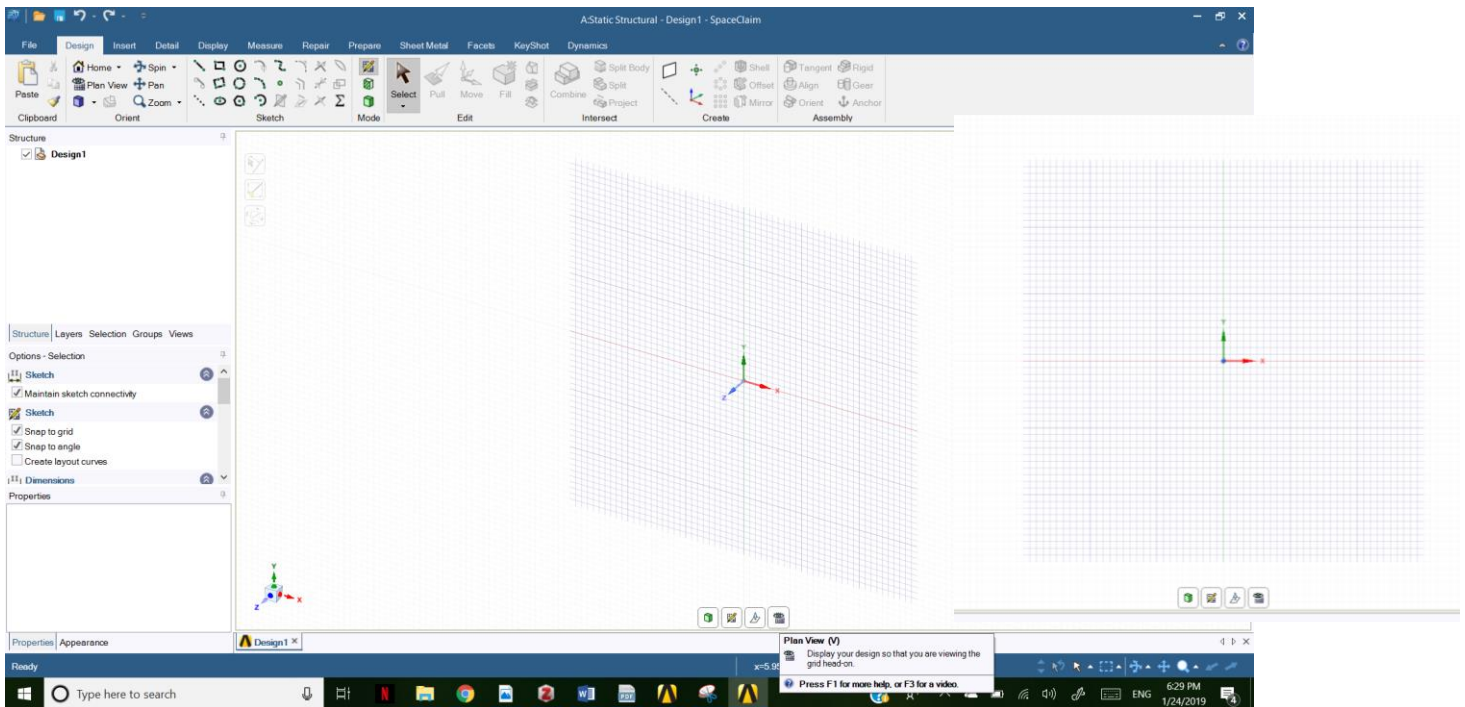

Material: Structural steel
Line pressure: 50 kN/m
I-beam size: W356 × 171
    Beam depth = 355.6 mm
    Flange width = 171.5 mm
    Web thickness = 11.5 mm
    Flange thickness = 7.3 mm

