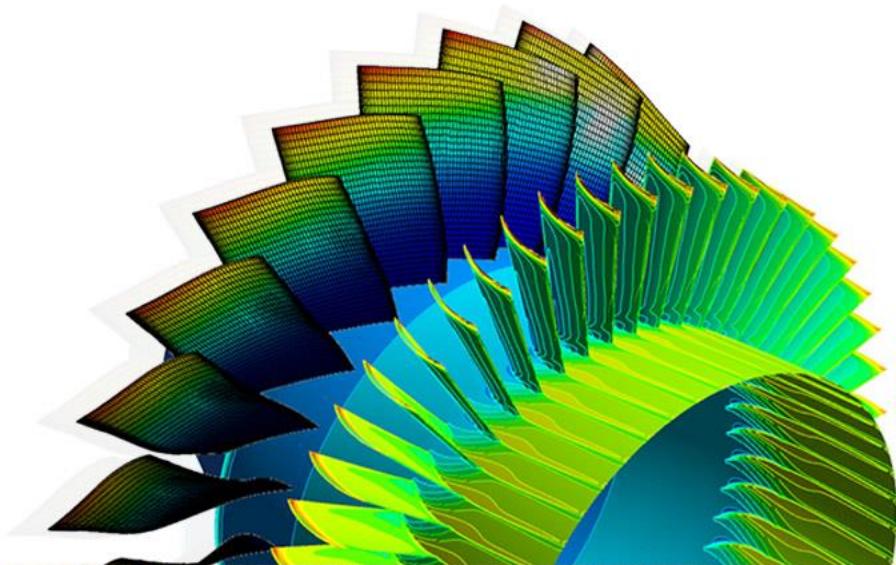




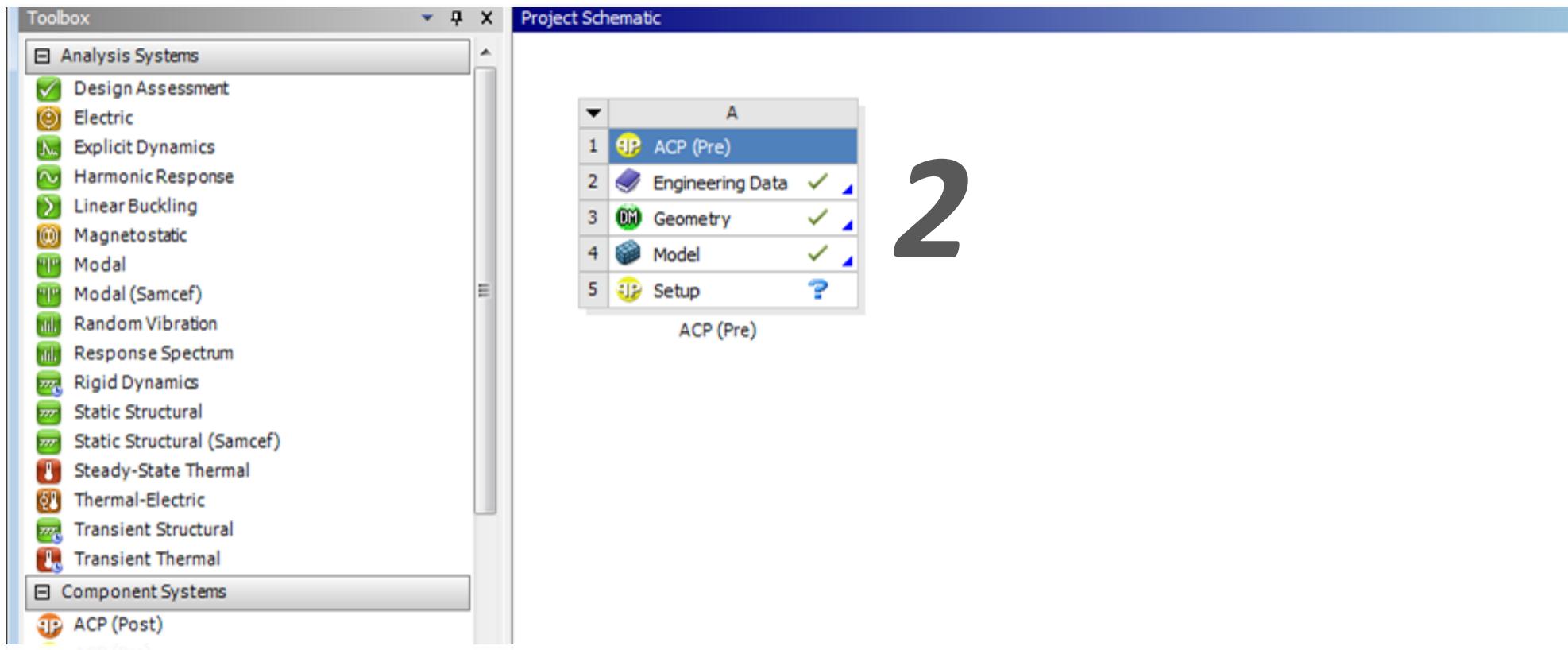
ANSYS Composite PrepPost 19.0

Workshop 04.2 – T-Joint



4. Workshop T-Joint

Start ANSYS Workbench and Restore Archive



1. Start ANSYS Workbench and restore Archive *T-Joint_FROM_START_18.0.wbpz*
2. Edit Engineering Data

4. Workshop T-Joint

1

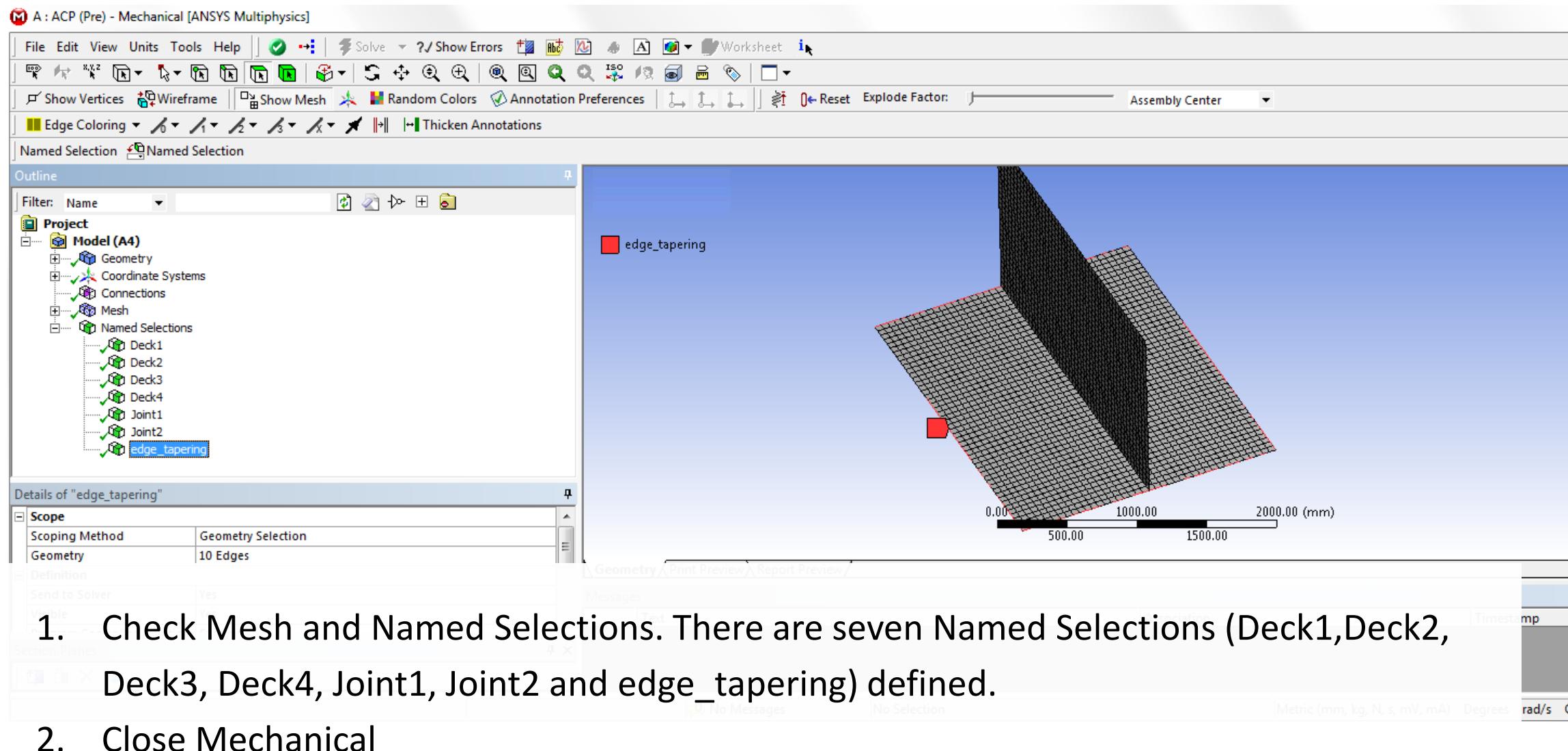
	A	B	C	D	E
1	Contents of Engineering Data		Source	Description	
2	Material				
3	Epoxy_Carbon_UD_395GPa_Prepreg		C:\Pr		
4	Honeycomb		C:\Pr		
*	Click here to add a new material				

