Ansys Tutorial 1: “What If” Study for Bracket

Overview

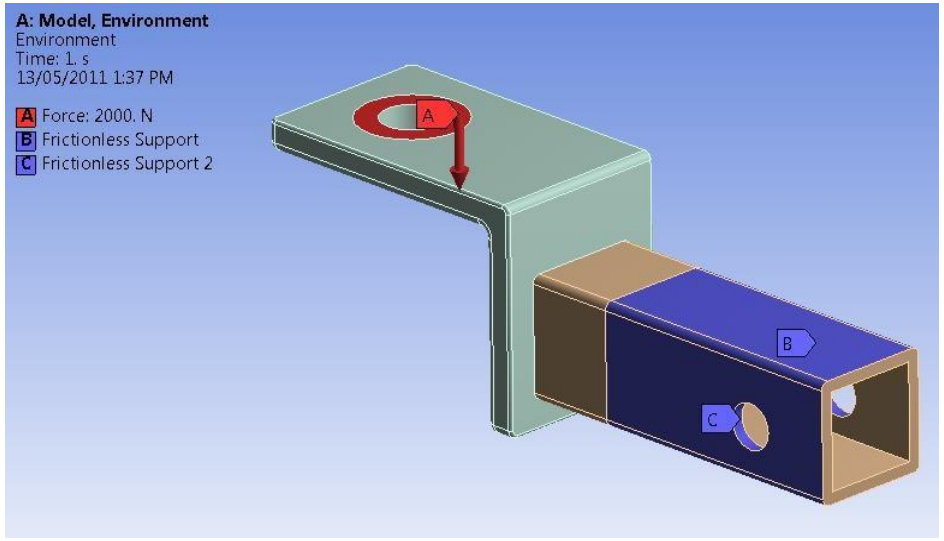
- **Goal**
  - **Using Parameter Manager to investigate the behavior of stress, mass, and deformation in the hitch receiver shown here as geometry parameters are changed during vertical loading**

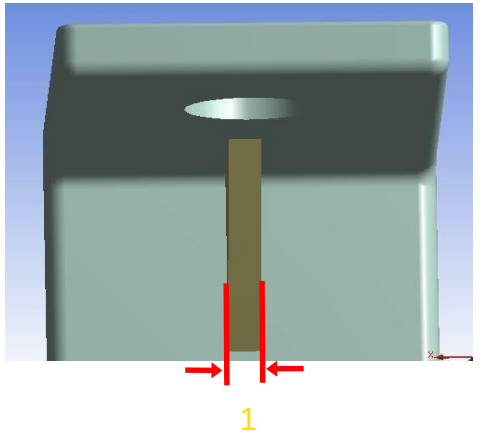
  [note: This workshop uses functionality inherent to WB.

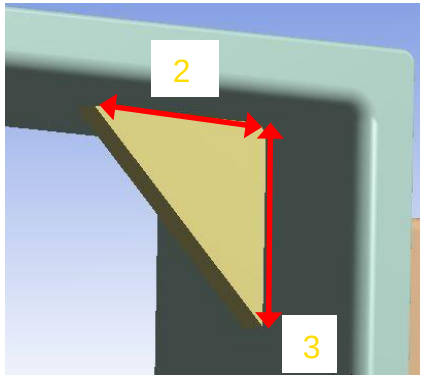
  A DX license is not required to complete this workshop]

- **Model Description**
  - **The model is composed of a multibody part (3 bodies) created in DesignModeler. Constraints and loads are shown in the top figure**

  - **The dimensions labeled 1, 2, and 3 in the bottom figures will be promoted to input parameters**

