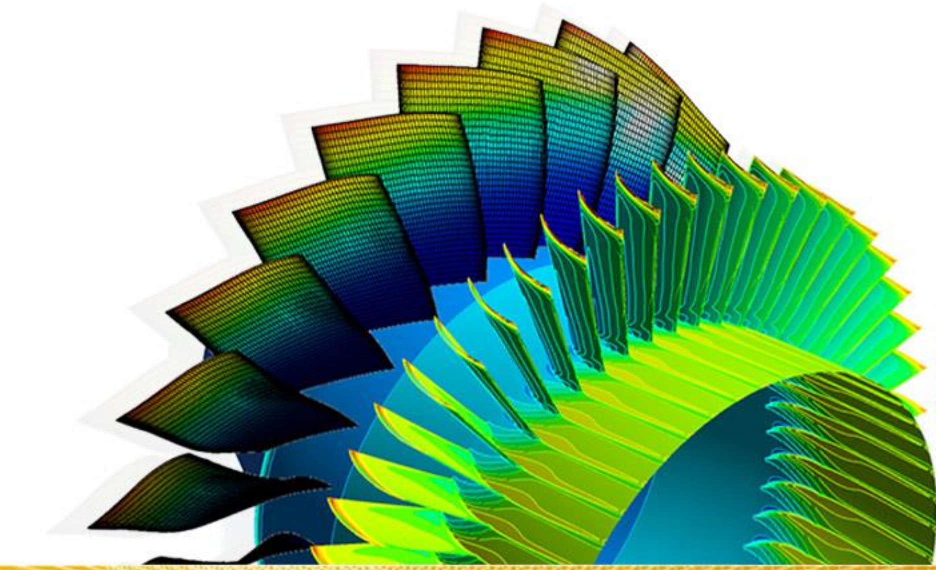
ANSYS Composite PrepPost 19.0

Workshop 08.1 – Parameters in ANSYS Composite PrepPost



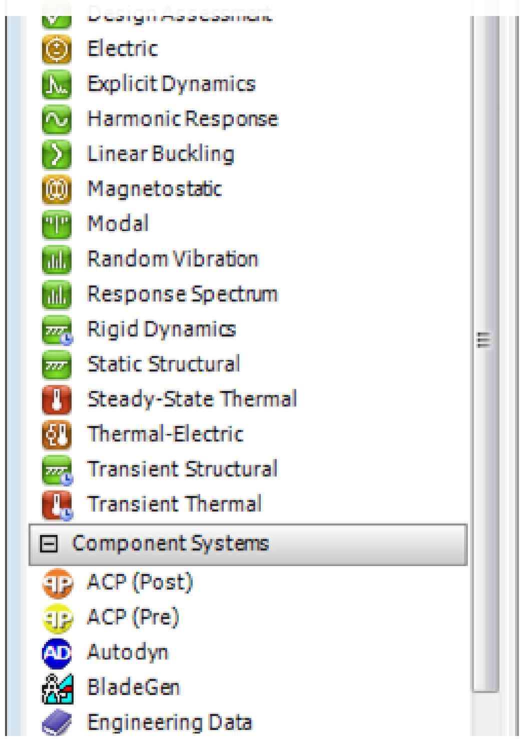
9. Workshop Parameters in ANSYS Composite PrepPost

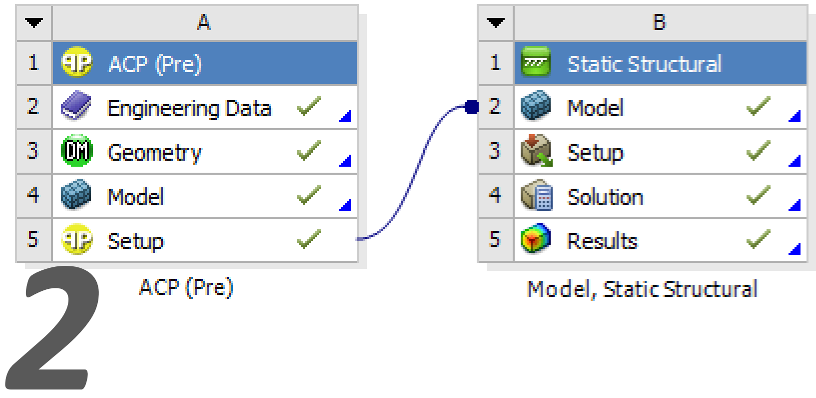
Agenda

- Define input parameters for the ply angle of all six defined plies
- Solve the model and define output parameter for bending and torsion stiffness of the model
- Define output parameter for composite specific failure evaluation
- Specify design variations in ANSYS Workbench and update all design points

9. Workshop Parameters in ANSYS Composite PrepPost

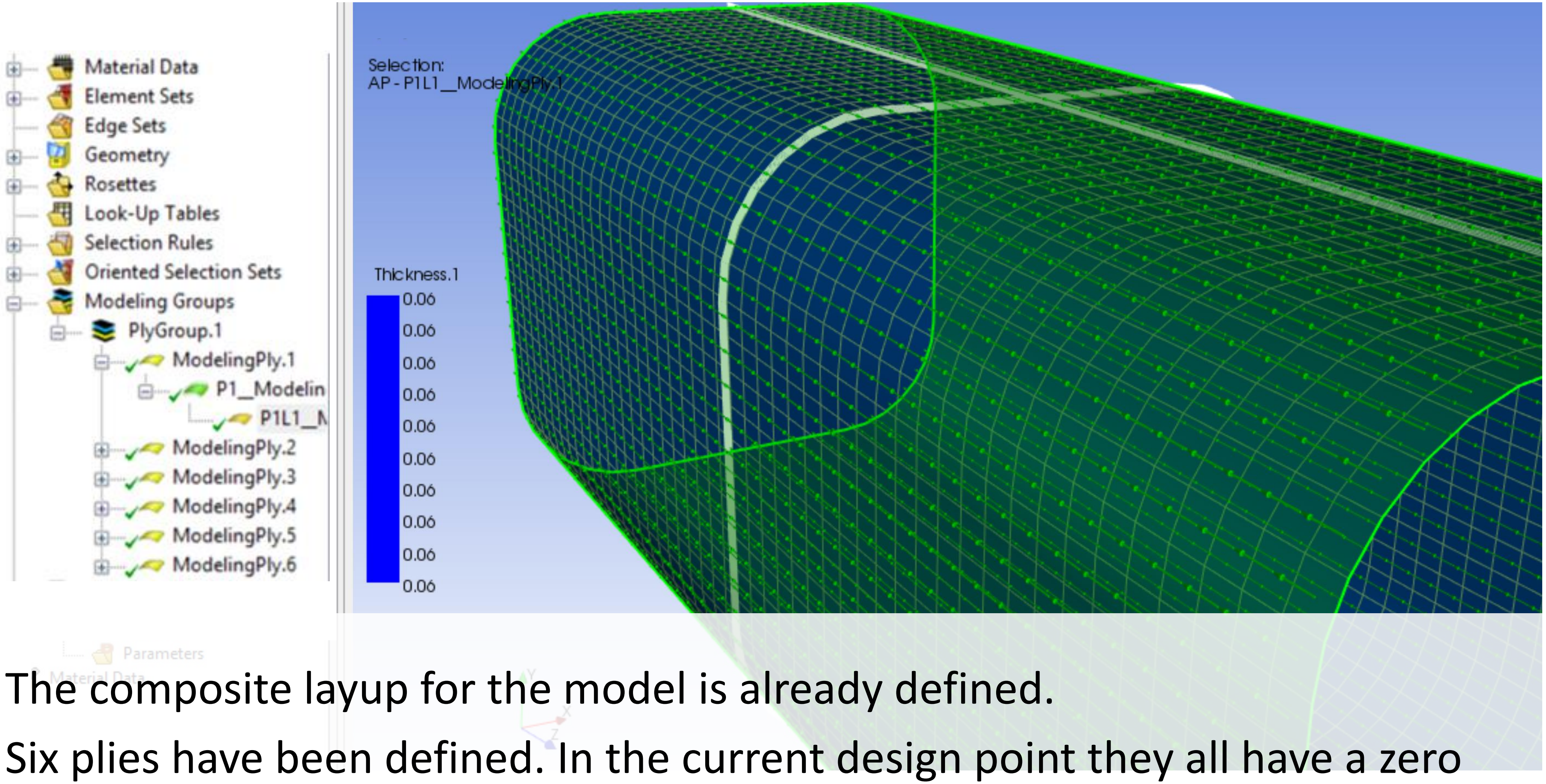
Start ANSYS Workbench and Restore Archive





1. Start ANSYS Workbench and restore Archive
   Parameters_in_ACP_FROM_START_19.0.wbpz
2. Open ANSYS Composite PrepPost Model (ACP Pre)

9. Workshop Parameters in ANSYS Composite PrepPost



- The composite layup for the model is already defined.
- Six plies have been defined. In the current design point they all have a zero degree fiber angle.