Properties of Outline Row 3: Epoxy_Carbon_UD_395GPa_Prepreg

	A	B	C	D	E
1	Property	Value	Unit		
2	Density	1.54E-09	mm ⁻³ t		
3	Orthotropic Secant Coefficient of Thermal Expansion				
9	Orthotropic Elasticity				
10	Young's Modulus X direction	2.09E+05	MPa		
11	Young's Modulus Y direction	9450	MPa		
12	Young's Modulus Z direction	9450	MPa		
13	Poisson's Ratio XY	0.27			
14	Poisson's Ratio YZ				
15	Poisson's Ratio XZ				

1. Check Engineering Data. There are two materials (Epoxy Carbon UD 395 Gpa PrePreg and Honeycomb) defined for layer and core, both materials are from the Engineering Database.
2. Return to Project
3. Edit Model

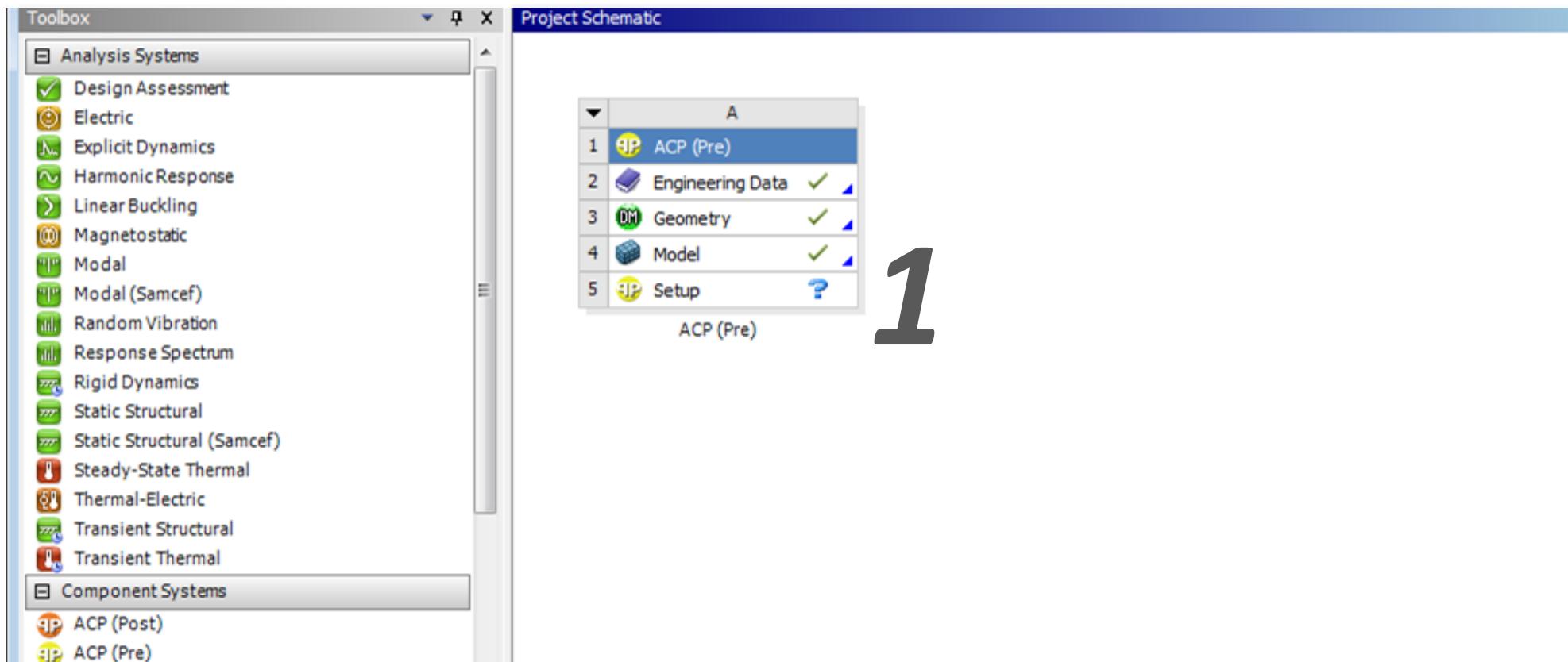
4. Workshop T-Joint



1. Check Mesh and Named Selections. There are seven Named Selections (Deck1, Deck2, Deck3, Deck4, Joint1, Joint2 and edge_tapering) defined.
2. Close Mechanical

4. Workshop T-Joint

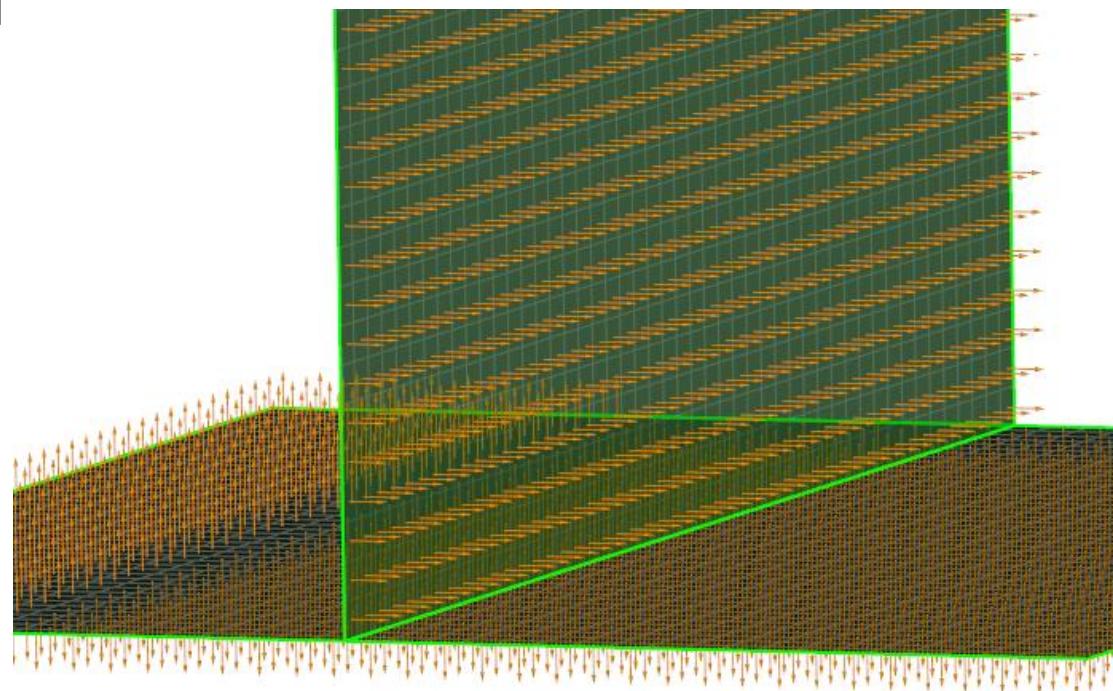
Start ANSYS Composite PrepPost



1. Start ANSYS Composite PrepPost

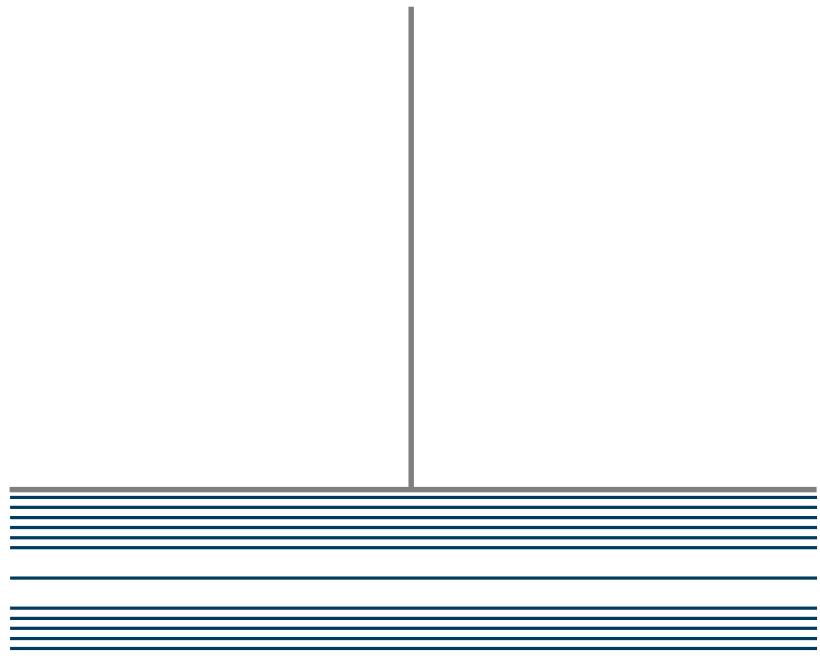
4. Workshop T-Joint

- Using the Oriented Selection Sets we define composite layups **without** considering the element normal directions.
- Section offsets are calculated by ANSYS Composite PrepPost before solving the model