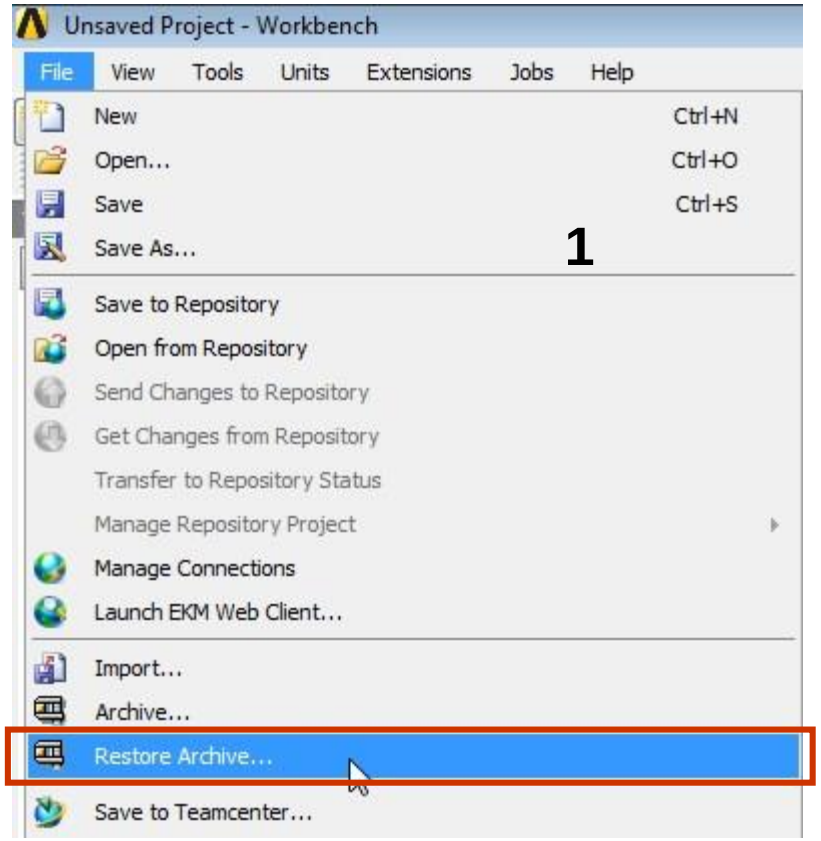


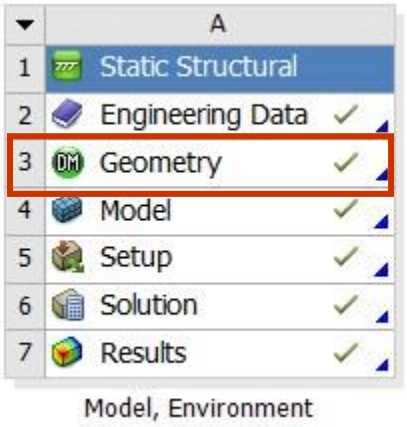




Project Startup

1. File>Restore Archive >receiver.wbpz

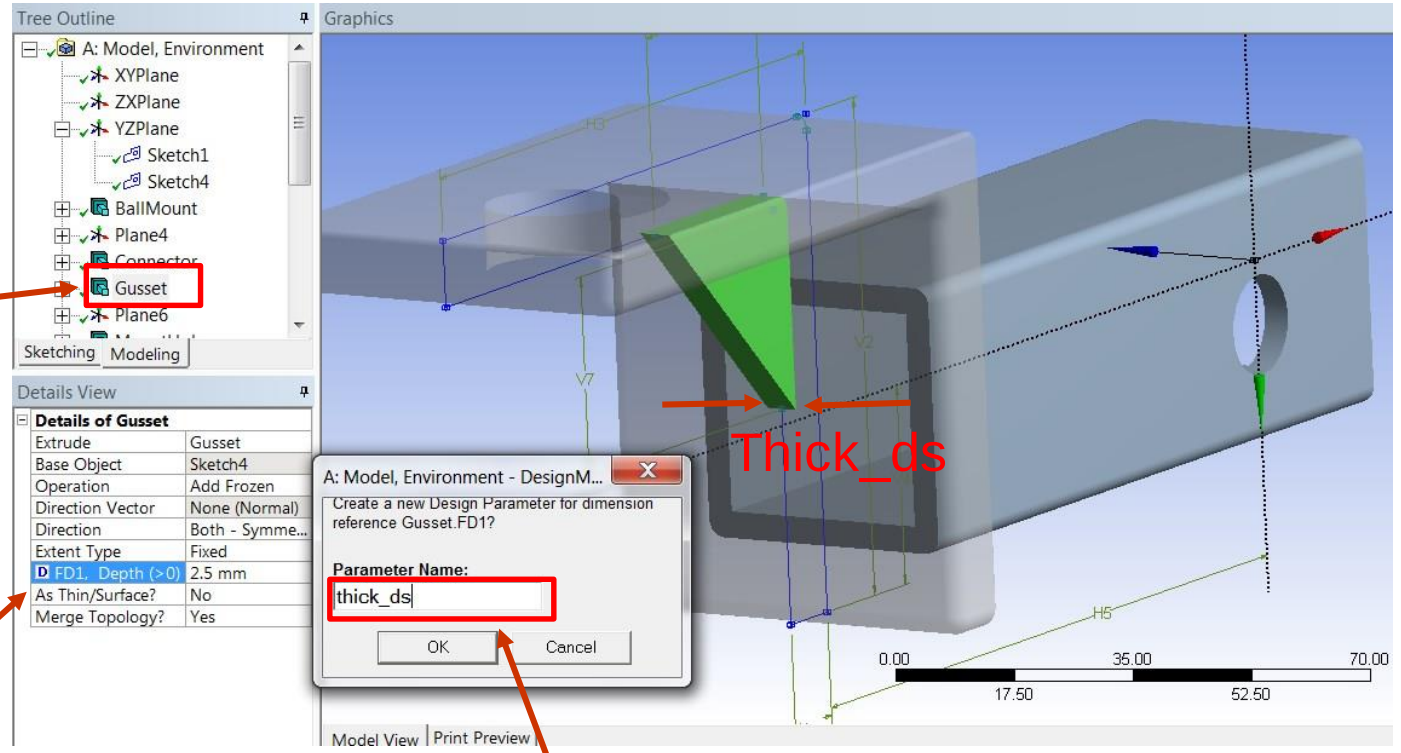




2

2. Double click on Geometry to promote dimensions to input parameters

Parameterize Project in DesignModeler



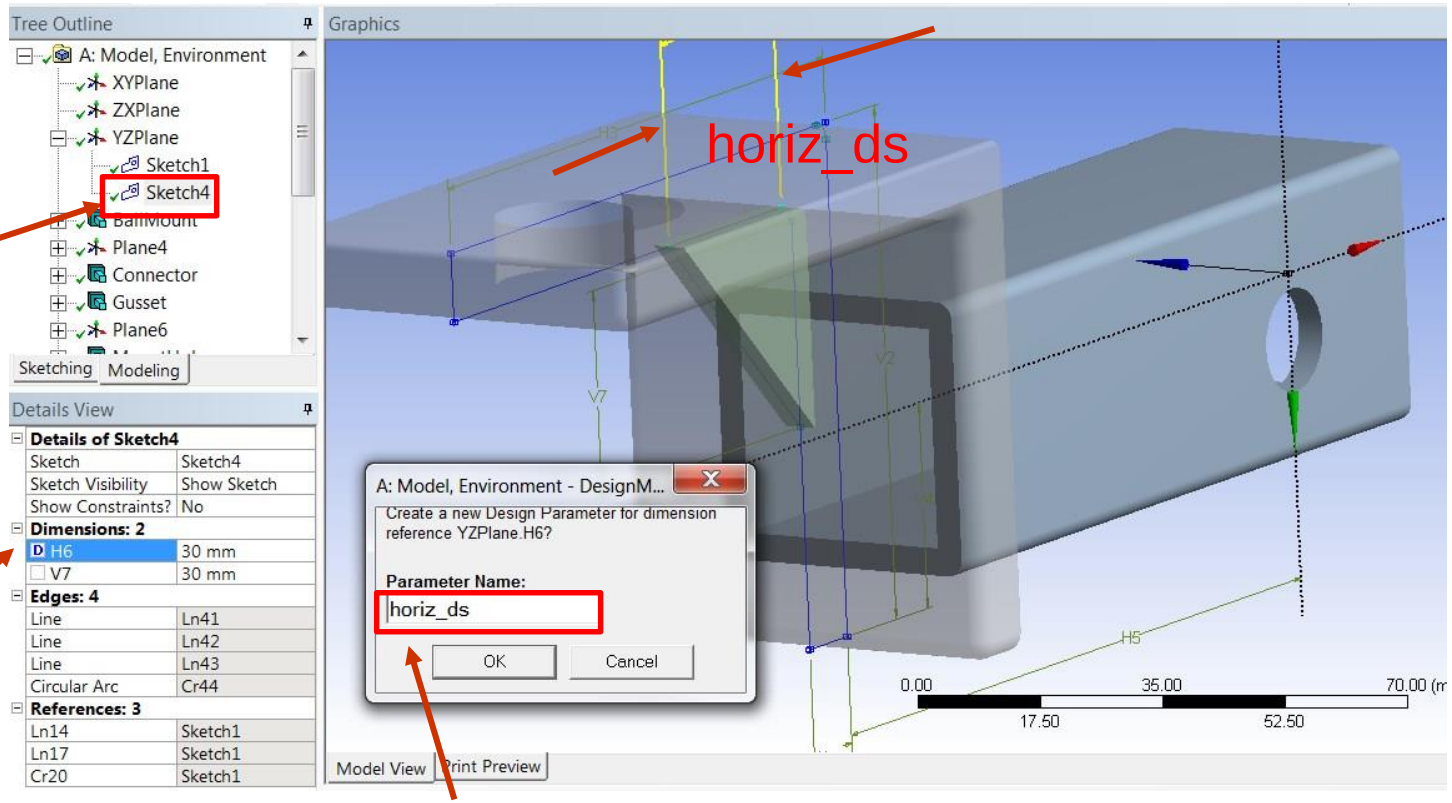
3. Click "Gusset" in the Tree Outline

4. Check the parameter box