Step 1: Create geometry using SpaceClaim

1. Click on select new sketch plane

2. Select the x-y plane
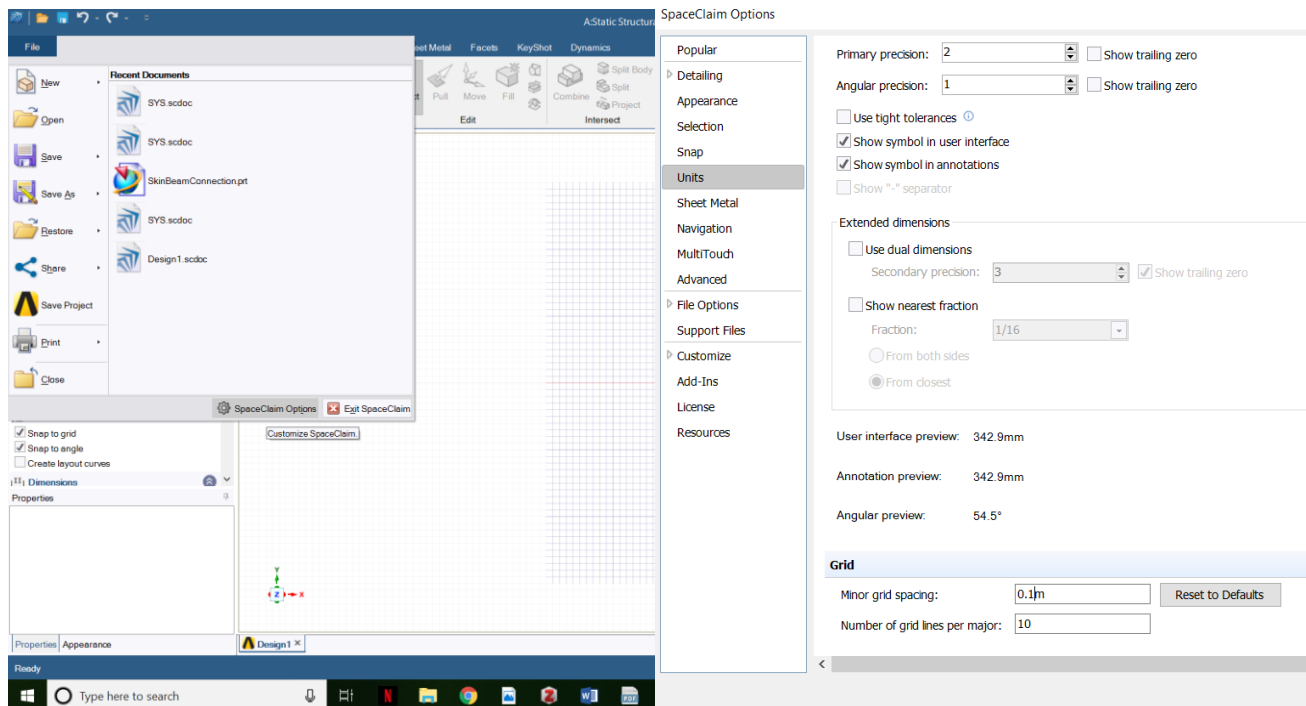

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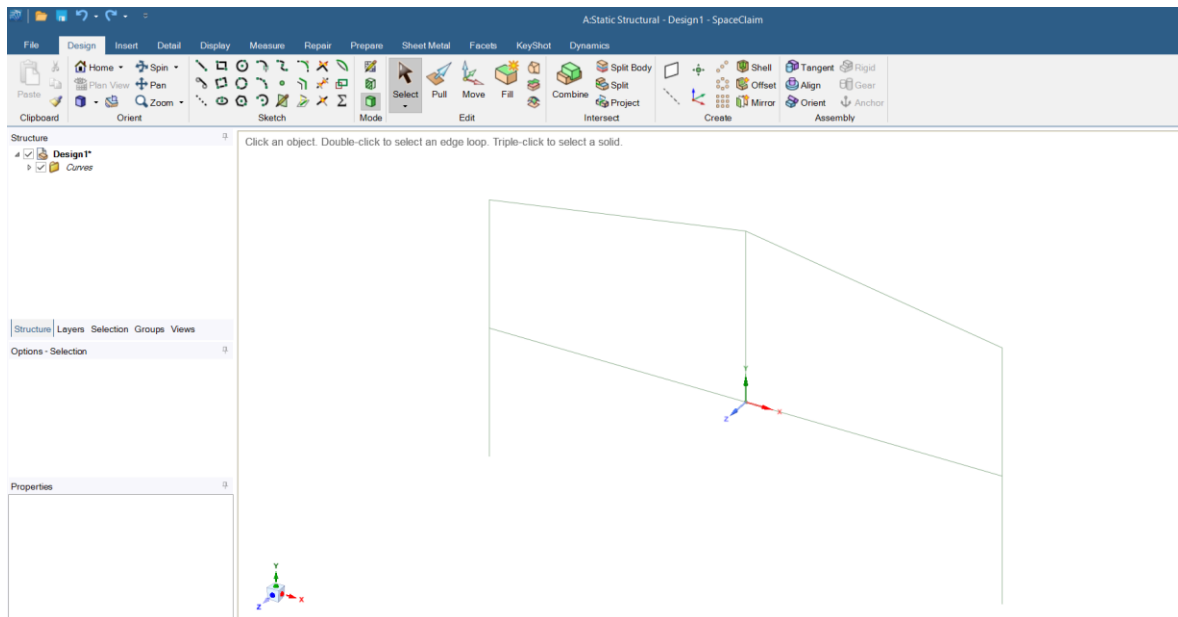