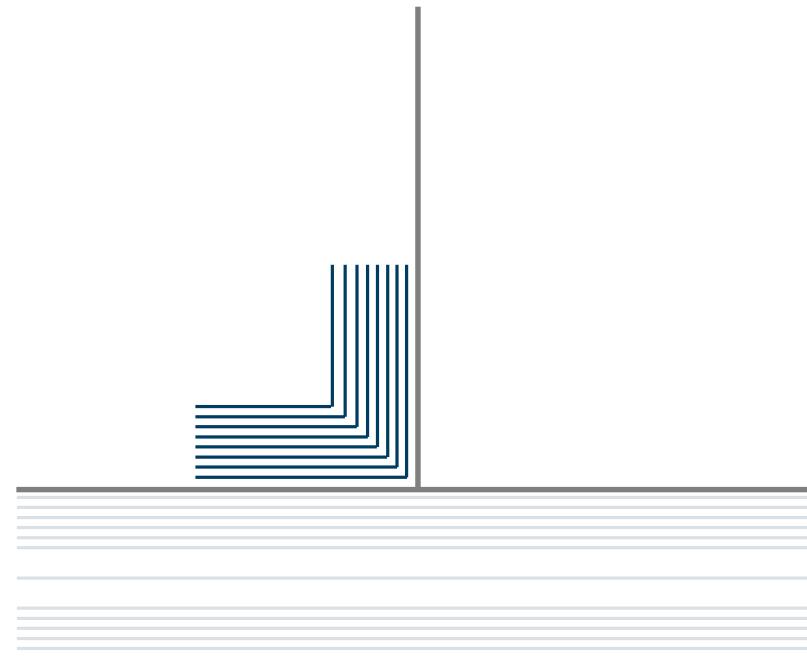


4. Workshop T-Joint

- Five steps to define the composite layup for the T-Joint including reinforcement layers.



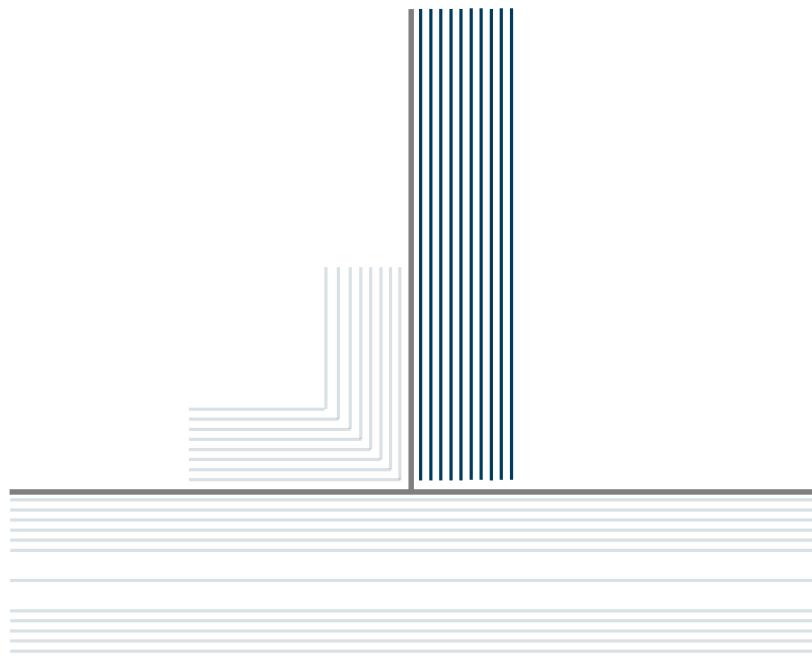
Step One
Base Plate



Step Two
Bonding

4. Workshop T-Joint

- Five steps to define the composite layup for the T-Joint including reinforcement layers.



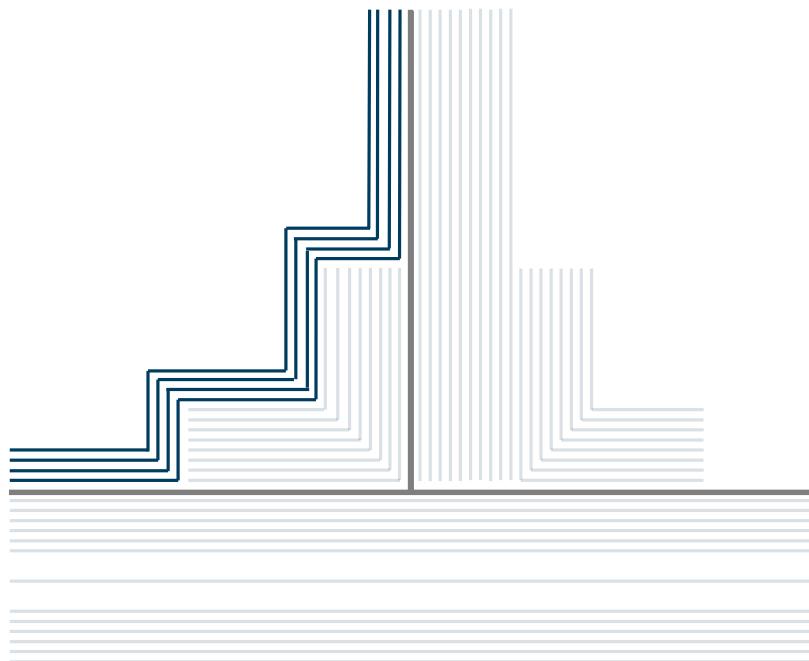
Step Three
Base Stinger



Step Four
Bonding

4. Workshop T-Joint

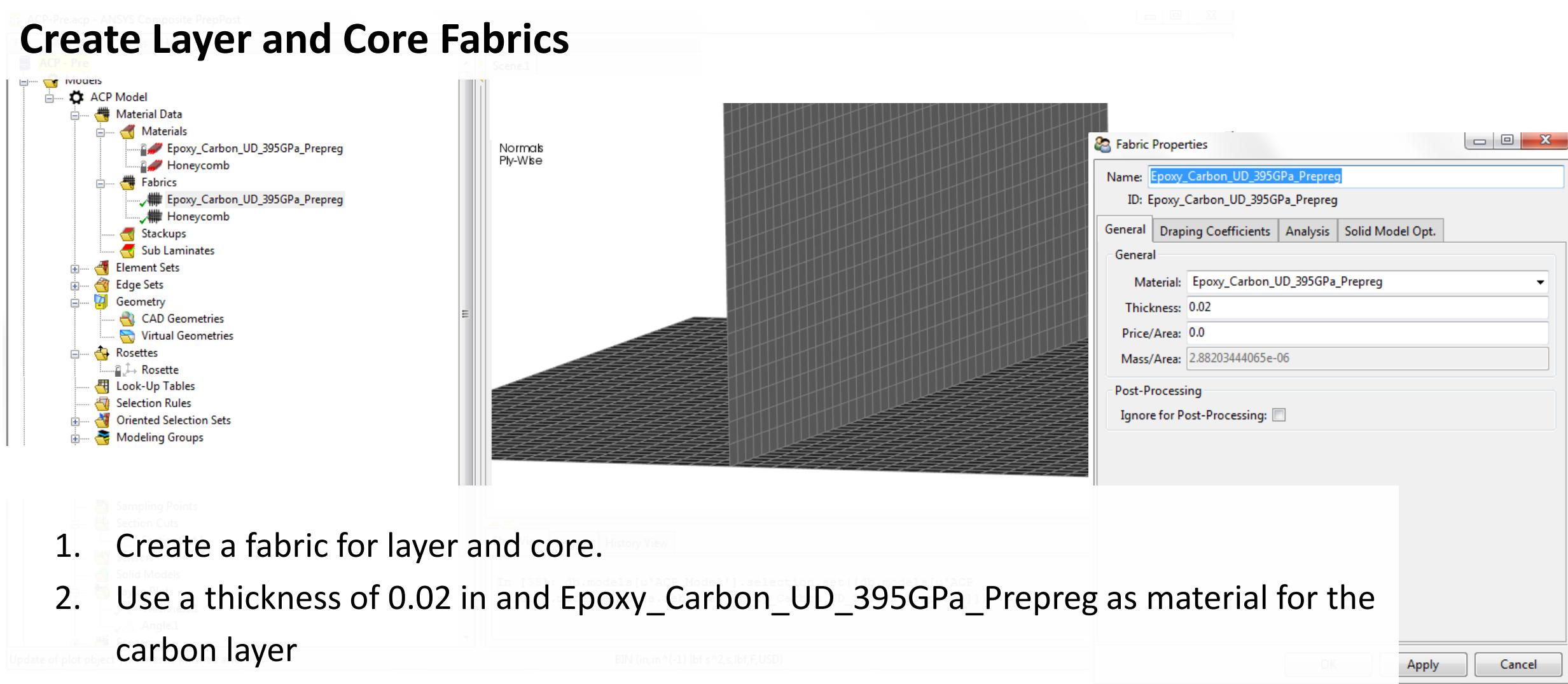
- Five steps to define the composite layup for the T-Joint including reinforcement layers.