5. Set parameter name to next to D1"thick_ds" and click OK

Parameterize Project in DesignModeler

6. Click “Sketch4” under the YZPlane in the Tree Outline

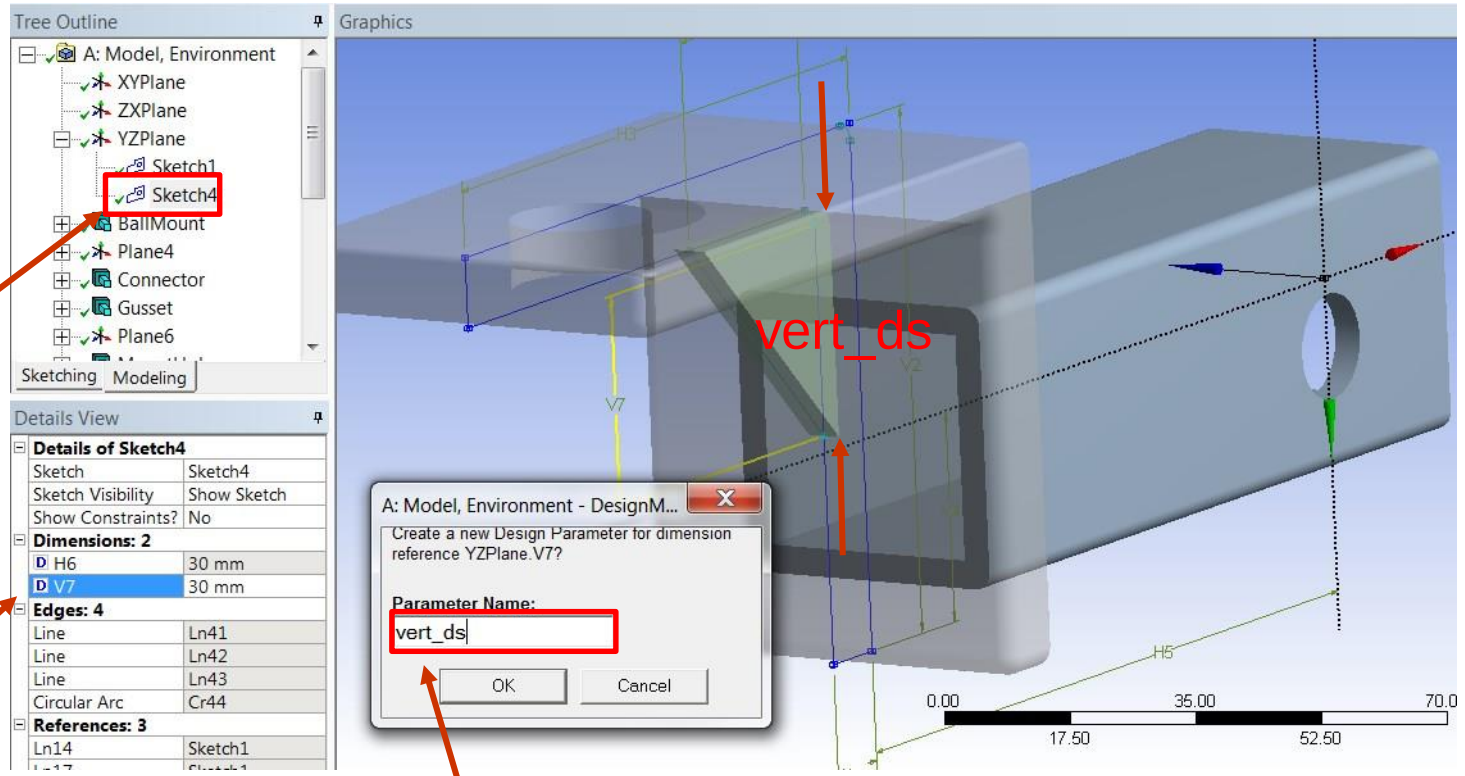


7. Check the parameter box next to H6

8. Set parameter name to “horiz_ds” and click OK

Parameterize Project in DesignModeler

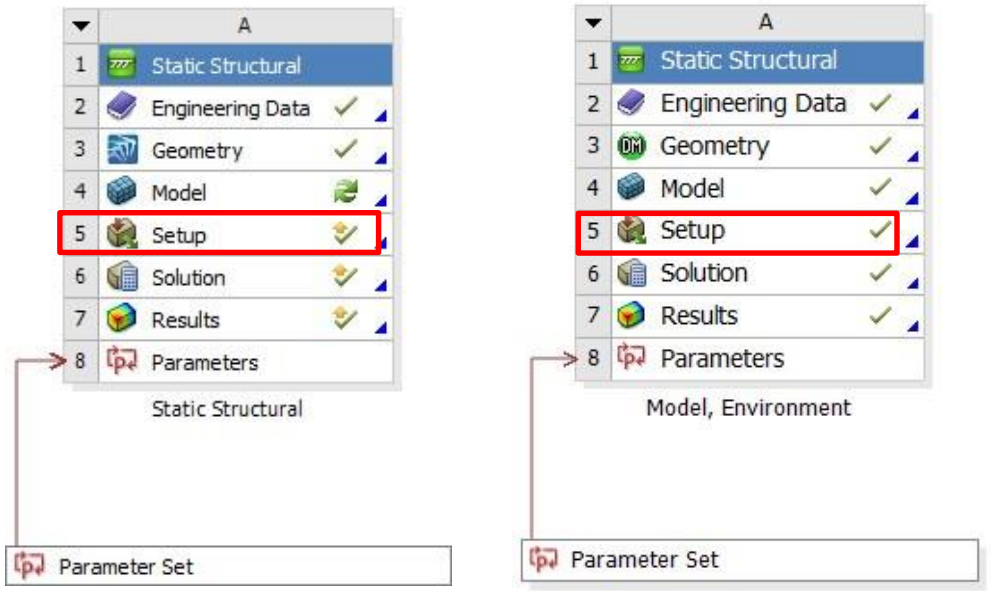
9. Again, click "Sketch4" under the YZPlane in the Tree Outline