9. Workshop Parameters in ANSYS Composite PrepPost

- In the next step we will add input parameter for the fiber angles of all plies:

Input Parameter

Outline: No data

	A	B	C	D
1	ID	Parameter Name	Value	Unit
2	Input Parameters			
3	ACP (Pre) (A1)			
4	P1	ModelingPly.1.ply_angle	0	
5	P2	ModelingPly.2.ply_angle	0	
6	P3	ModelingPly.3.ply_angle	0	
7	P4	ModelingPly.4.ply_angle	0	
8	P5	ModelingPly.5.ply_angle	0	
9	P6	ModelingPly.6.ply_angle	0	
*	New input parameter	New name	New expression	
11	Output Parameters			
12	ACP (Post) (C1)			
13	P13	Sensor.1.Price	2.5816	
14	Static Structural (B1)			
15	P9	Moment Reaction Torsion Minimum Z Axis	-3897.4	N m
16	P10	Moment Reaction Bending Minimum X Axis	-12260	N m
17	P11	Torsion Stiffness	-2998	N m
18	P12	Bending Stiffness	-6130	N m
*	New output parameter		New expression	
20	Charts			

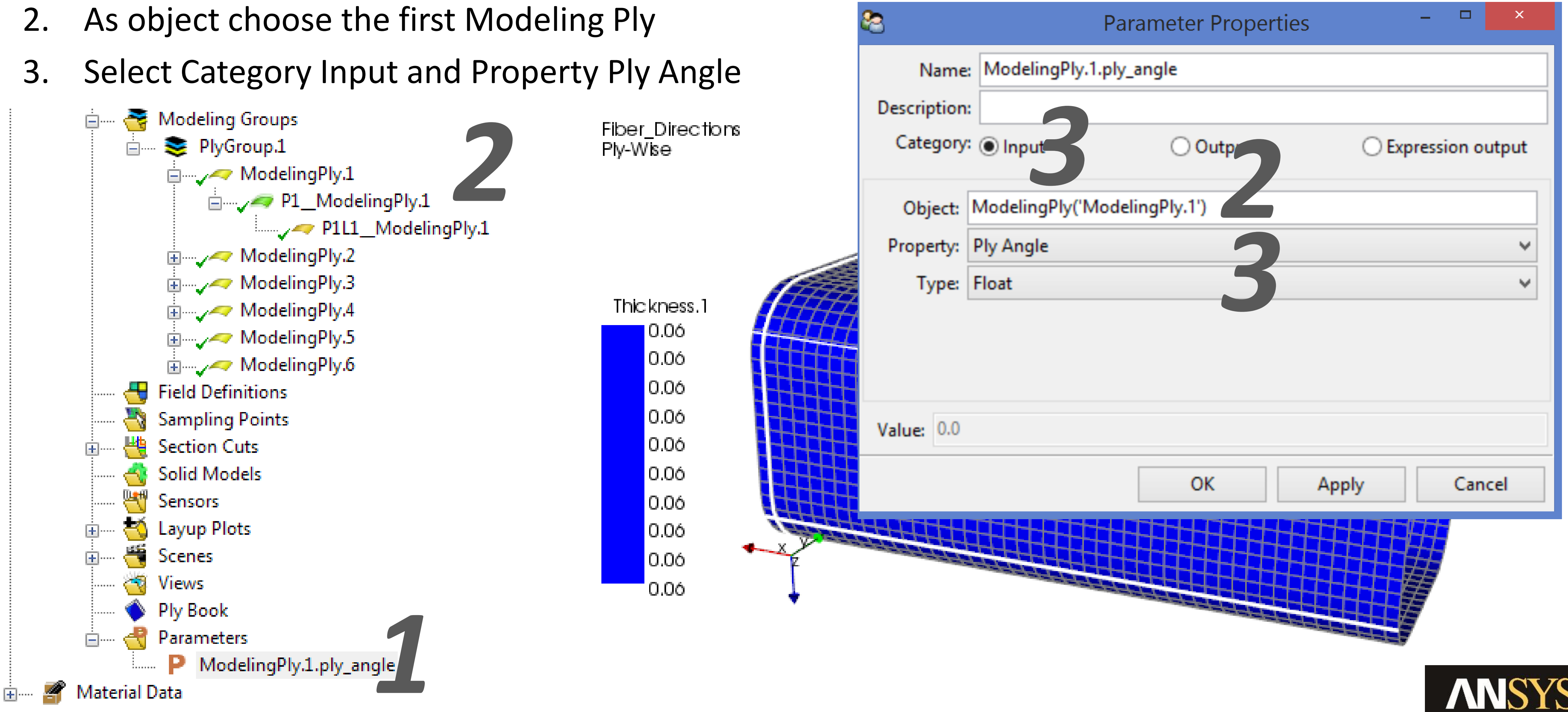
Table of Design Points

	A	B	C	D	E	F	G	H	I
1	Name							P13 - Sensor .1.Price	P11 - Torsion Stiffn
2	Units								N m
3	Current	0	0	0	0	0	0	2.5816	-2998
4	DP 1	45	-45	45	-45	45	-45	2.5816	-4235.5
5	DP 2	45	-45	0	0	45	-45	2.5816	-3852.2
6	DP 3	30	30	0	0	-30	-30	2.5816	-3618.4
*									

ANSYS

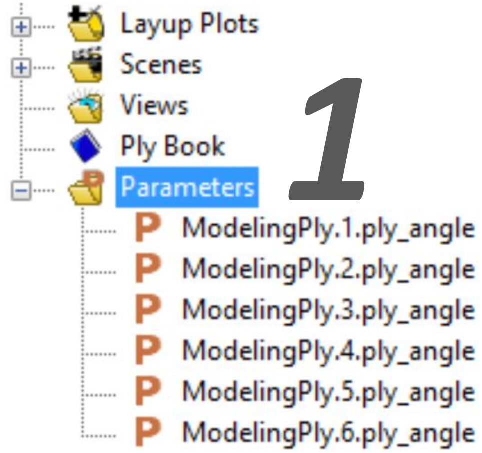
9. Workshop Parameters in ANSYS Composite PrepPost

1. Create a new parameter (Right mouse button on parameters → Create parameter)
2. As object choose the first Modeling Ply
3. Select Category Input and Property Ply Angle

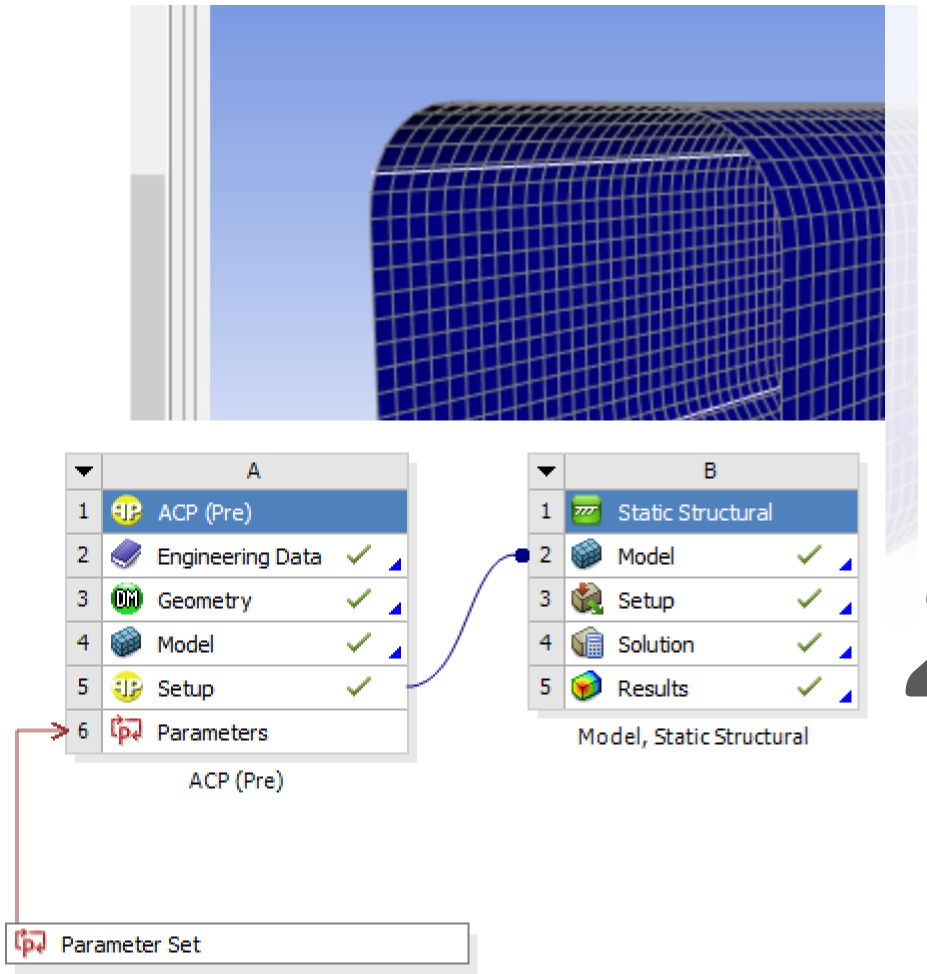


ANSYS

9. Workshop Parameters in ANSYS Composite PrepPost



1

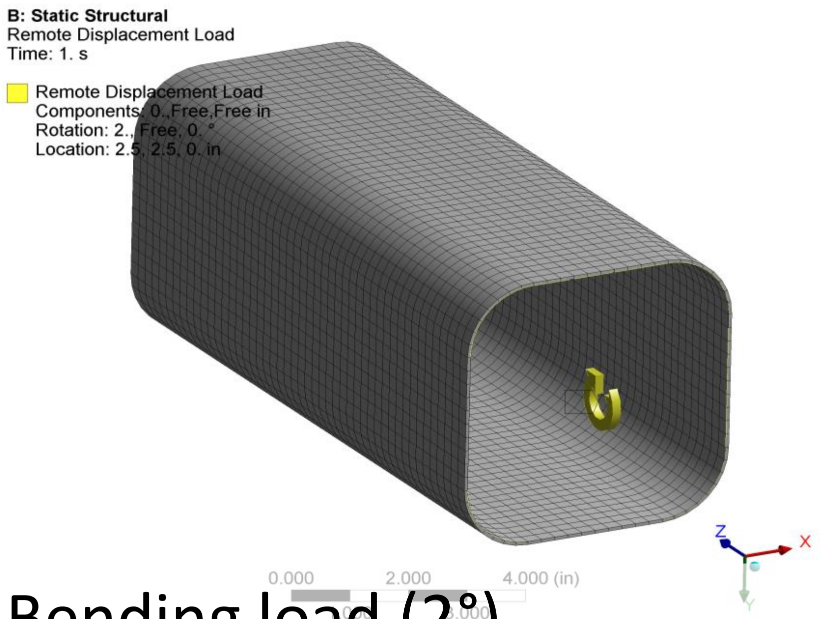


2

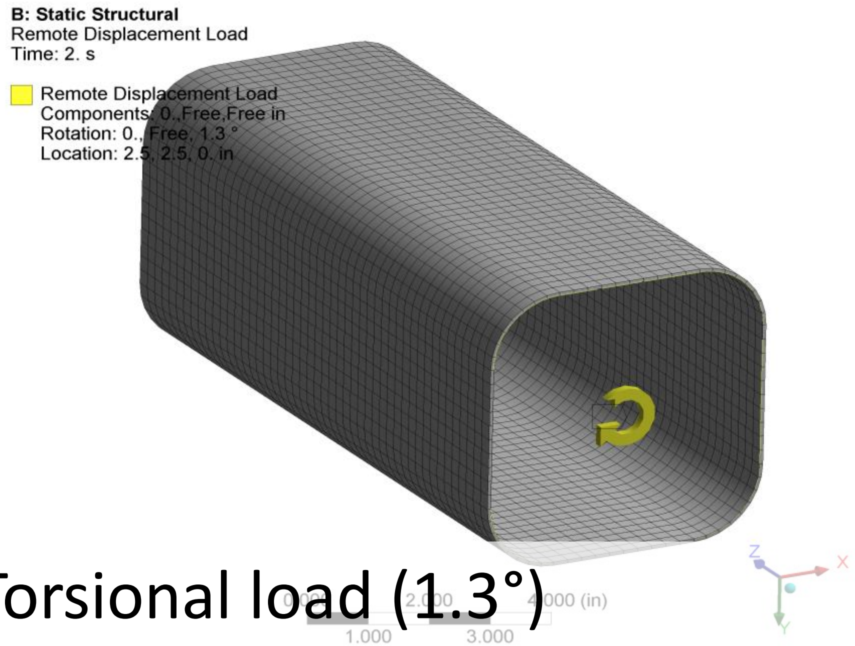
- Create 5 more input parameter for the ply angles of the next five modeling plies
- The input parameter are now accessible in the project overview
- In the next step we will add output parameter in ANSYS Mechanical for bending and torsion stiffness
- Update the setup in ACP (Pre) and open ANSYS Mechanical