Step Five
Base Cover

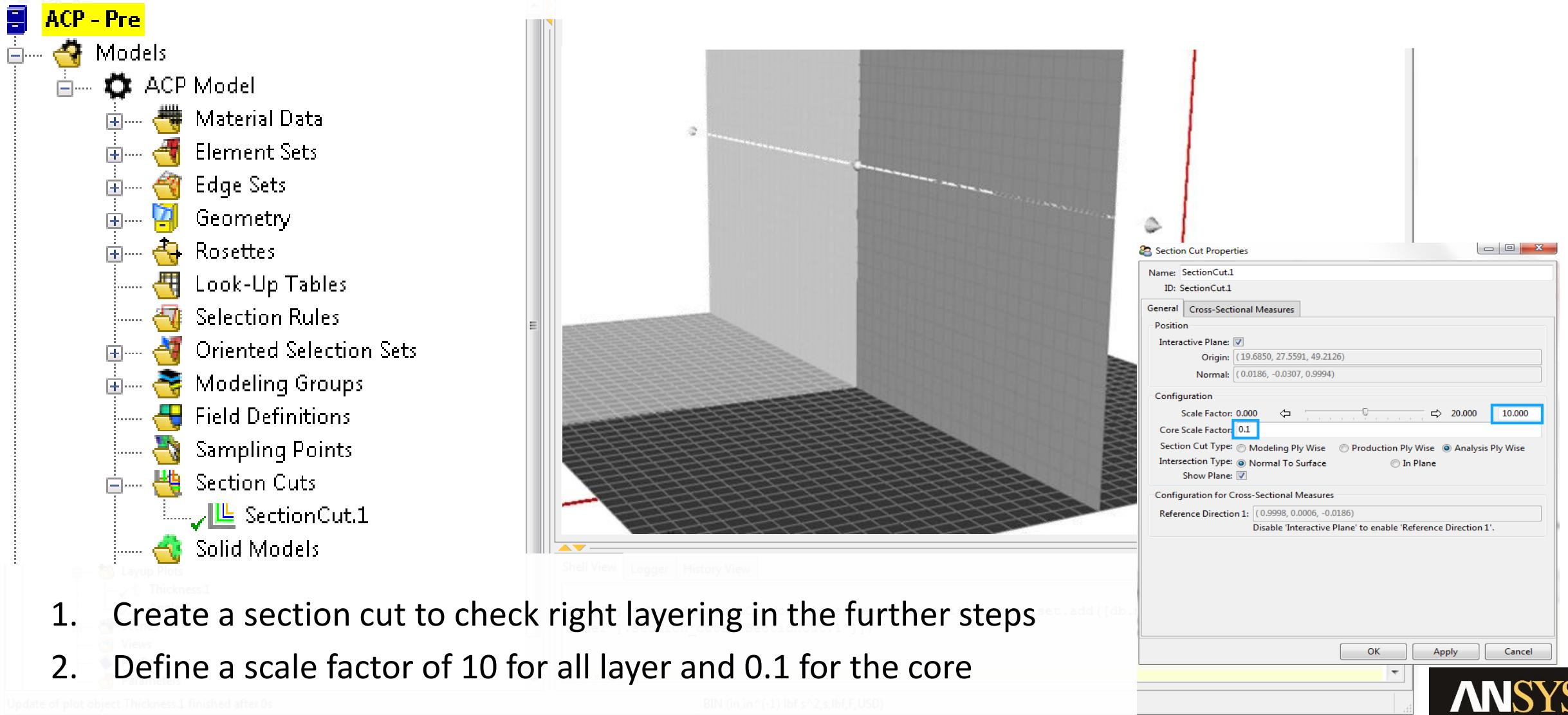
4. Workshop T-Joint

Create Layer and Core Fabrics



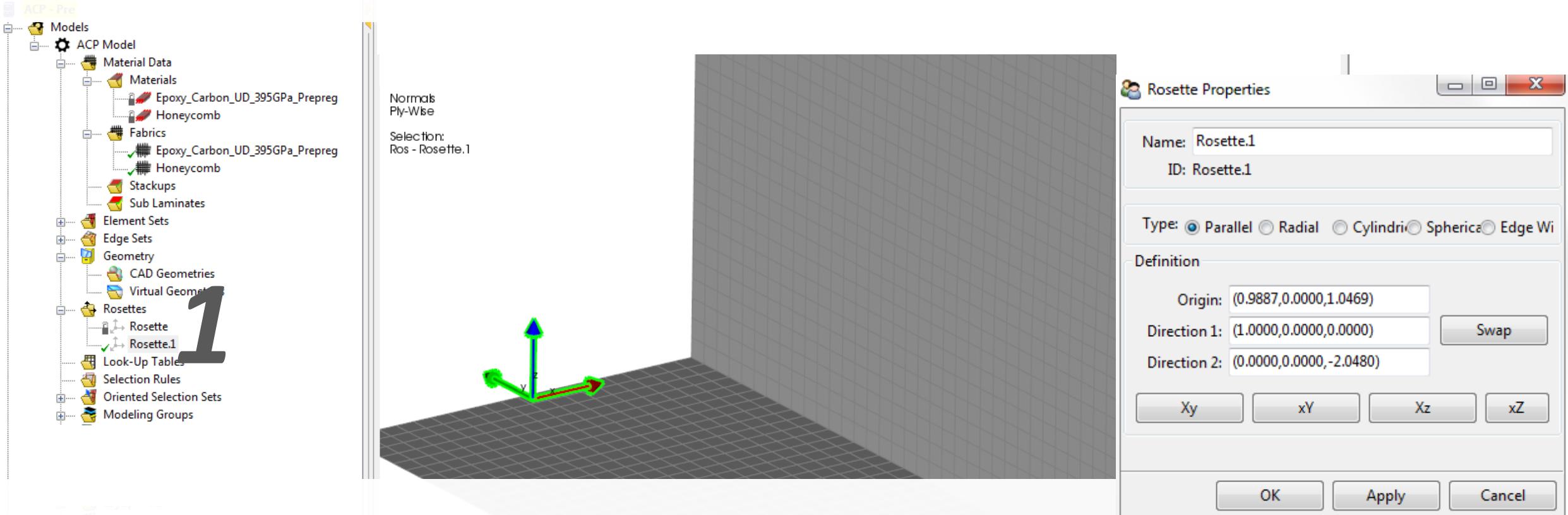
4. Workshop T-Joint

Create a Section Cut



4. Workshop T-Joint

Create a Rosette

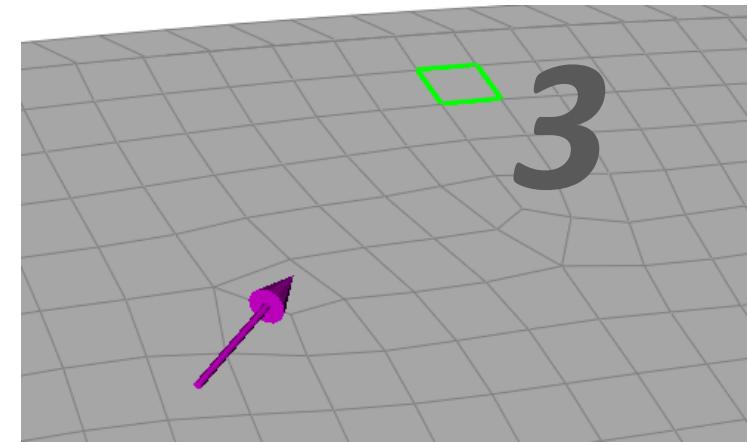
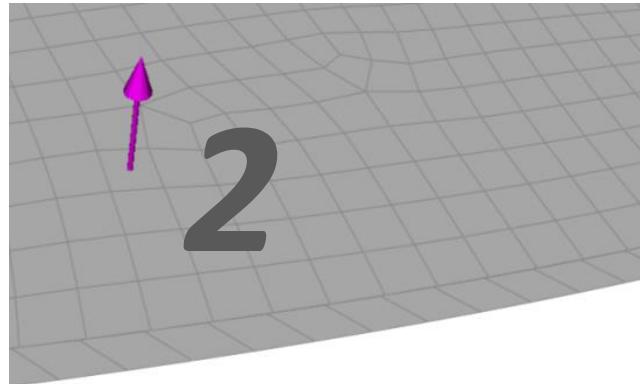
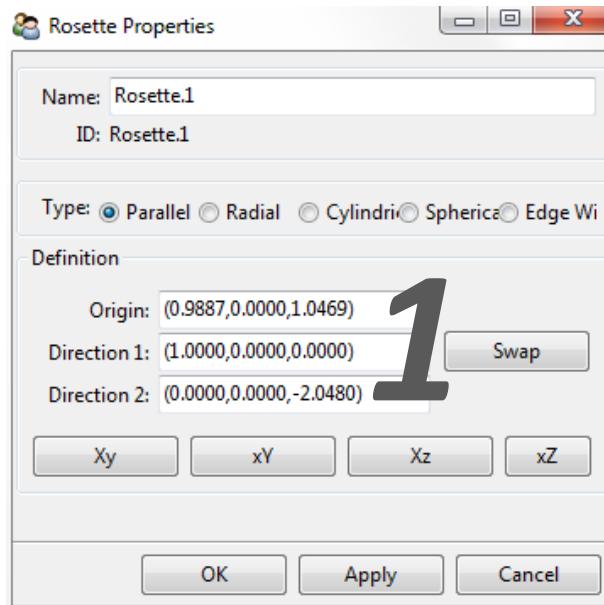


1. Create a Rosette
2. Orient Rosette as shown above. Orientation can be done by defining a vector or by selecting elements or nodes (see next slide)