10. Check the parameter box next to V7

11. Set parameter name to "vert_ds" and click OK

Parameterize Project in Mechanical

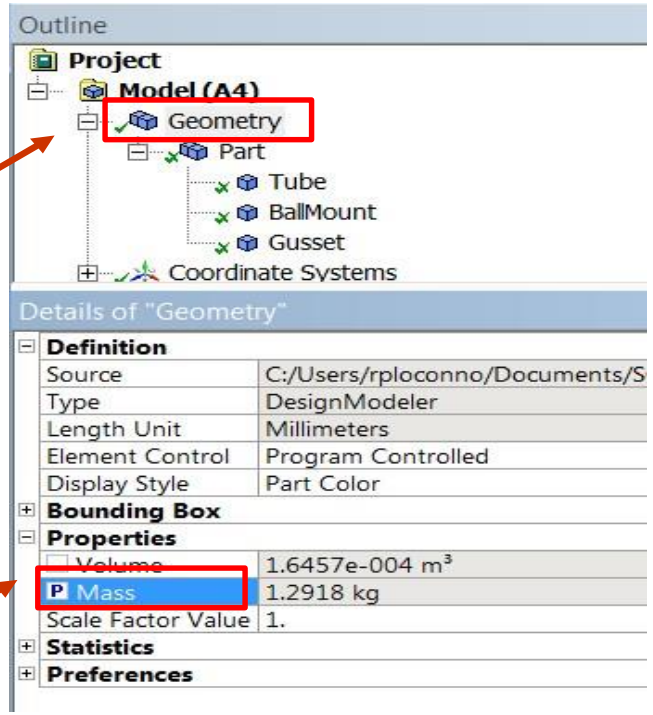


12. Return to the Workbench window. Notice that the Parameter Set bar is now present having an arrow leaving the Parameter Set bar and connected to cell A8. This indicates that input parameters have been defined