9. Workshop Parameters in ANSYS Composite PrepPost

- The boundary conditions and loads have already been defined.
- Two loadsteps are defined in the analysis setup:
  1. The first loadstep will be a bending load
  2. The second loadstep will be a torsional load



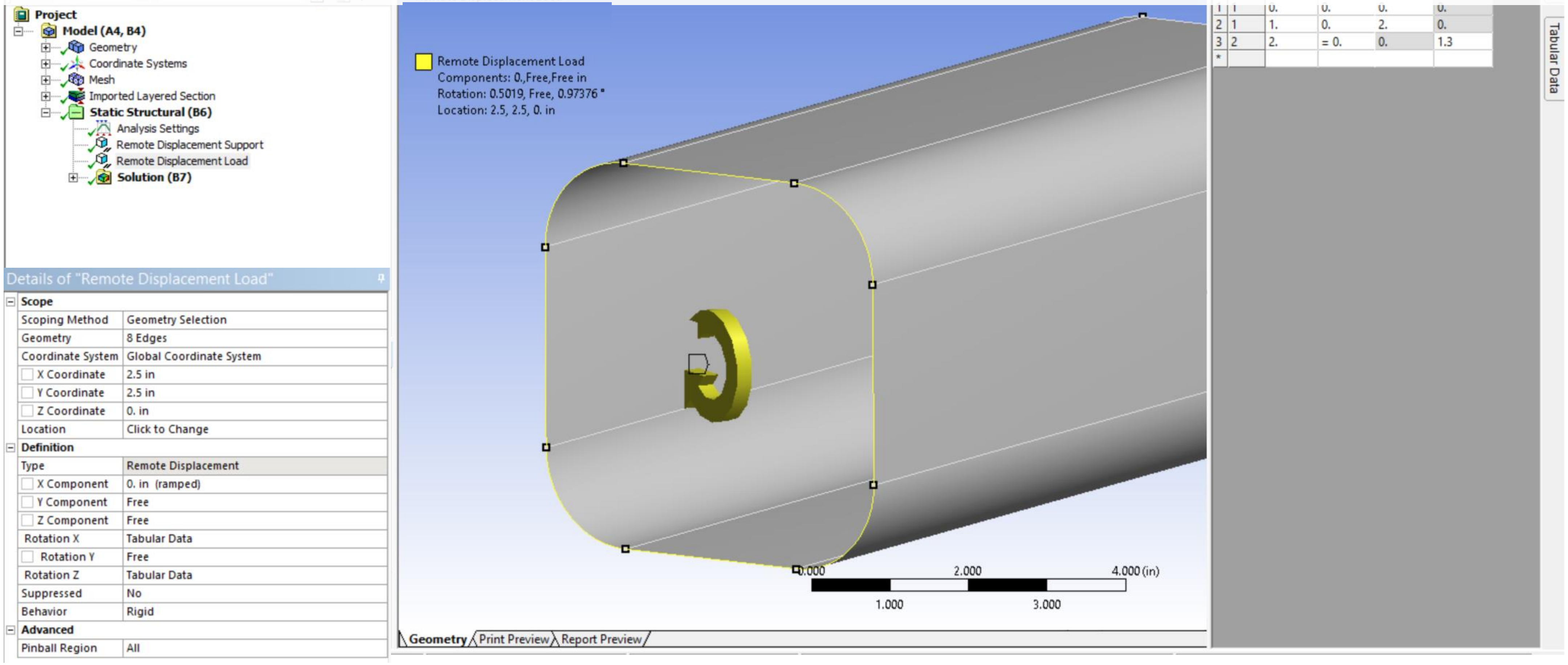
Bending load (2°)



Torsional load (1.3°)

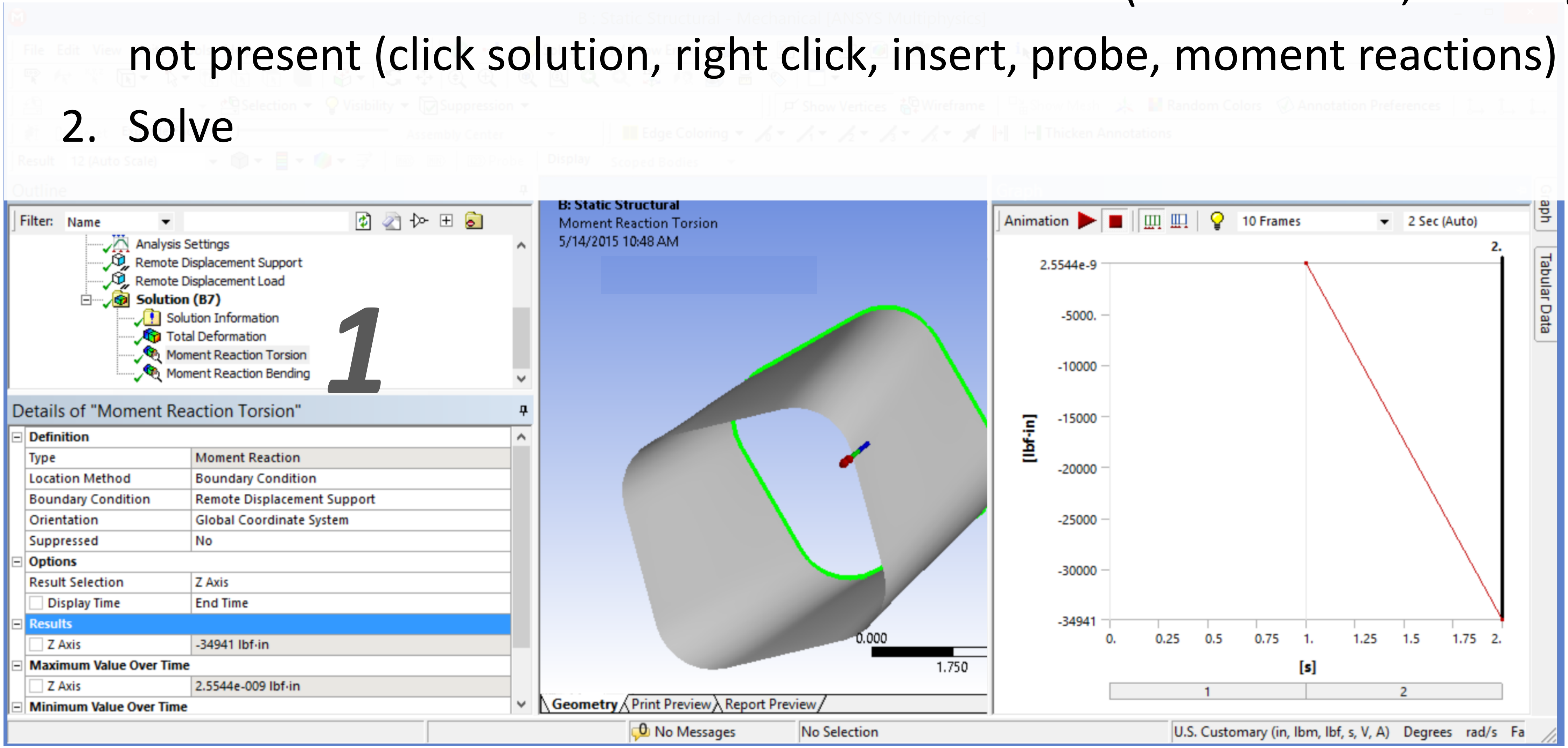
9. Workshop Parameters in ANSYS Composite PrepPost

- Boundary conditions and loads (torsion and bending are combined in a unique remote displacement load):



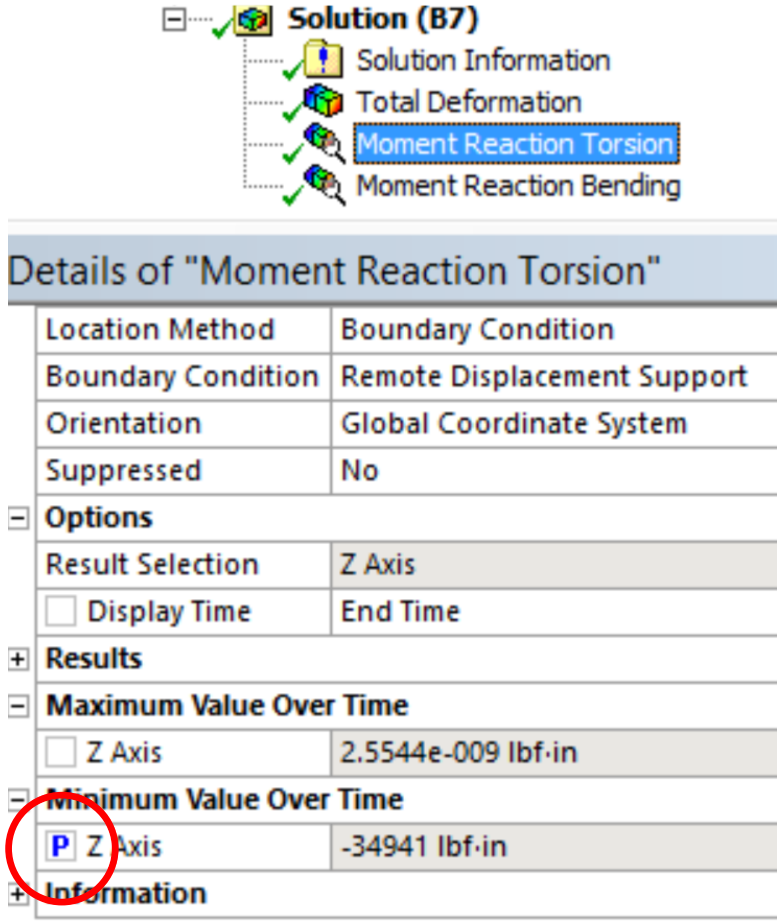
9. Workshop Parameters in ANSYS Composite PrepPost