3. Click on plane view
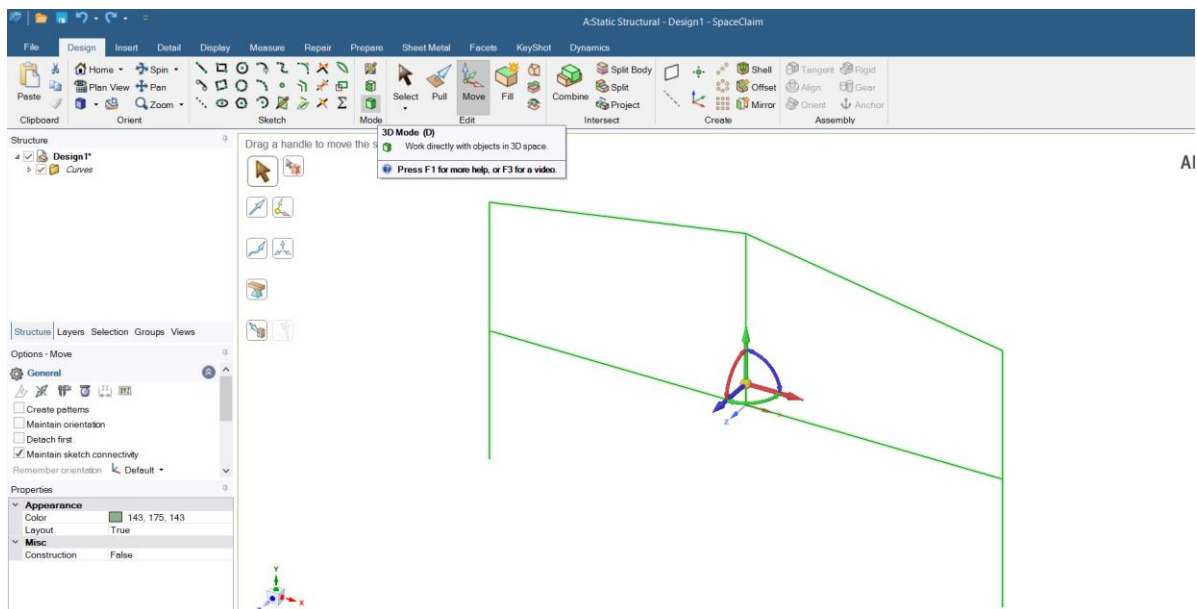

4. Click on file – spaceclaim options. In the options window select units and change the grid spacing as in the following figure