13. Double-click on the Setup cell

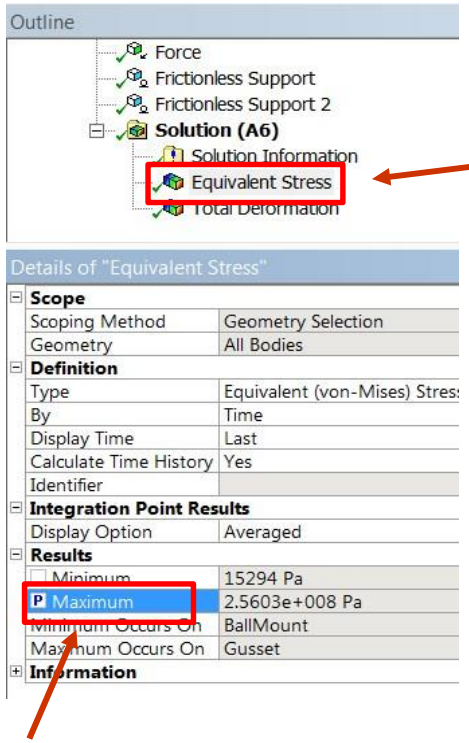
Parameterize Project in Mechanical

14 . In the Tree Outline, click Geometry



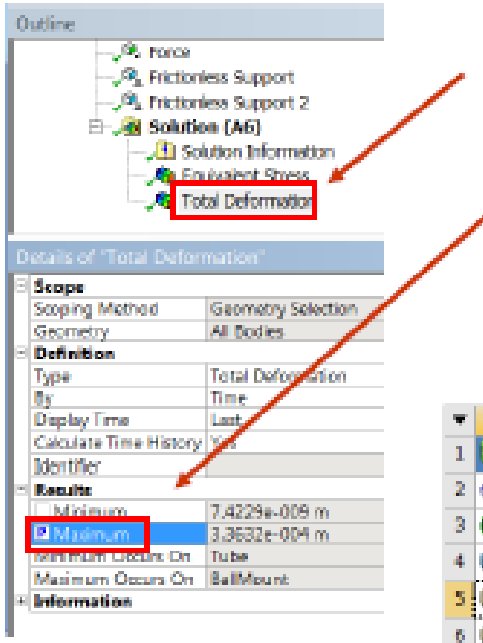
15. In the Details view, click the parameter box next to Mass to promote the mass to an output parameter

16. In the Tree Outline under Solution, click Equivalent Stress



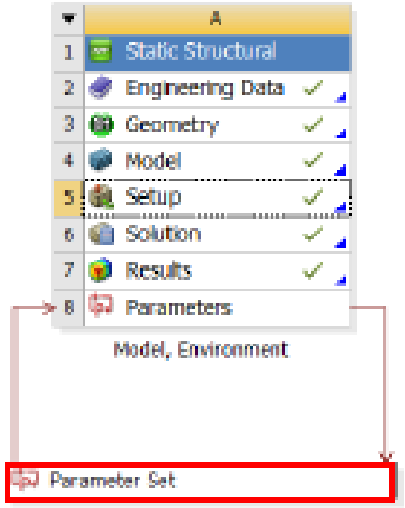
17. In the Details view, click the parameter box next to Maximum to promote the Maximum Equivalent Stress to an output parameter

Parameterize Project in Mechanical



18. In the tree outline, click Total Deformation

19. In the Details view, click the parameter box next to Maximum to promote the Maximum Total Deformation to an output parameter



20. Return to the Workbench window. Notice that the Parameter Set bar is now present having an arrow leaving cell A8 bar and connected to Parameter Set bar. This indicates that output parameters have been defined

21. Double-click the Parameter Set bar

Conduct a What If study

22. Add the following 3 design points to the Table of Design Points

Table of Design Points

	A	B	C	D	E	F	G	H	I	J
1	Name	P1 - thick_ds	P2 - horiz_ds	P3 - vert_ds	P4 - Geometry Mass	P5 - Equivalent Stress Maximum	P6 - Total Deformation Maximum	Retain	Retained Data	Note
2	Units	mm	mm	mm	kg	Pa	m			
3	DP 0 (Current)	2.5	30	30	1.2918	2.5899E+08	0.00033775	☑	✓	
4	DP 1	2.25	27	33				☐		
5	DP 2	2.75	33	30				☐		
6	DP 3	2.5	33	33				☐		
*								☐		

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Values to enter if you are using DesignModeler