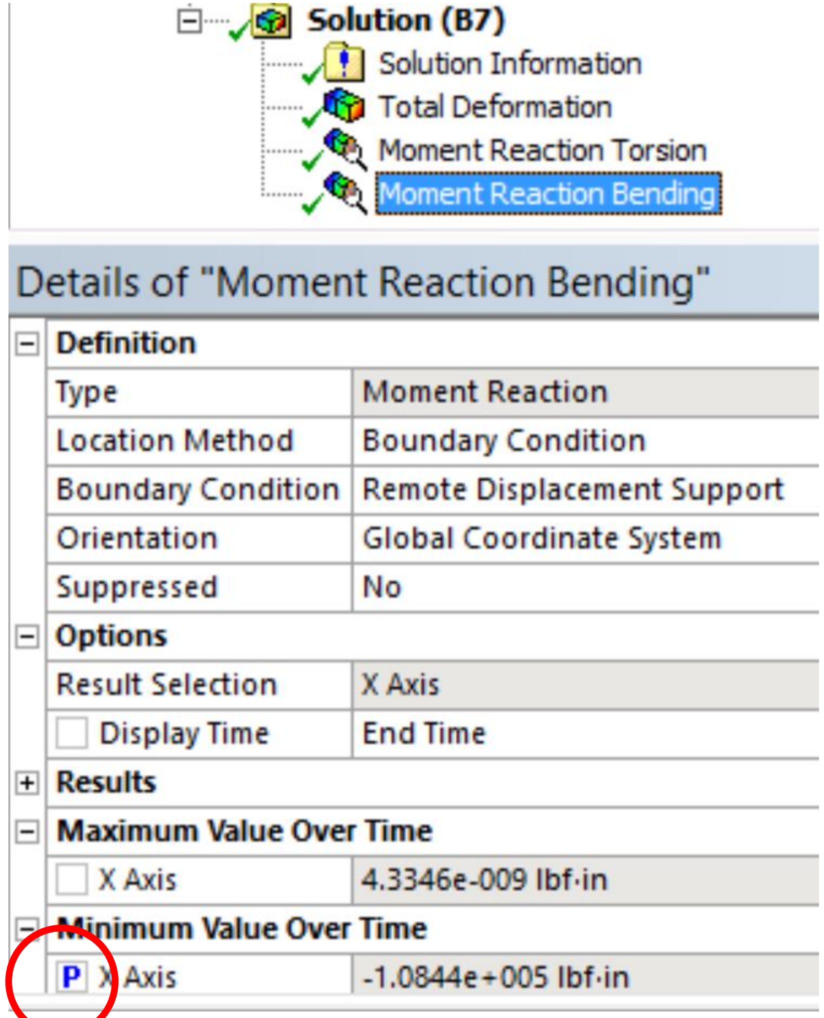
1. Add to the solution results for moment reactions (torsion Z axis, bending x axis) if not present (click solution, right click, insert, probe, moment reactions)
2. Solve



9. Workshop Parameters in ANSYS Composite PrepPost

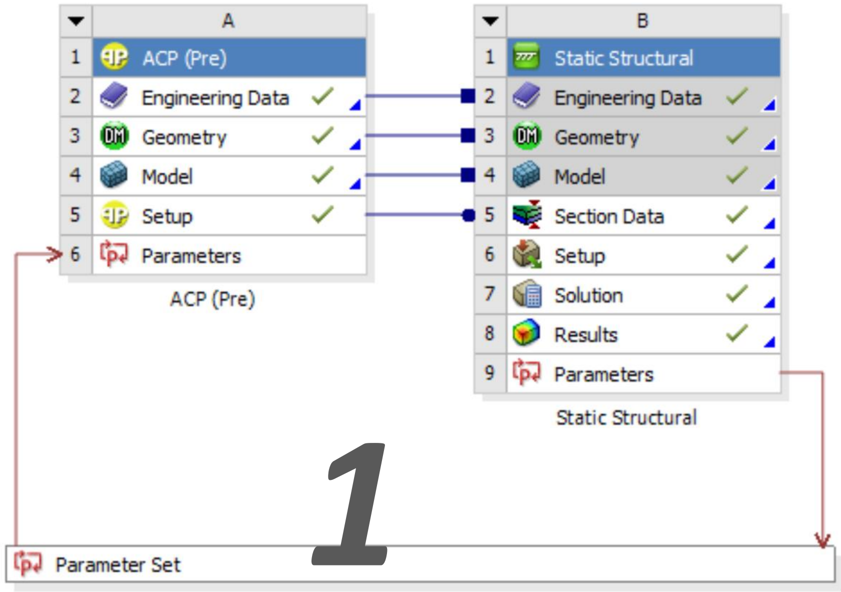
1. Add a new parameter for the minimum reaction moment of the bending and torsional load case

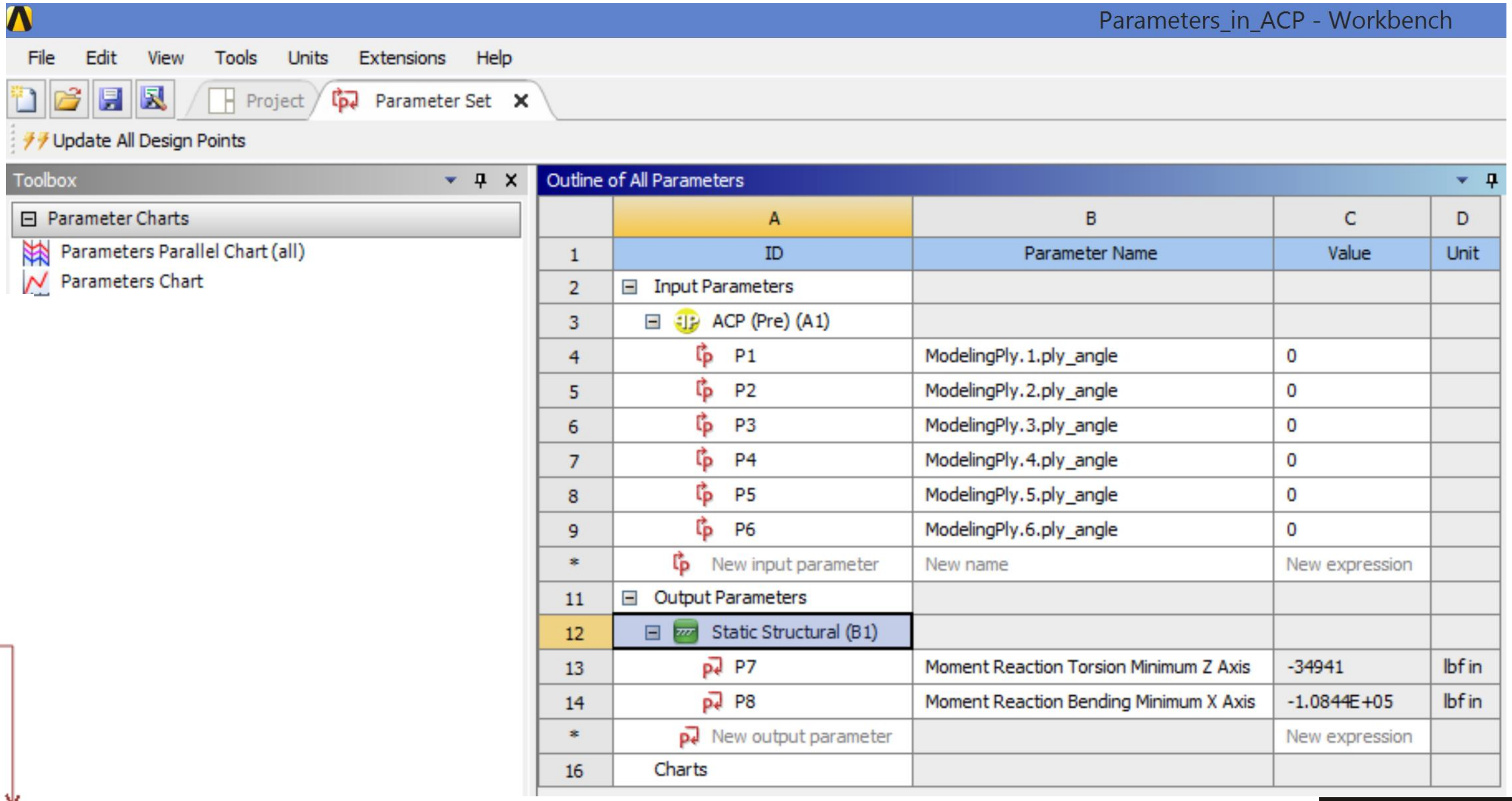




9. Workshop Parameters in ANSYS Composite PrepPost

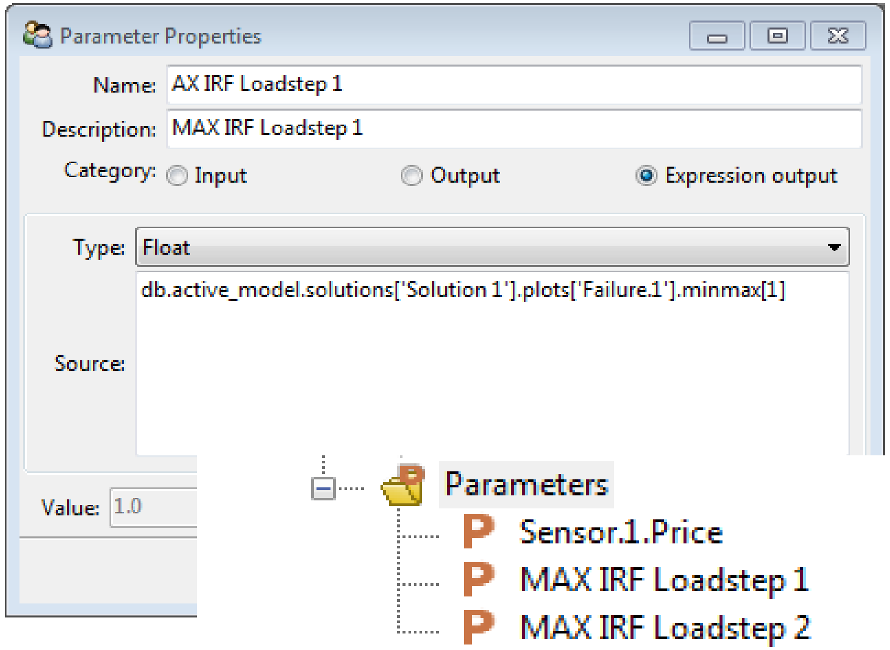
- Both, input and output parameter, are now available in the parameter set (Double click on parameter set in Workbench project overview)