4. Workshop T-Joint

Defining Directions for the Rosette by Picking Elements

1. Click into the Direction 1 definition area

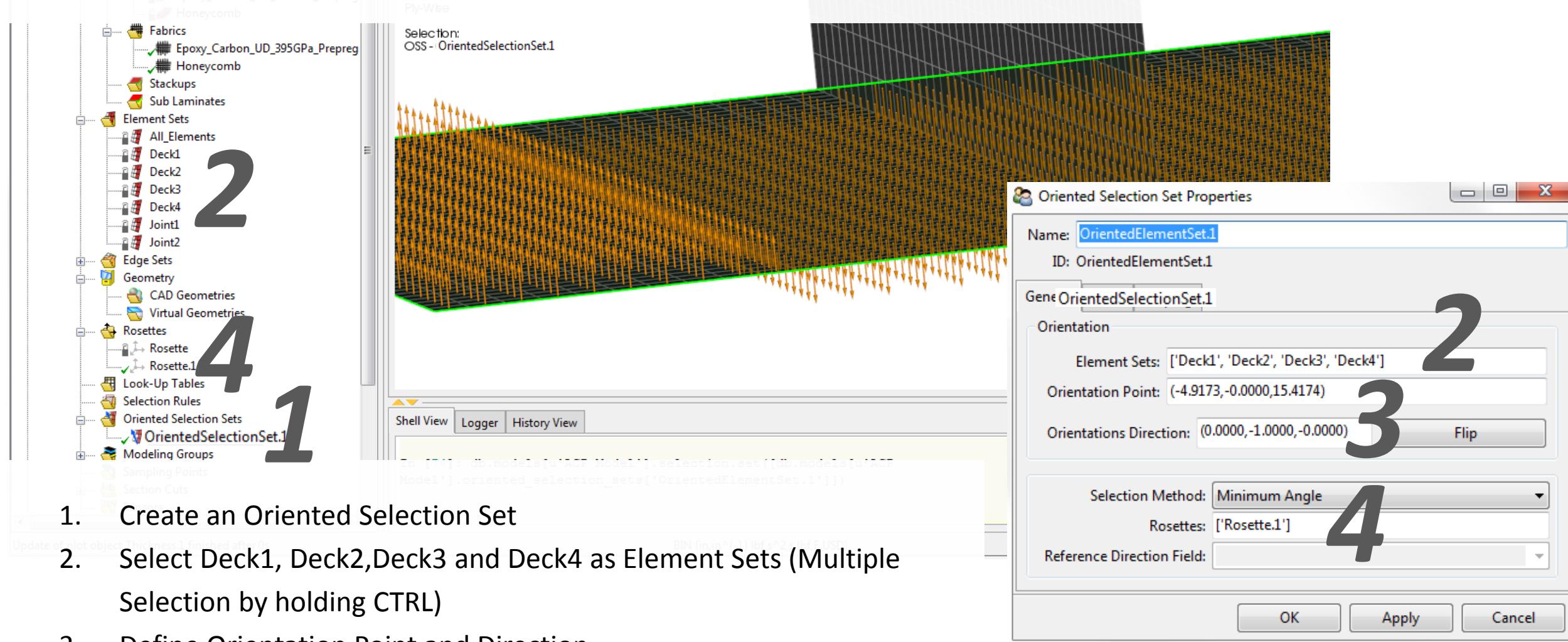


2. Select one element as source
3. Press CTRL and select another element as target

→ This works whenever directions are defined in ANSYS Composite PrepPost. Similar to this you can define origins by selecting a node or an element and define normal directions simply by selecting an element.