Table of Design Points

	A	B	C	D	E	F	G	H	I	J
1	Name	P1 - thick_ds	P2 - horiz_ds	P3 - vert_ds	P4 - Geometry Mass	P5 - Equivalent Stress Maximum	P6 - Total Deformation Maximum	Retain	Retained Data	Note
2	Units				kg	Pa	m			
3	DP 0 (Current)	5	32.5	32.5	1.2917			☑	✓	
4	DP 1	4.5	29.5	35.5				☐		
5	DP 2	5.5	35.5	32.5				☐		
6	DP 3	5	35.5	35.5				☐		
*								☐		

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Values to enter if you are using SpaceClaim

24

Show Progress | Show 27 Messages

24. Click Show Progress in the Status Bar

23

Update All Design Points

23. Update all Design Points

Progress

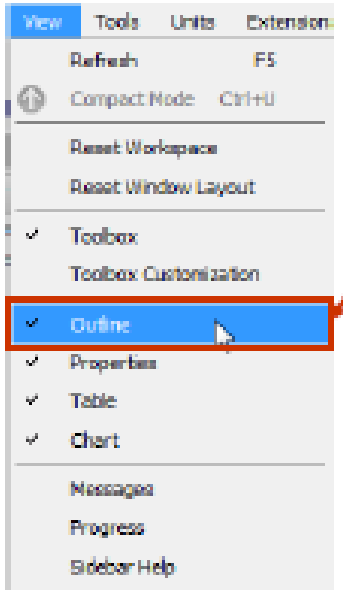
	A	B	C
1	Status	Details	Progress
2	Updating the Model component in Model, Environment for design point 1		

Conduct a What If study

Table of all design points – results

Table of Design Points

	A	B	C	D	E	F	G	H	I	J
1	Name	P1 - thick_ds	P2 - horiz_ds	P3 - vert_ds	P4 - Geometry Mass	P5 - Equivalent Stress Maximum	P6 - Total Deformation Maximum	Retain	Retained Data	Note
2	Units	mm	mm	mm	kg	Pa	m			
3	DP 0 (Current)	2.5	30	30	1.2918	2.8895E+08	0.00021775	☑	✓	
4	DP 1	2.23	27	33	1.2098	2.8935E+08	0.00034845	☐		
5	DP 2	2.75	33	30	1.296	2.6346E+08	0.00031454	☐		
6	DP 3	2.5	33	33	1.2958	2.2912E+08	0.00030385	☐		
*								☐		



25

25. Charts, Properties, Tables may not all be available by default, go to Main menu>View>Outline

Note: you may have slight differences in the output parameters values if you are using SpaceClaim

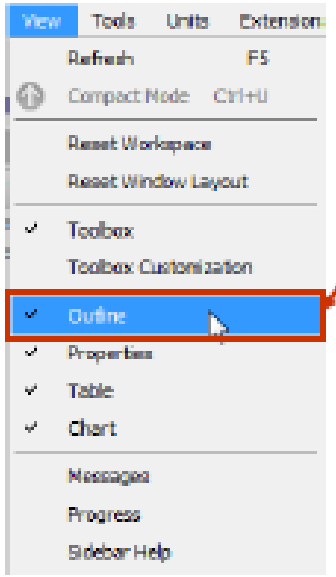
Note: the rest of the screenshots are shown with the model using DesignModeler, if you are using SpaceClaim you may not have the same input parameters values but there is no change in the procedure

Conduct a What If study

Table of all design points – results

Table of Design Points

	A	B	C	D	E	F	G	H	I	J
1	Name	P1 - thick_ds	P2 - horiz_ds	P3 - vert_ds	P4 - Geometry Mass	P5 - Equivalent Stress Maximum	P6 - Total Deformation Maximum	Retain	Retained Data	Note
2	Units	mm	mm	mm	kg	Pa	m			
3	DP 0 (Current)	2.5	30	30	1.2918	2.8955E+08	0.00033775	✓	✓	
4	DP 1	2.23	27	33	1.2898	2.8935E+08	0.00034845			
5	DP 2	2.75	33	30	1.296	2.6346E+08	0.00031454			
6	DP 3	2.5	33	33	1.2958	2.7912E+08	0.00030385			
*										



25

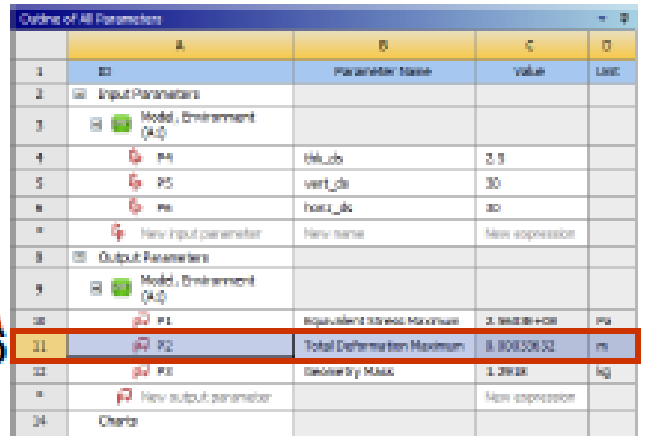
25. Charts, Properties, Tables may not all be available by default, go to Main menu>View>Outline

Note: you may have slight differences in the output parameters values if you are using SpaceClaim