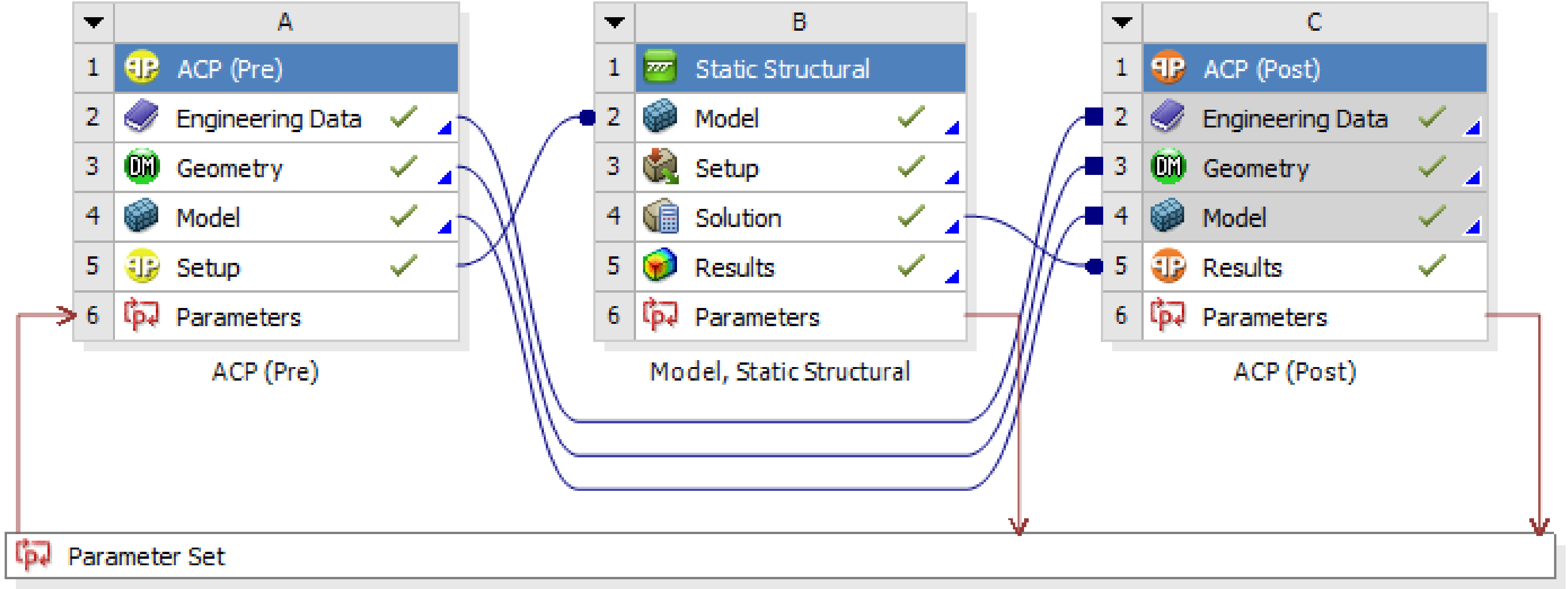
9. Workshop Parameters in ANSYS Composite PrepPost

- In the next step we will add output parameters in ANSYS Composite PrepPost.
- Output parameters are either available from sensors, modeling ply information or by so called expressions. Expressions allow the definition of failure criteria and other results as output parameter.
- Add a new ACP postprocessing system (ACP Post) and connect it to the ACP (Pre) model and the solution of ANSYS Mechanical.



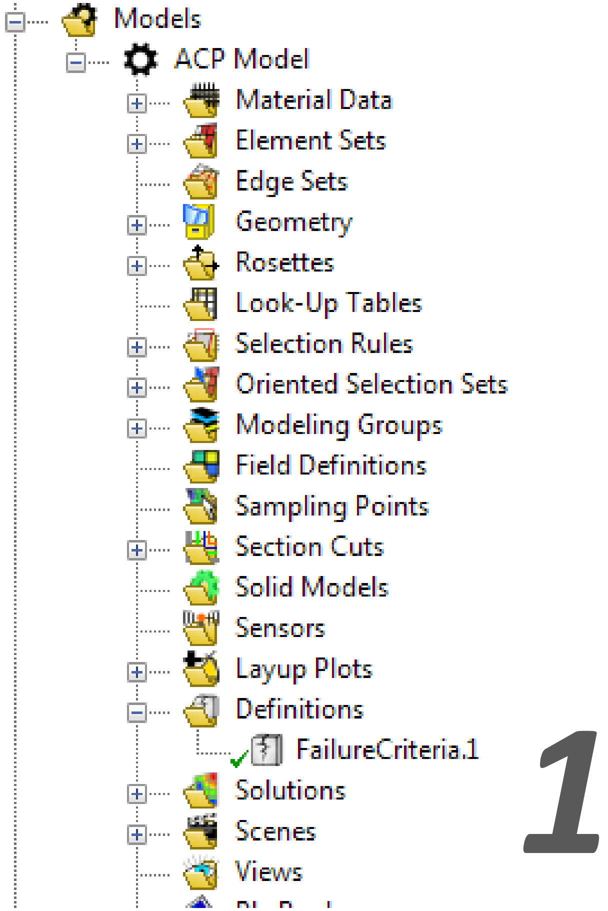
9. Workshop Parameters in ANSYS Composite PrepPost

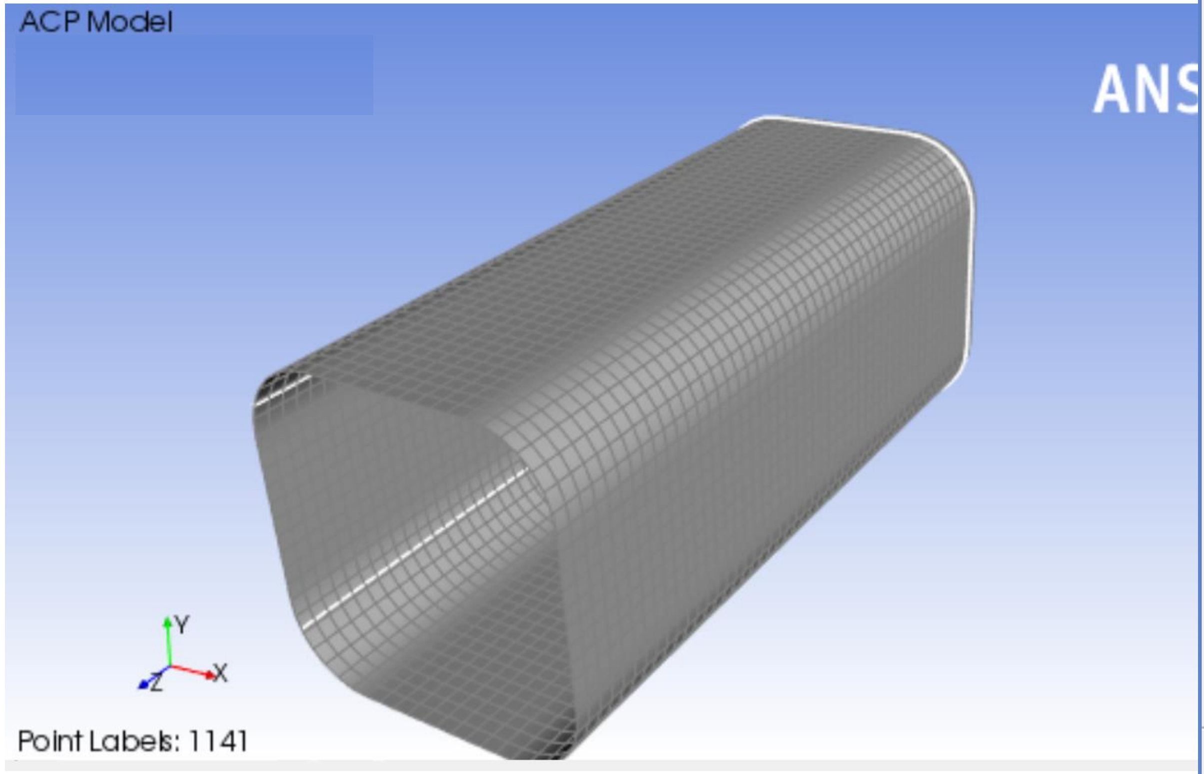
Add a new ACP postprocessing system (ACP Post) and connect it to the ACP (Pre) model and the solution of ANSYS Mechanical:

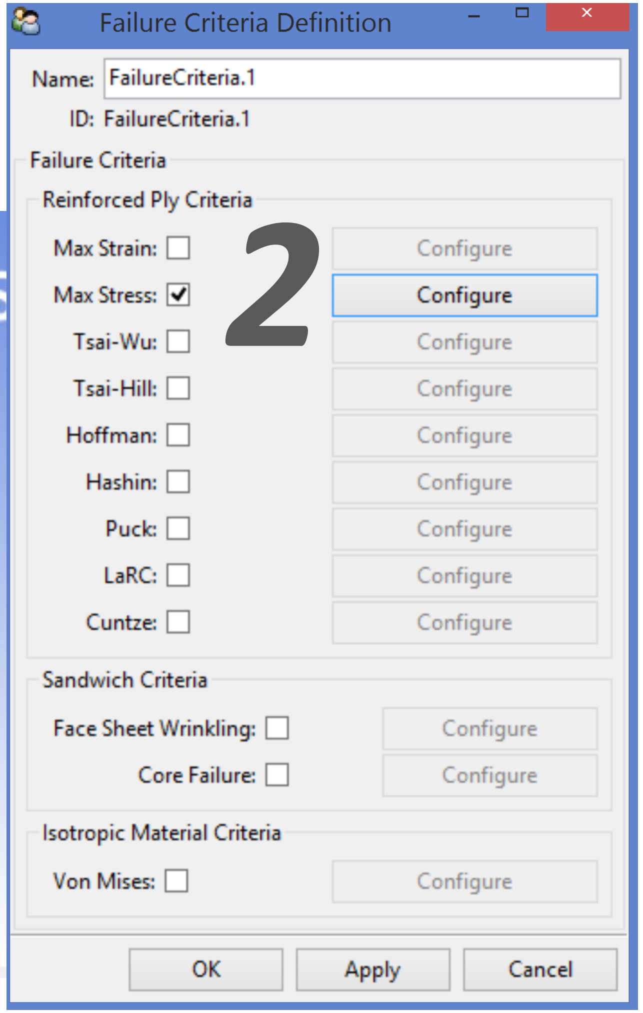


9. Workshop Parameters in ANSYS Composite PrepPost

1. Add failure criteria to definitions
2. Select all Max Stress failure criteria

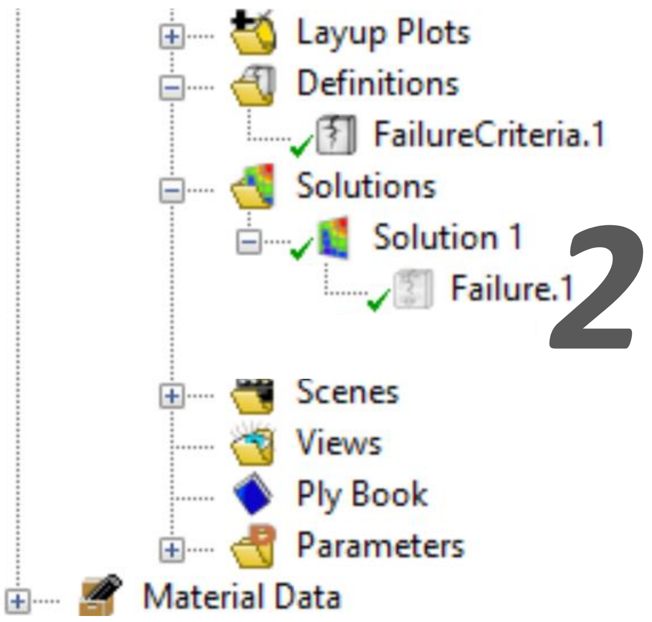


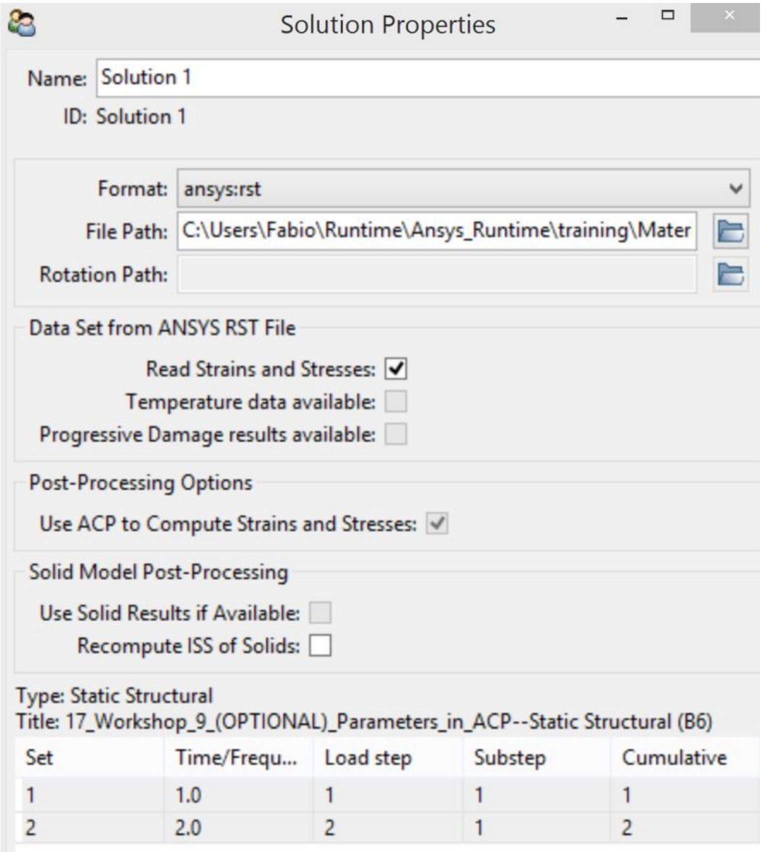


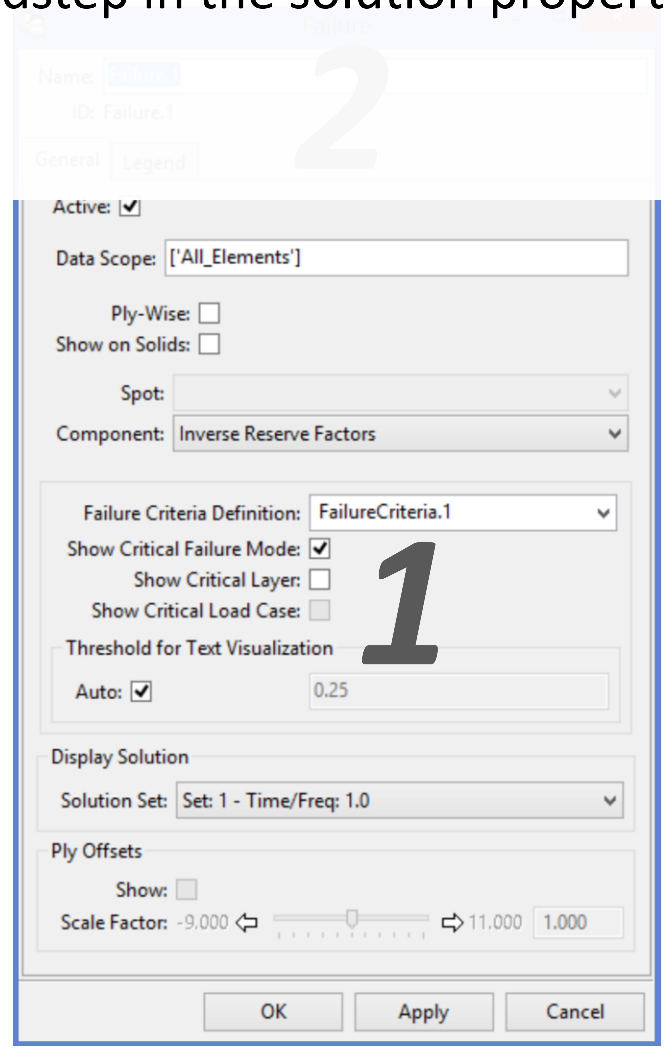


9. Workshop Parameters in ANSYS Composite PrepPost

1. Both loadsteps are available in the solution. Selecting a loadstep in the solution properties will select it for postprocessing
2. Add a Failure plot to the solution