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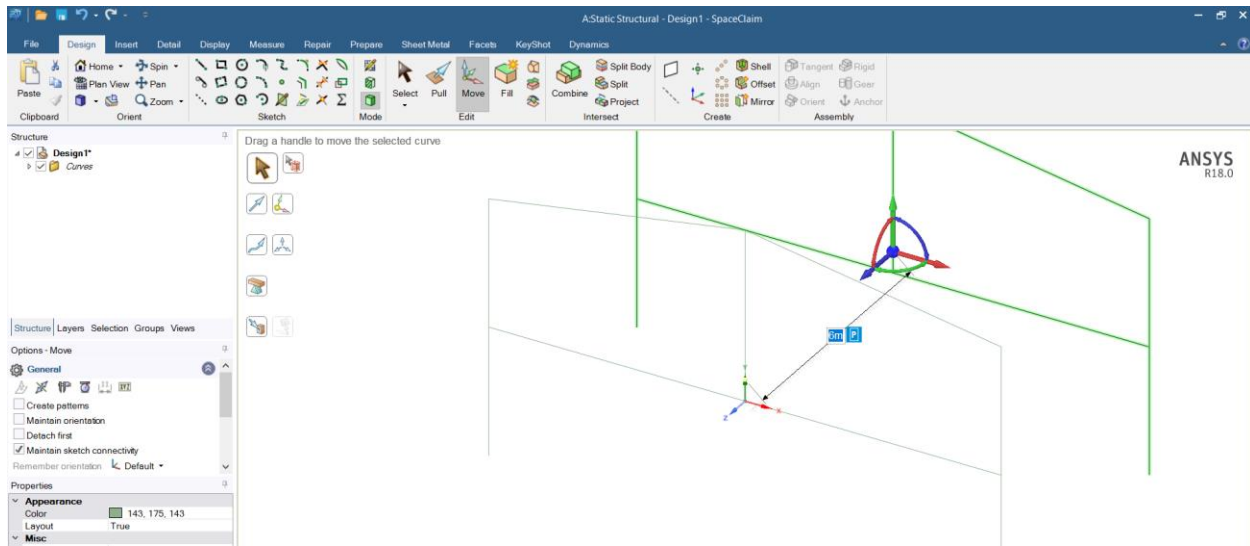Aerospace Engineering Department, Cairo University

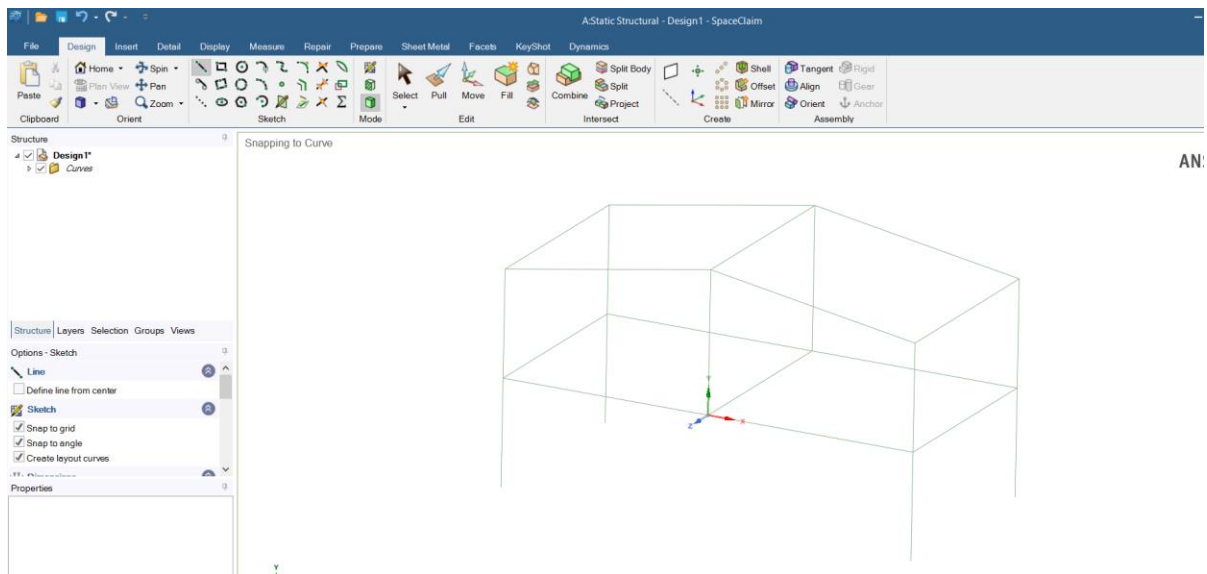5. From the design tab – select line and sketch the following shape

6. Select Move under the design – edit tabs then select all the sketch lines, then select 3D mode

7. Press Ctrl and move the sketch in the z-direction – enter 6 m

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8. Connect all the vertices together using the line option