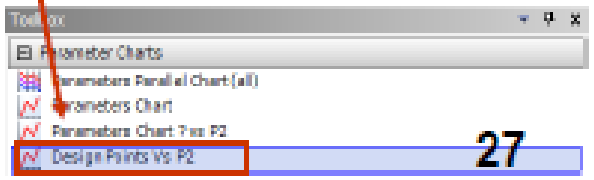
Note: the rest of the screenshots are shown with the model using DesignModeler, if you are using SpaceClaim you may not have the same input parameters values but there is no change in the procedure

Conduct a What If study

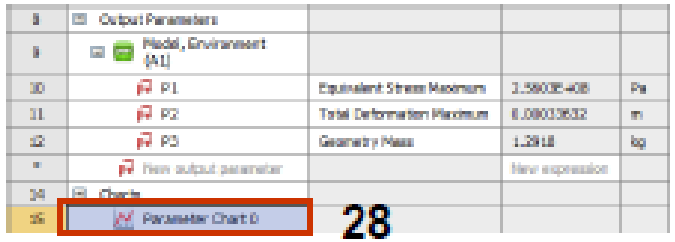
26. Highlight parameter for Total Deformation Maximum in the Outline of all parameters

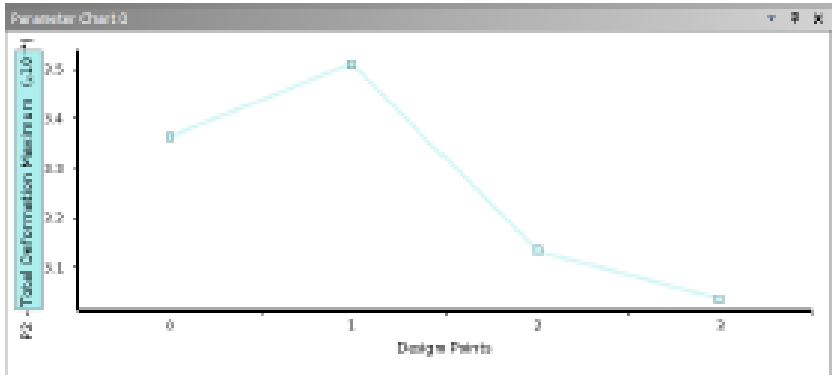


27. Double click on Design Point vs P2 to create a Chart

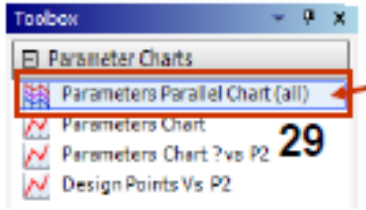


28. Select Parameter Chart 0 to view the created Chart

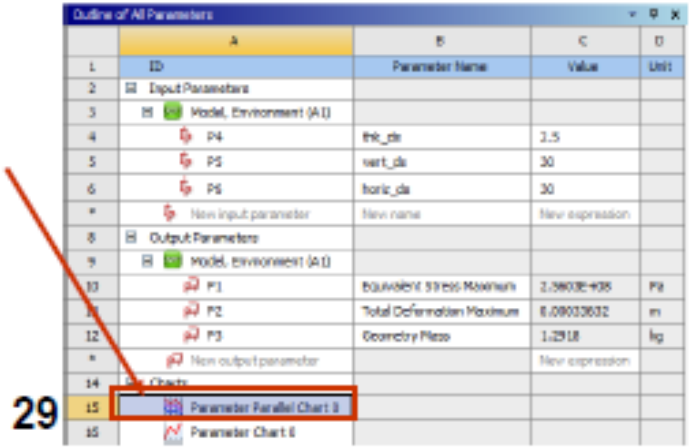




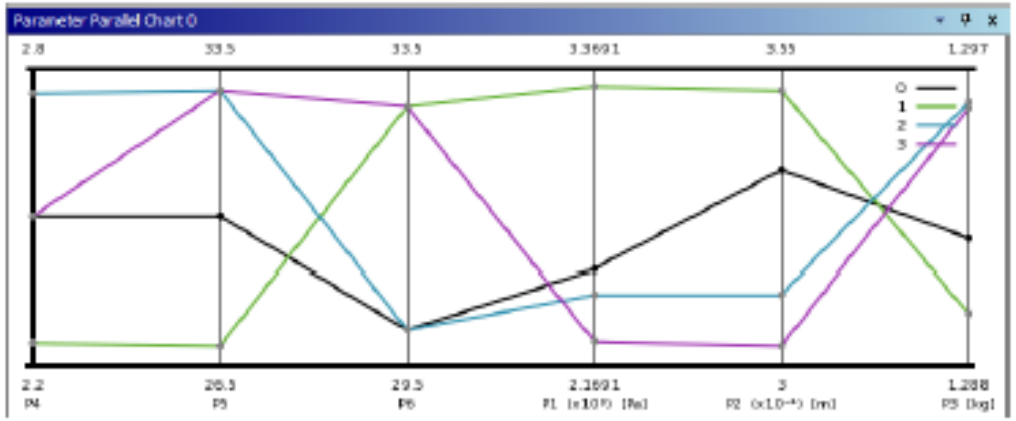
Conduct a What If study



29. Double click on Parameters Parallel Chart (all)

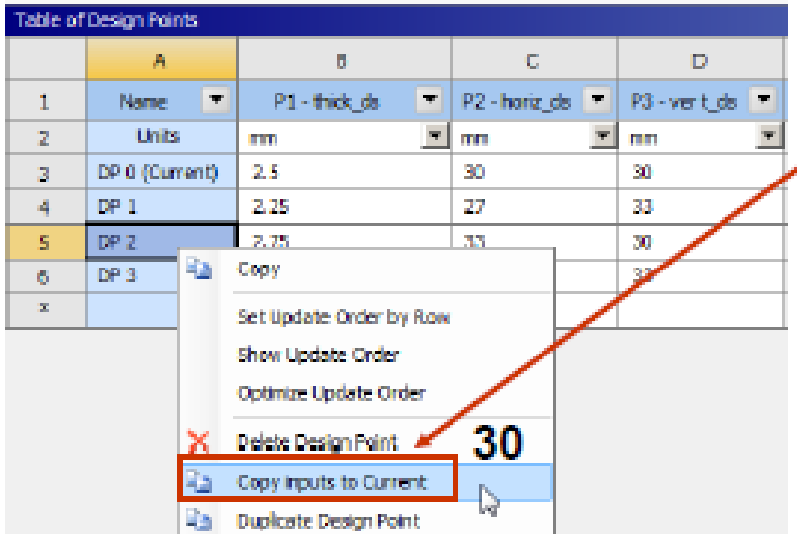


Top and bottom values on the chart indicate the range relative to each parameter