4. Workshop T-Joint

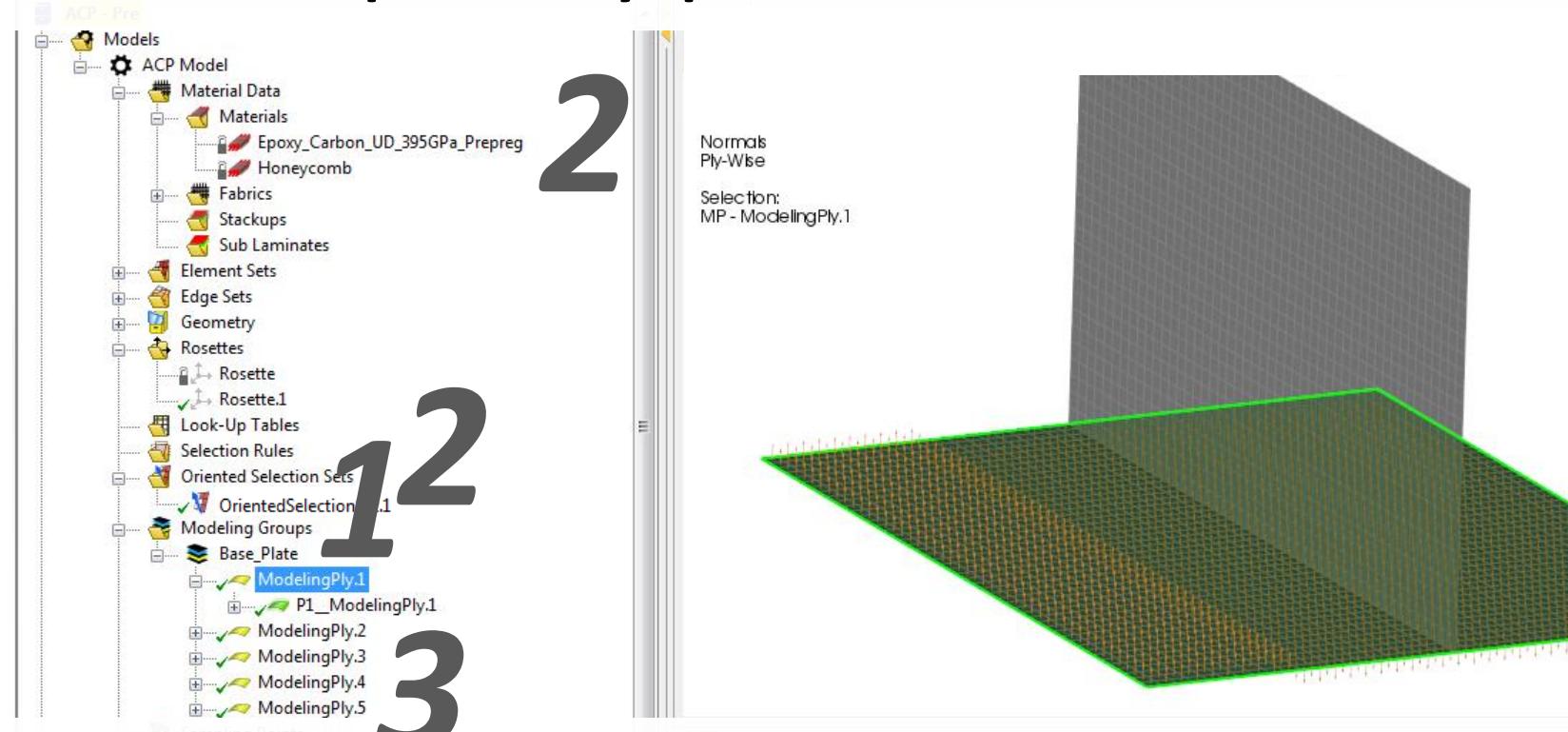
Create an Oriented Selection Set



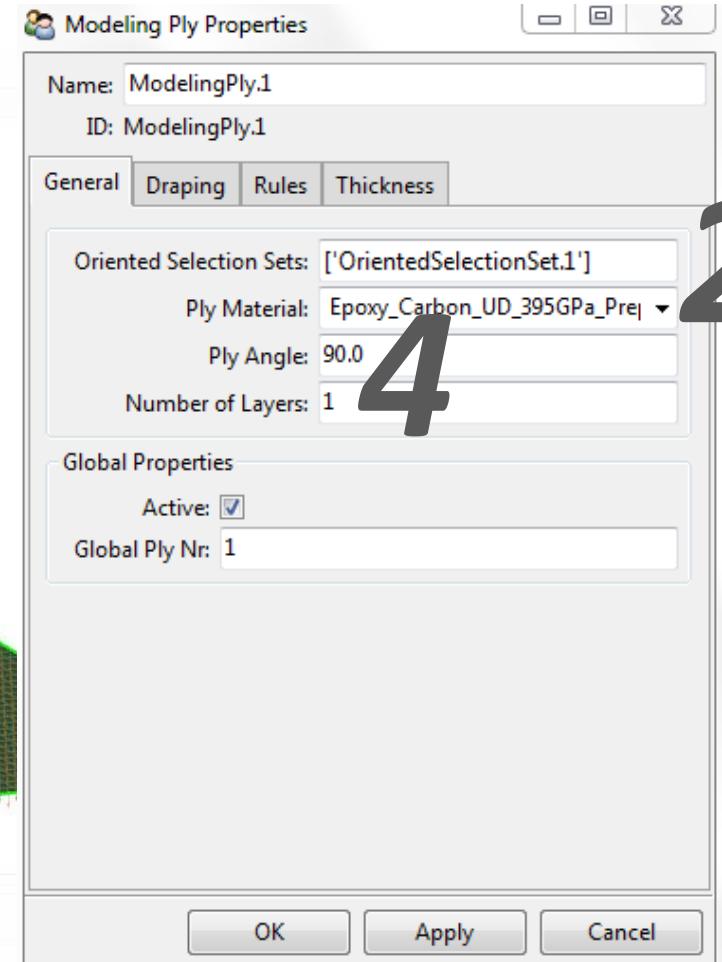
1. Create an Oriented Selection Set
2. Select Deck1, Deck2, Deck3 and Deck4 as Element Sets (Multiple Selection by holding CTRL)
3. Define Orientation Point and Direction
4. Select Rosette.1

4. Workshop T-Joint

Define Composite Layup on the Base Plate

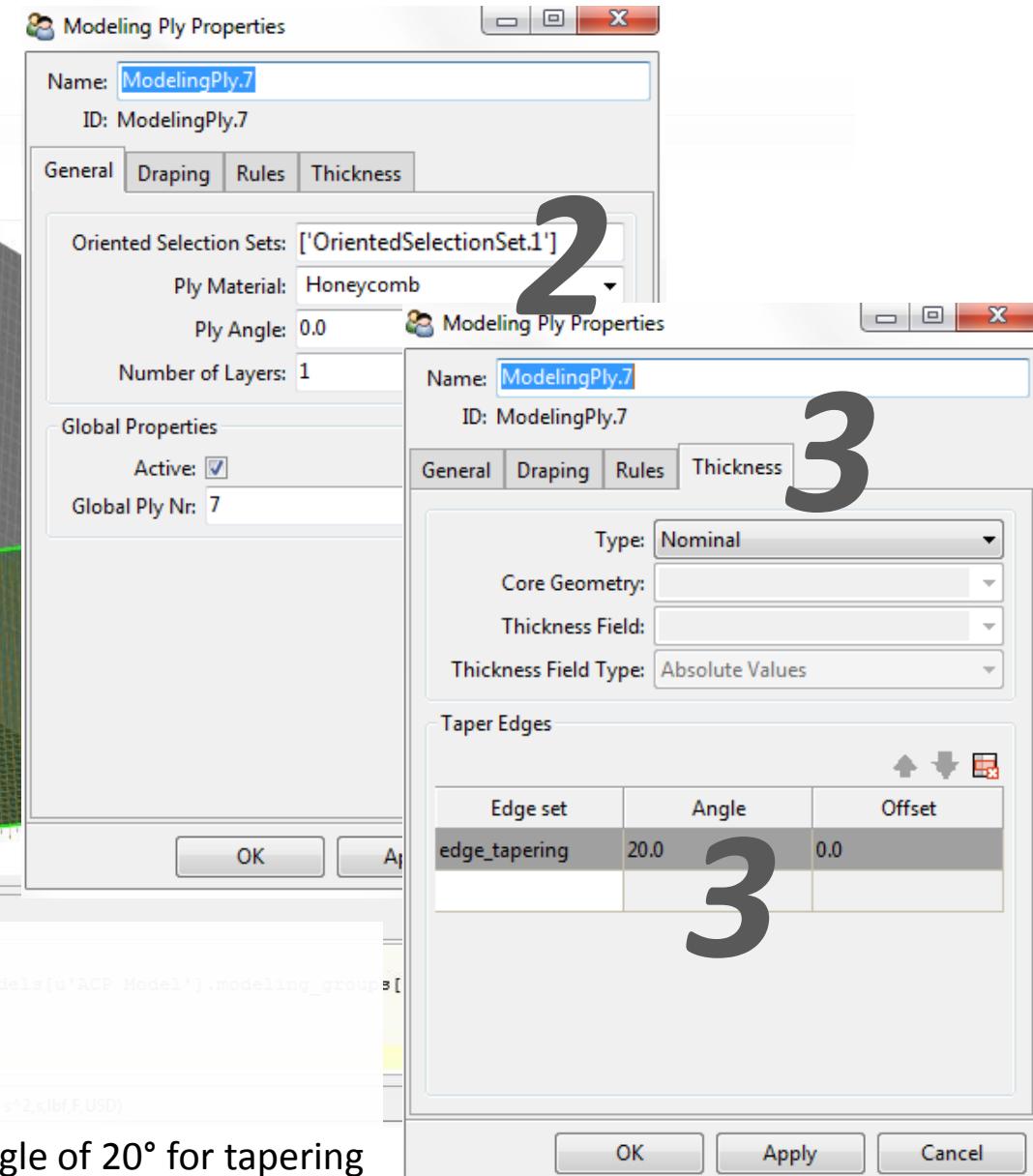
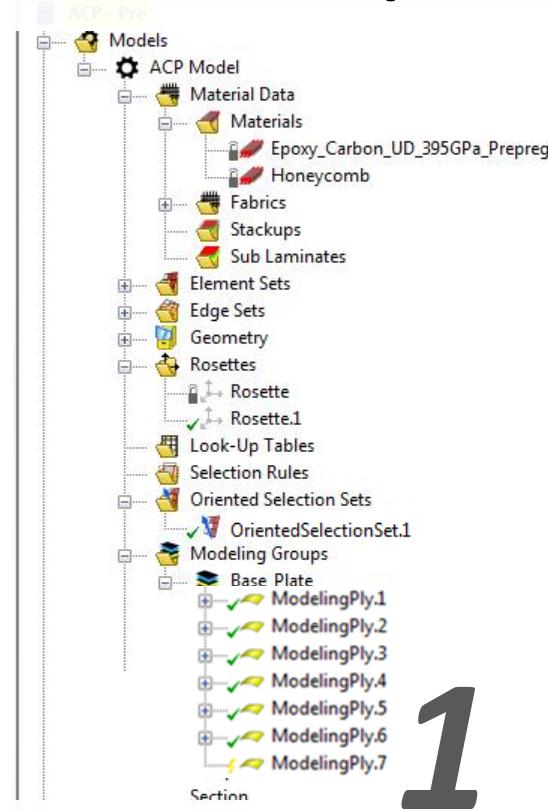