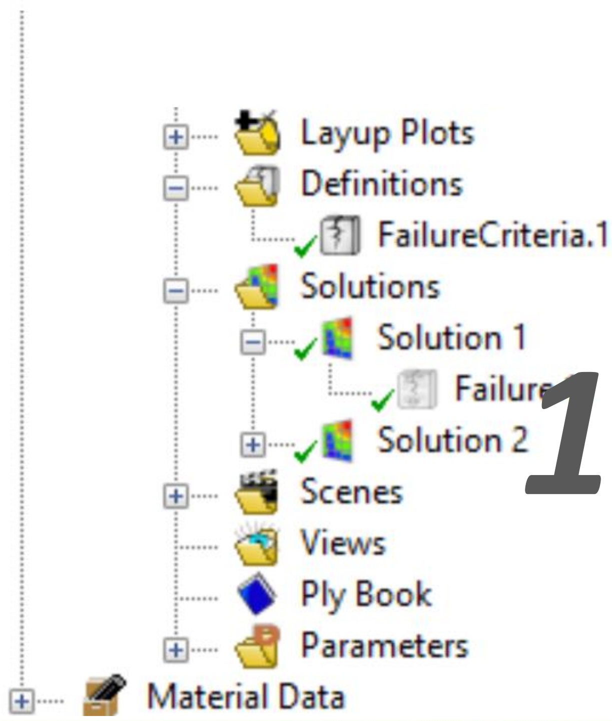


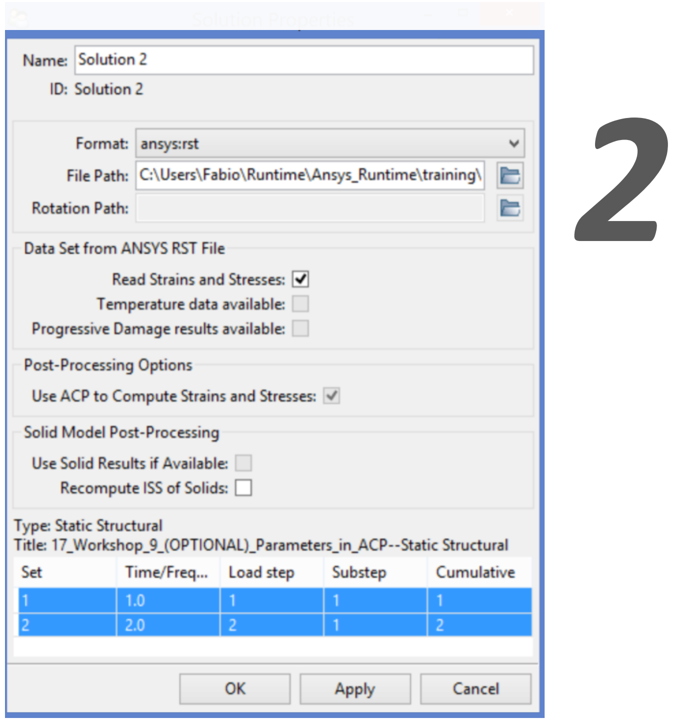


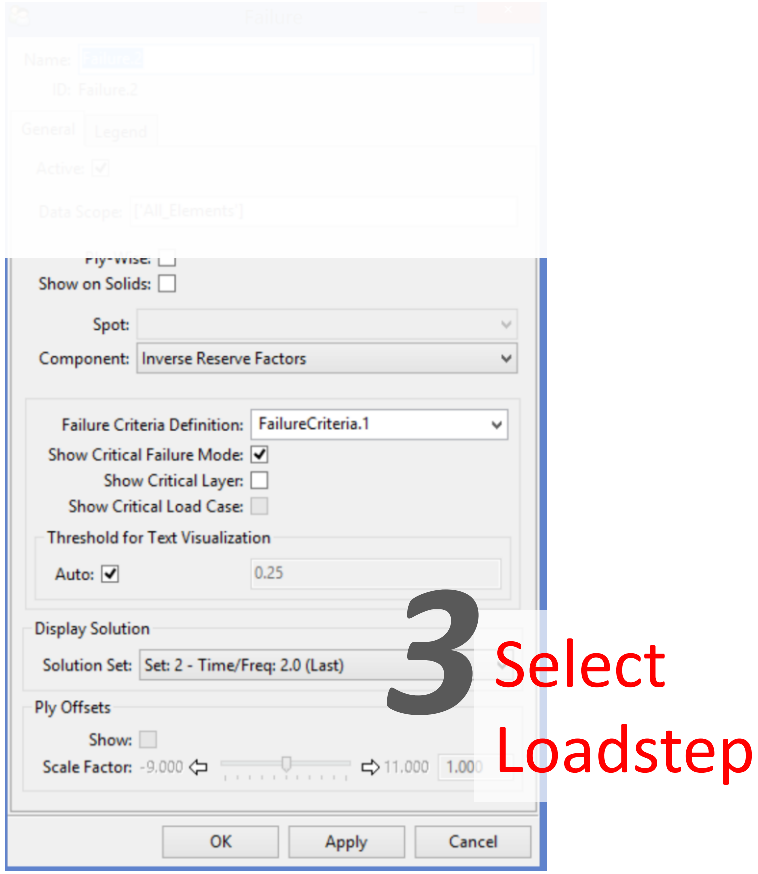


9. Workshop Parameters in ANSYS Composite PrepPost

1. We will need both loadsteps simultaneously. Therefore we will have to add a new solution manually (Right mouse button on Solutions → Import Results)
2. Copy the file path from the first solution and rename the new solution to Solution 2. Add a Failure plot to both solutions
3. Select the first loadstep in Solution 1 and the second loadstep in Solution 2 when adding a Failure plot



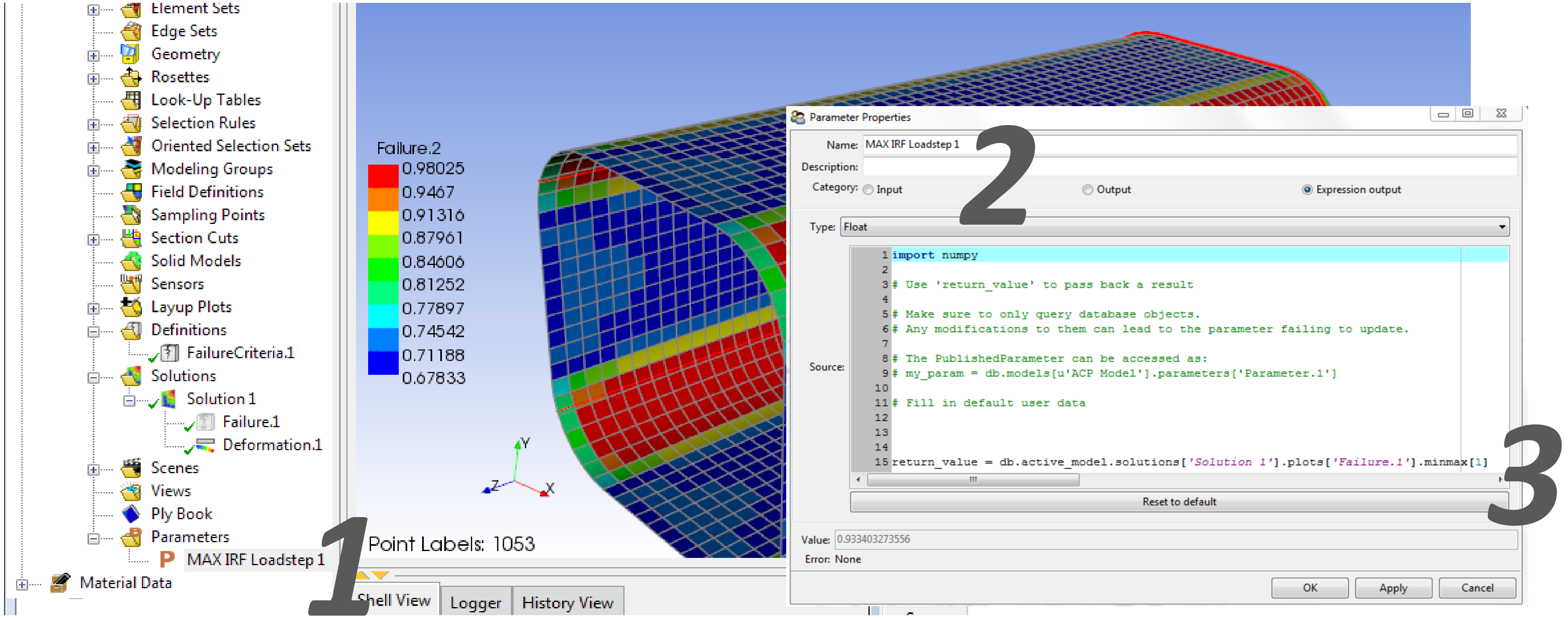




9. Workshop Parameters in ANSYS Composite PrepPost

1. Create a new parameter for each failure plot
2. Rename the parameter to MAX IRF Loadstep 1 (2) and switch to output expression
3. Define expression : db.active_model.solutions['Solution 1'].plots['Failure.1'].minmax[1]

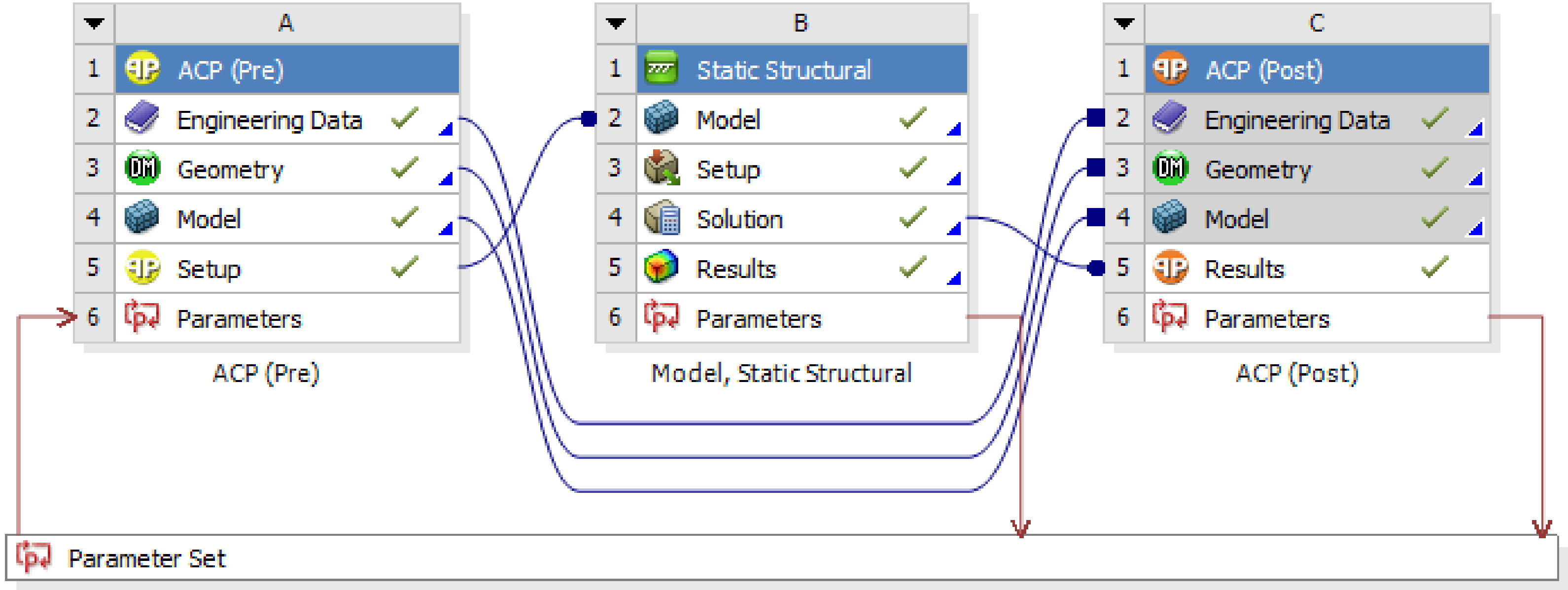
   db.active_model.solutions['Solution 2'].plots['Failure.2'].minmax[1]



9. Workshop Parameters in ANSYS Composite PrepPost

- The defined expression will retrieve the maximal value of the result shown on plots.
- This can be used to define parameters for ply wise results or as shown here for overall plots.