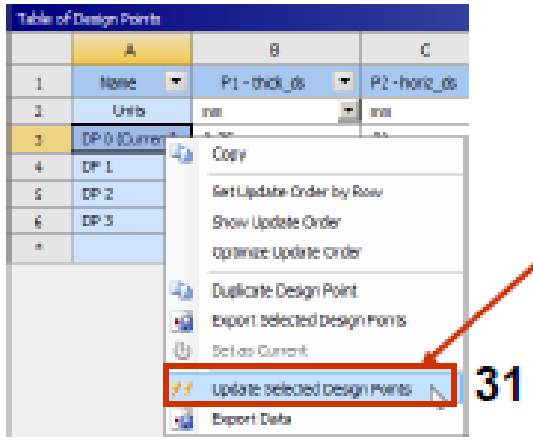


Each color coded line on the plot represents one of the design points. Individual parameters are displayed along the bottom of the chart

Conduct a What If study



30. Copy design point DP2 to Current by clicking RMB on DP 2 and selecting "Copy inputs to Current", notice how current changes



31. RMB on Current and select "Update Selected Design Points"

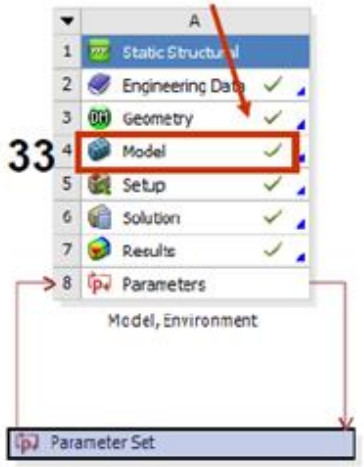
Model Review

Solution for the current design point

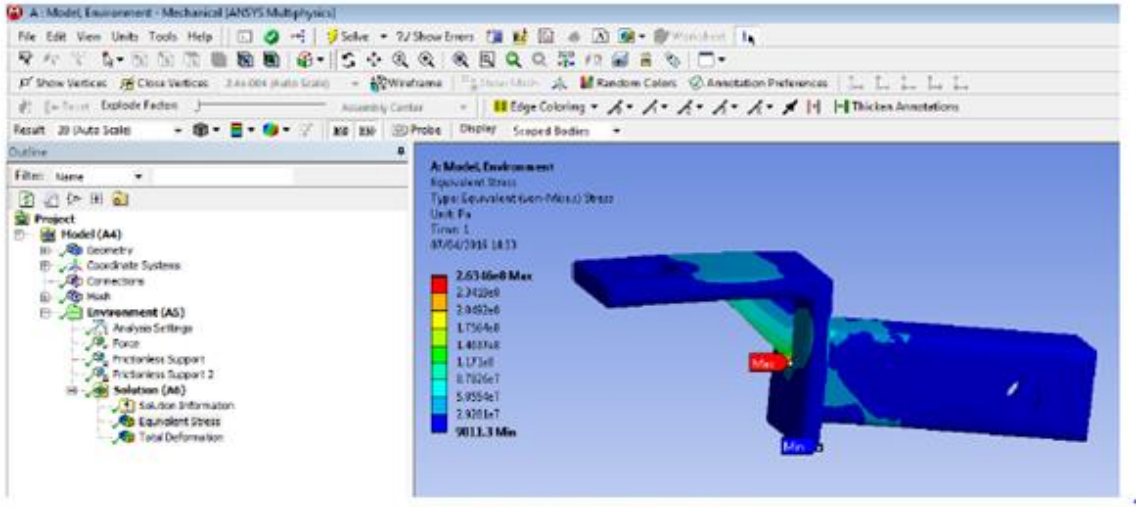
	Name	P1 - thick_ds	P2 - horiz_ds	P3 - vert_ds	P4 - Geometry Mass	P5 - Equivalent Stress Maximum	P6 - Total Deformation Maximum	Retain	Retained Data
2	Units	mm	mm	mm	kg	Pa	m		
3	DP 0 (Current)	2.75	33	30	1.296	2.6346E+08	0.00031454	☑	✓

32. Switch to the Project tab

33. Double click on Model



33



Check the results