1. Create a Modeling Group `Base_Plate`
2. Create one layer based on the Oriented Selection Set created before and the Epoxy Carbon UD Prepreg material
3. Copy and paste the layer five times
4. Modify the angles of the single modeling plies (Double Click on Modeling Ply.1 → specify angle, Modeling Ply.2 → specify angle, ..., Modeling Ply.6) to a layup of 90°, 0°, 45°, -45°, 90°, 0°)



4. Workshop T-Joint

Define Composite Layup on the Base Plate

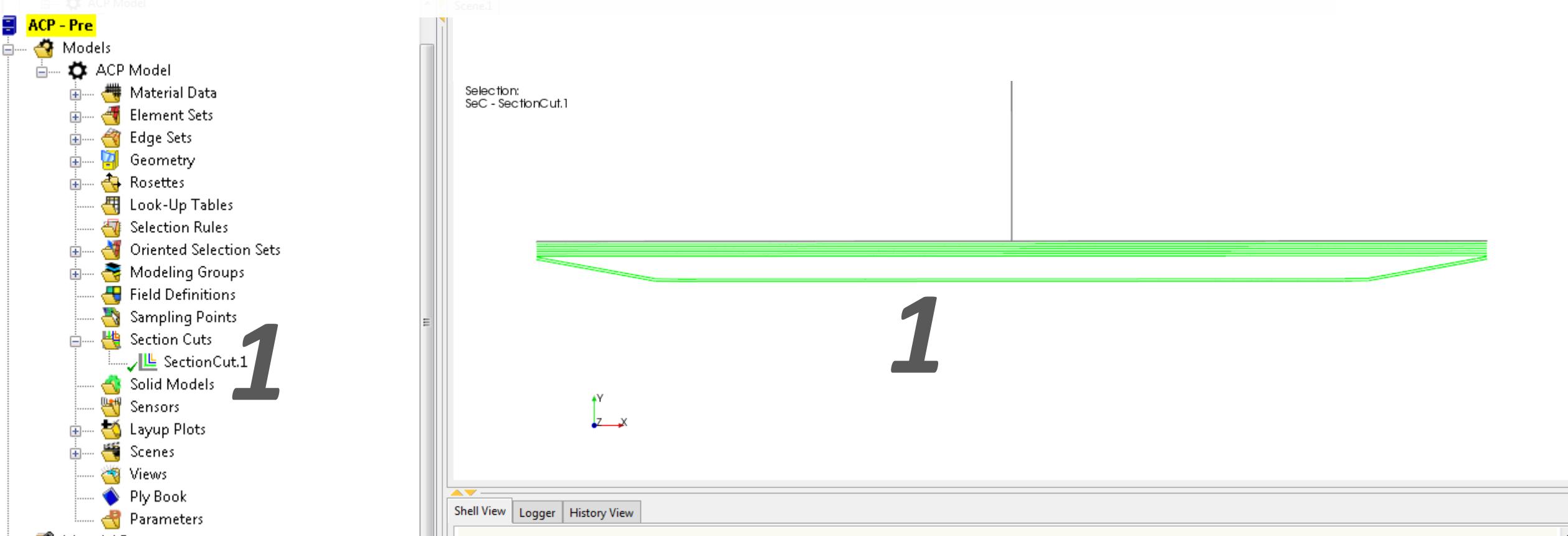


1. Create a new layer for the core
(Right mouse button on ModelingPly.6 → Create Ply After)
2. Select OrientedSelectionSet.1 and Honeycomb material
3. Switch to tab Thickness and select *edge_tapering* edge set and an angle of 20° for tapering of the core

4. Workshop T-Joint

ACP-Pre.prt - ANSYS Composite PrePost

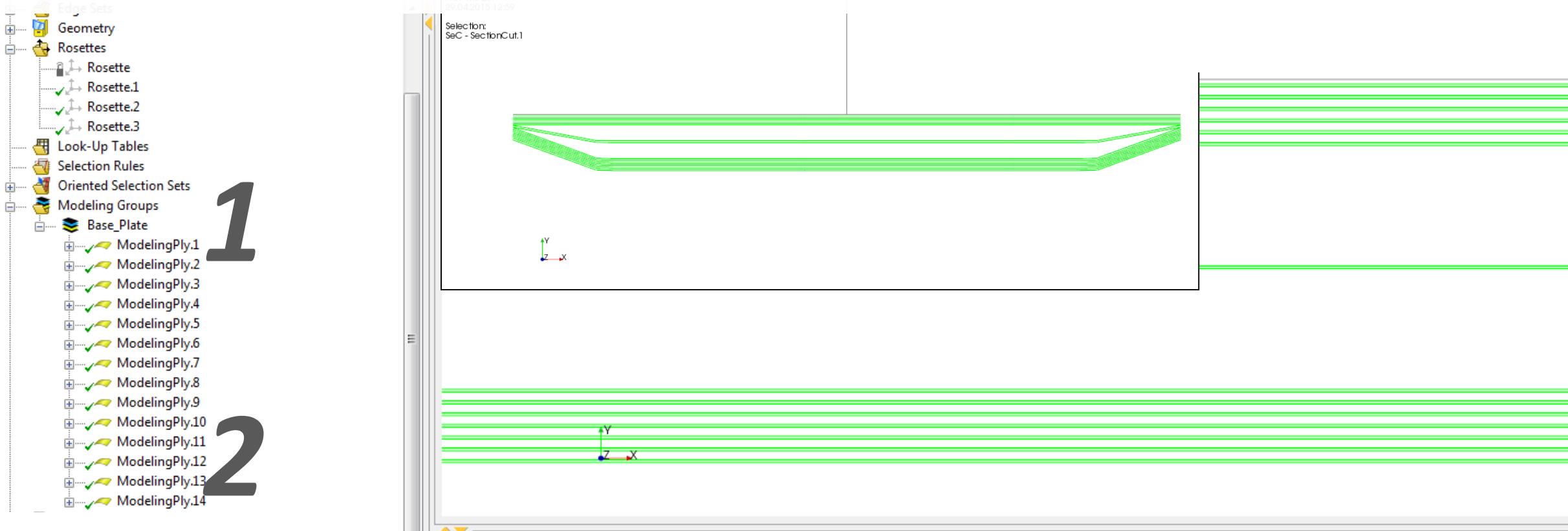
Define Composite Layup on the Base Plate