9. Workshop Parameters in ANSYS Composite PrepPost

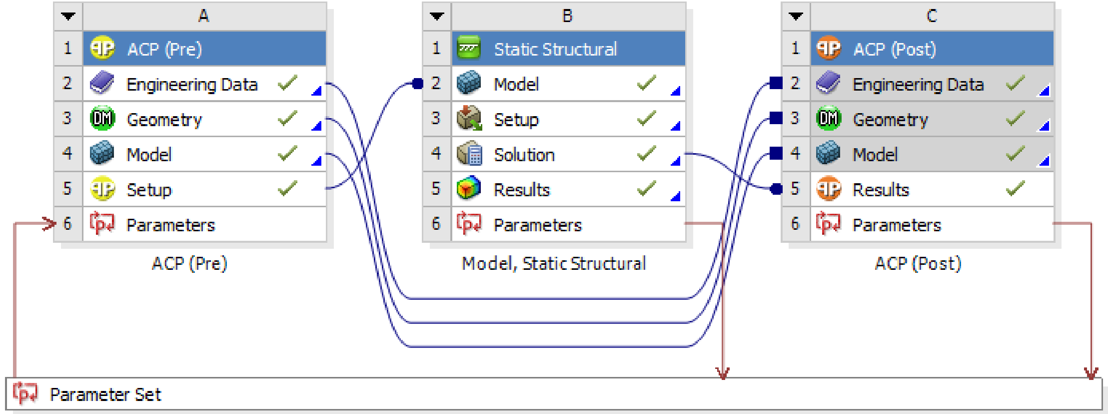


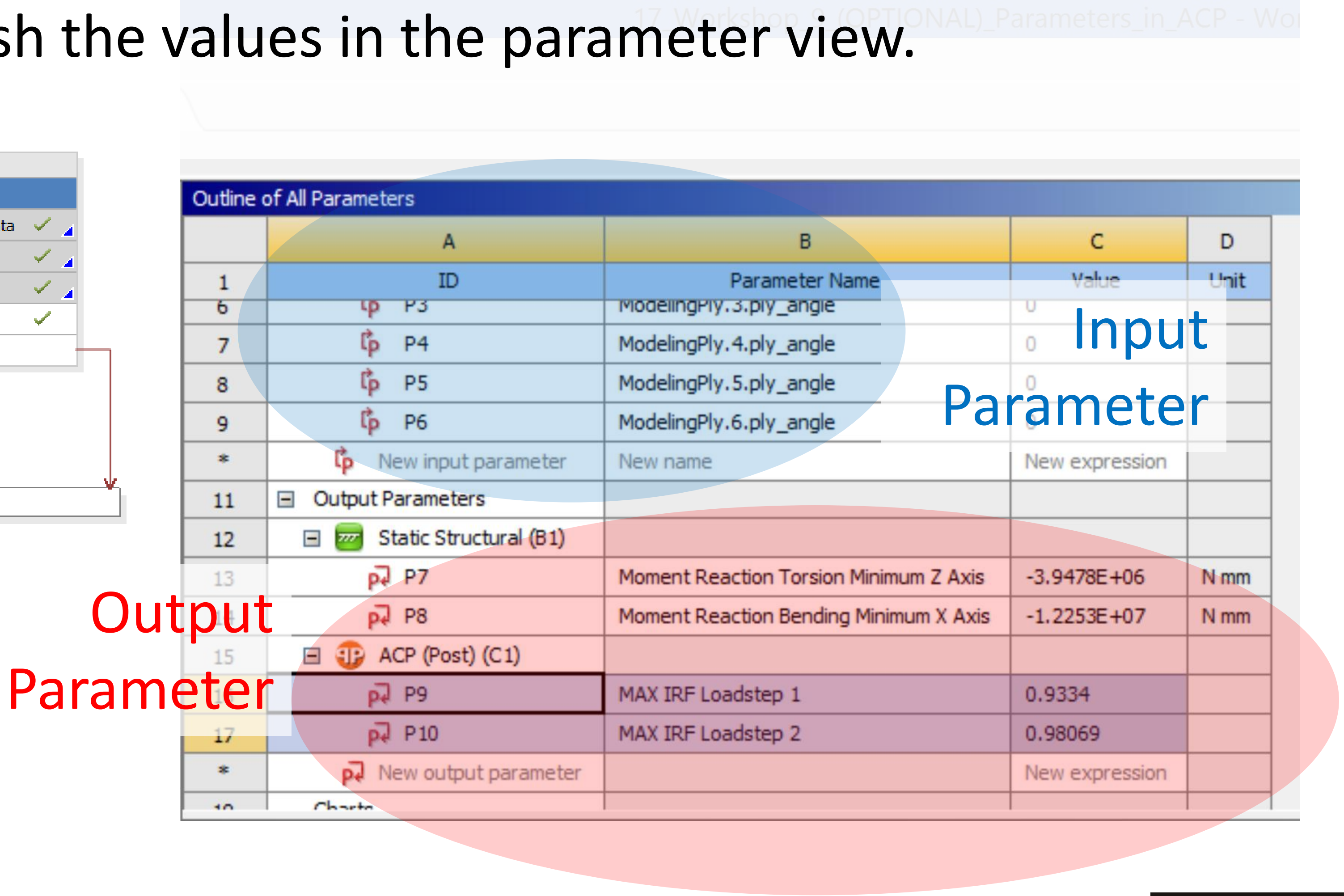
Outline of Schematic C6: Parameters

	A	B	C	D
1	ID	Parameter Name	Value	Unit
2	Input Parameters			
*	New input parameter	New name	New expression	
4	Output Parameters			
5	ACP (Post) (C1)			
6	P9	MAX IRF Loadstep 1	0.9334	
7	P10	MAX IRF Loadstep 2	0.98069	
*	New output parameter		New expression	
9	Charts			

9. Workshop Parameters in ANSYS Composite PrepPost

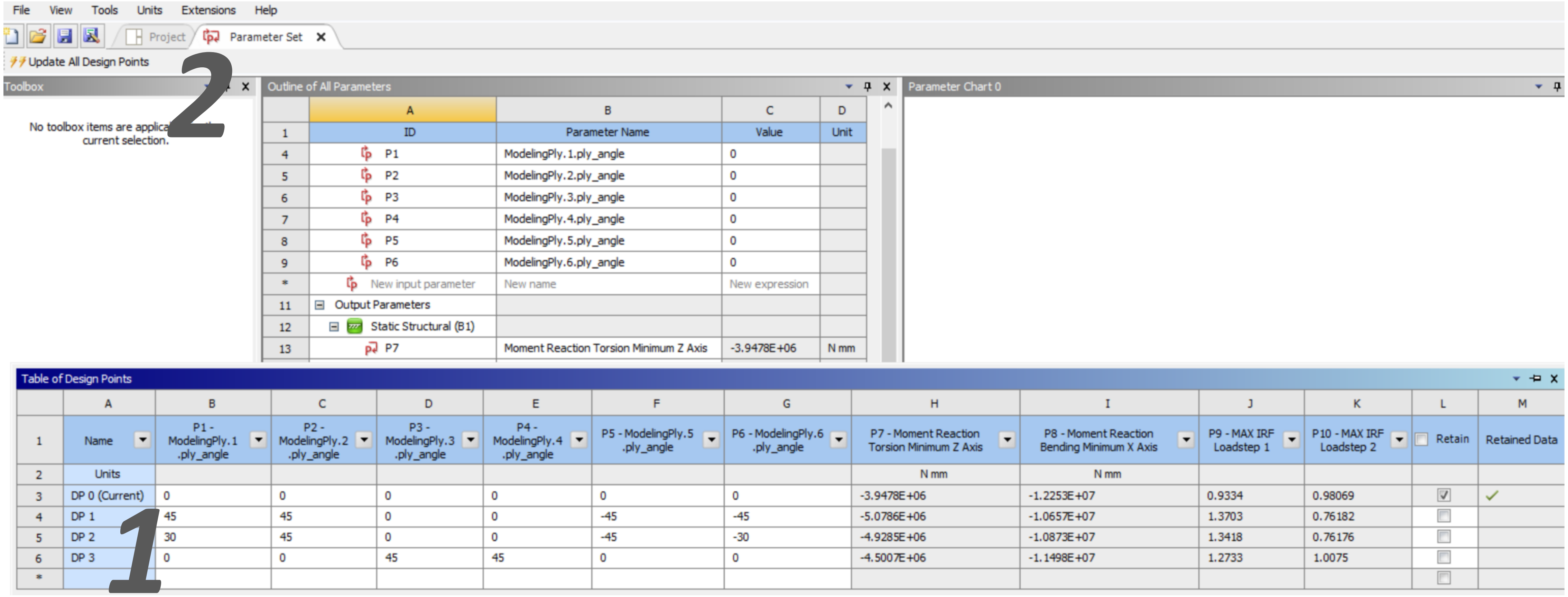
- All input and output parameter are now available in the parameter set.
- Update the project to refresh the values in the parameter view.





9. Workshop Parameters in ANSYS Composite PrepPost

- Define new design points in the Parameter Set by entering values for the ply angles in the line below current in Table of Design Points
- Update all design points to solve the defined design points and evaluate the results



	A	B	C	D
1	ID	Parameter Name	Value	Unit
4	P1	ModelingPly.1.ply_angle	0	
5	P2	ModelingPly.2.ply_angle	0	
6	P3	ModelingPly.3.ply_angle	0	
7	P4	ModelingPly.4.ply_angle	0	
8	P5	ModelingPly.5.ply_angle	0	
9	P6	ModelingPly.6.ply_angle	0	
*	New input parameter	New name	New expression	
11	Output Parameters			
12	Static Structural (B1)			
13	P7	Moment Reaction Torsion Minimum Z Axis	-3.9478E+06	N mm

	A	B	C	D	E	F	G	H	I	J	K	L	M
1	Name	P1 - ModelingPly.1 .ply_angle	P2 - ModelingPly.2 .ply_angle	P3 - ModelingPly.3 .ply_angle	P4 - ModelingPly.4 .ply_angle	P5 - ModelingPly.5 .ply_angle	P6 - ModelingPly.6 .ply_angle	P7 - Moment Reaction Torsion Minimum Z Axis	P8 - Moment Reaction Bending Minimum X Axis	P9 - MAX IRF Loadstep 1	P10 - MAX IRF Loadstep 2	Retain	Retained Data
2	Units							N mm	N mm				
3	DP 0 (Current)	0	0	0	0	0	0	-3.9478E+06	-1.2253E+07	0.9334	0.98069	☑	✓
4	DP 1	45	45	0	0	-45	-45	-5.0786E+06	-1.0657E+07	1.3703	0.76182	☐	
5	DP 2	30	45	0	0	-45	-30	-4.9285E+06	-1.0873E+07	1.3418	0.76176	☐	
6	DP 3	0	0	45	45	0	0	-4.5007E+06	-1.1498E+07	1.2733	1.0075	☐	
*												☐	