9. Define the elements cross section to be W356 x 171

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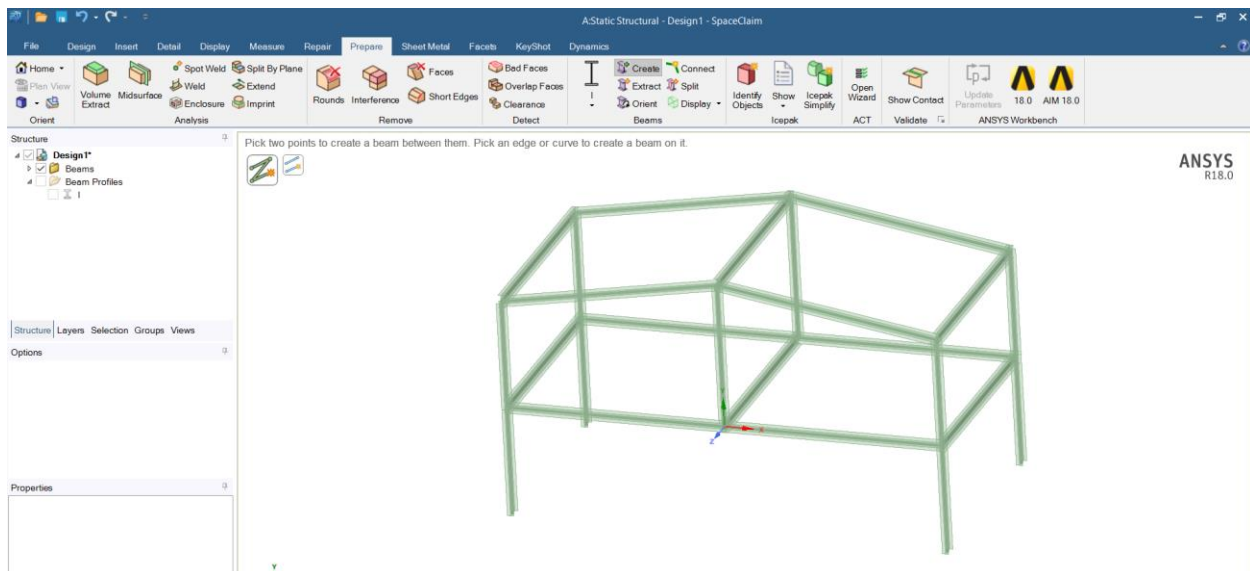Aerospace Engineering Department, Cairo University
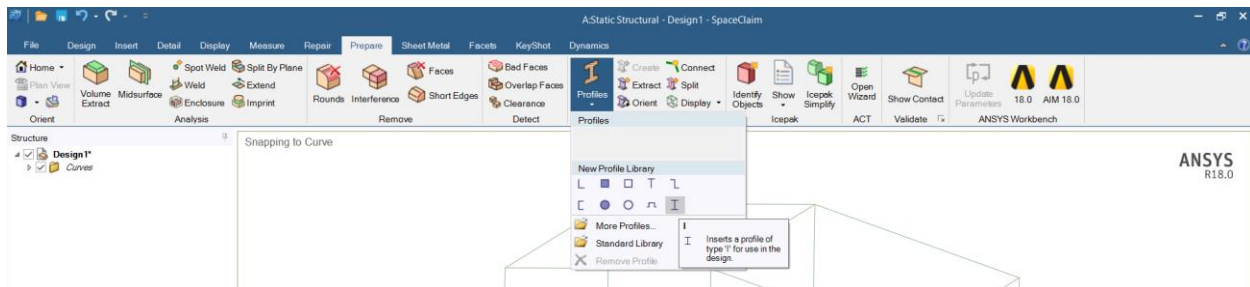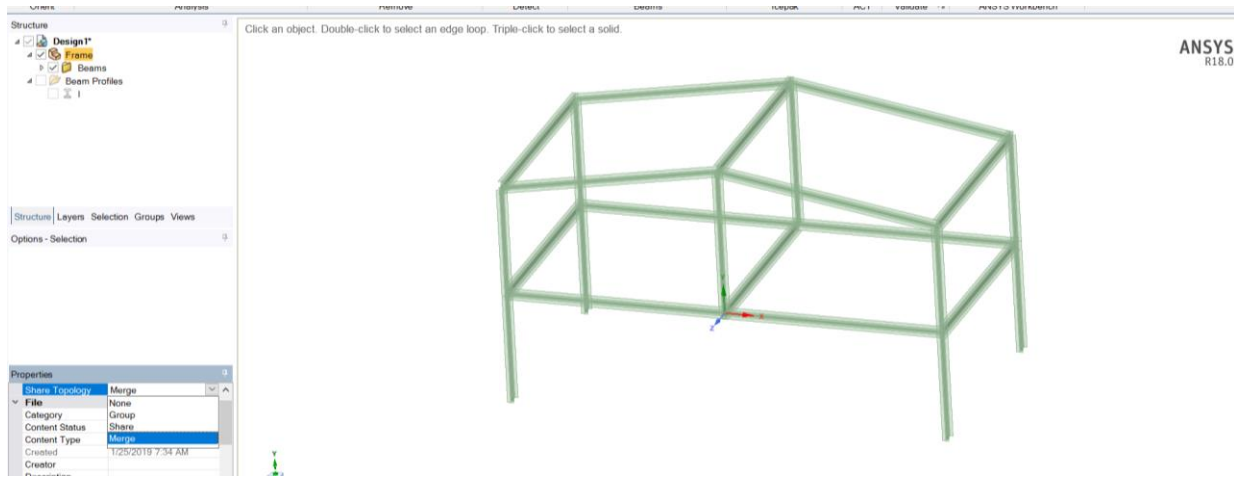
10. Right click on the beam section – select edit profile
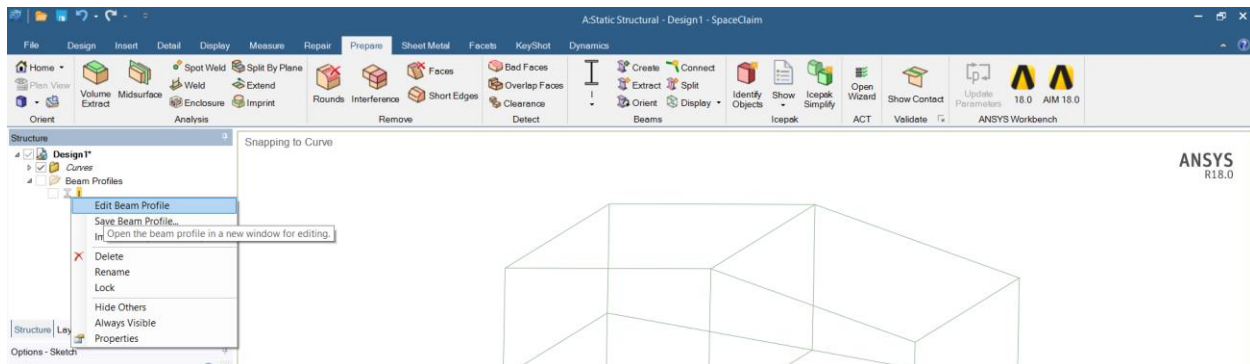
11. Select all the curve lines and click create in the Prepare – beams tab to define the elements cross sections

12. Select all beams – right click and choose -move to new component

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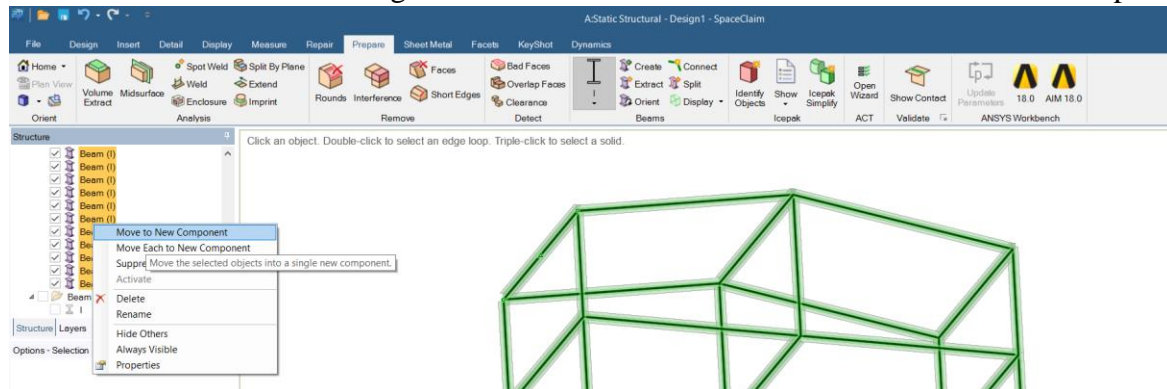
13. Under the component properties – in the share topology section – select Merge to merge the coincident nodes

This concludes the geometric modeling

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