1. Check tapering of the core using the section cut

4. Workshop T-Joint

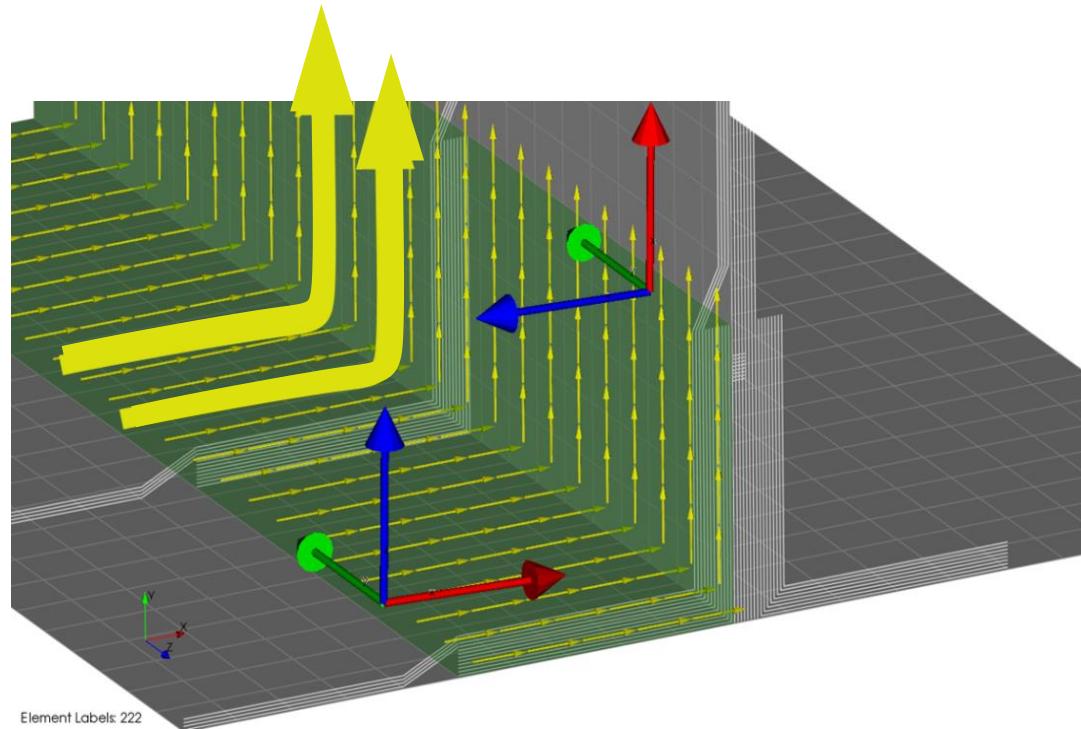
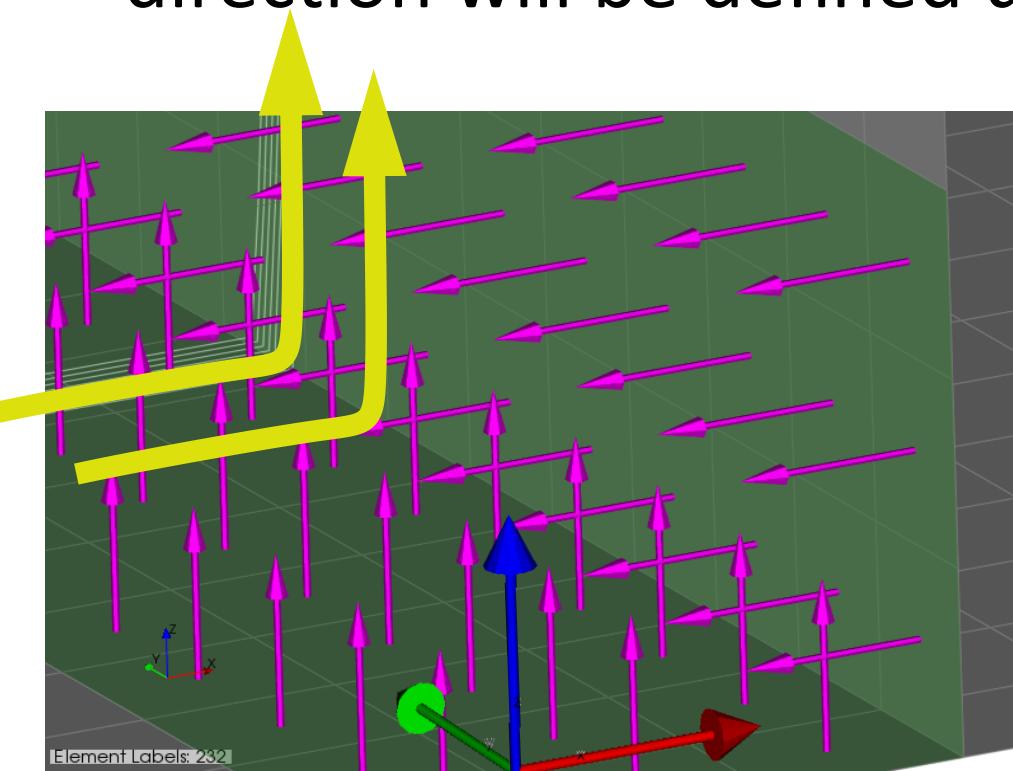
Define Composite Layup on the Base Plate



1. Copy the first Modeling Ply of the Base_Plate Modeling Group (ModelingPly.1)
2. Paste the ply seven times (Create plies after core ply, ModelingPly.7)
3. Modify the angles of the single plies to 0° , 90° , 0° , 45° , -45° , 90° , 0°

4. Workshop T-Joint

- The selection methods are essential when defining the oriented selection sets for the bonding parts. The correct reference direction will be defined using the minimum or maximum angle.



4. Workshop T-Joint

ACP-Pre.acp - ANSYS Composite PrepPost

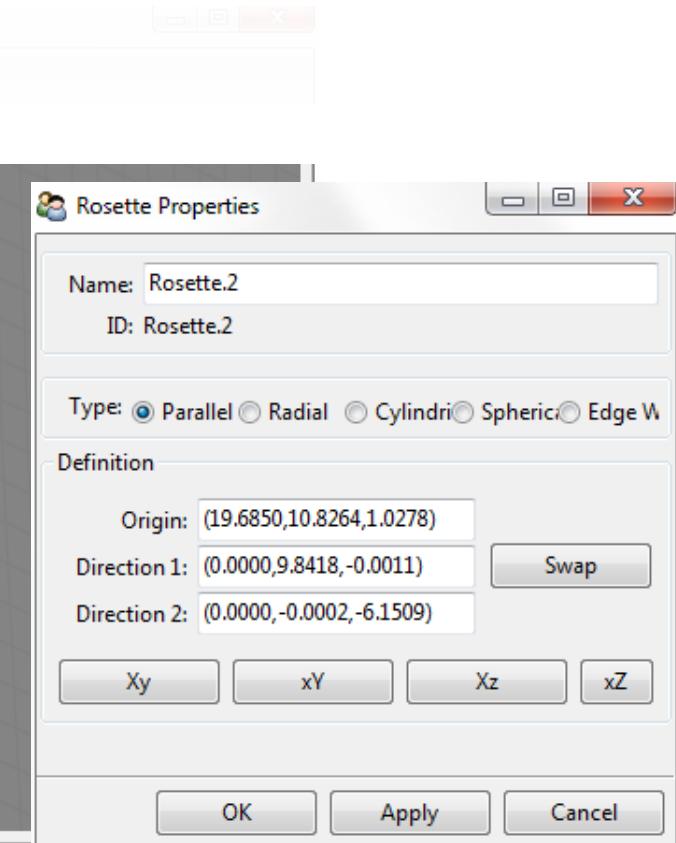
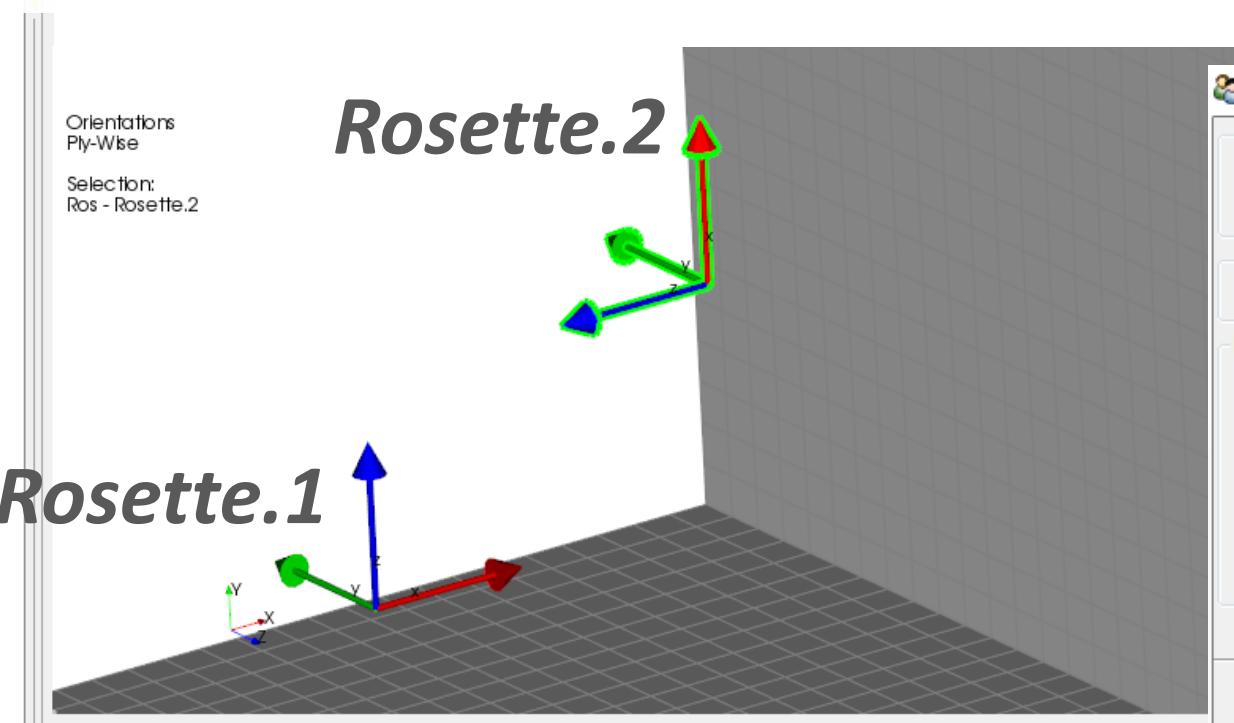
Create a Second Rosette

ACP - Pre

Models

- ACP Model
 - Material Data
 - Element Sets
 - Edge Sets
 - Geometry
 - Rosettes
 - Rosette
 - Rosette.1
 - Rosette.2

1



1. Create a second Rosette

2. Orient Rosette as shown above

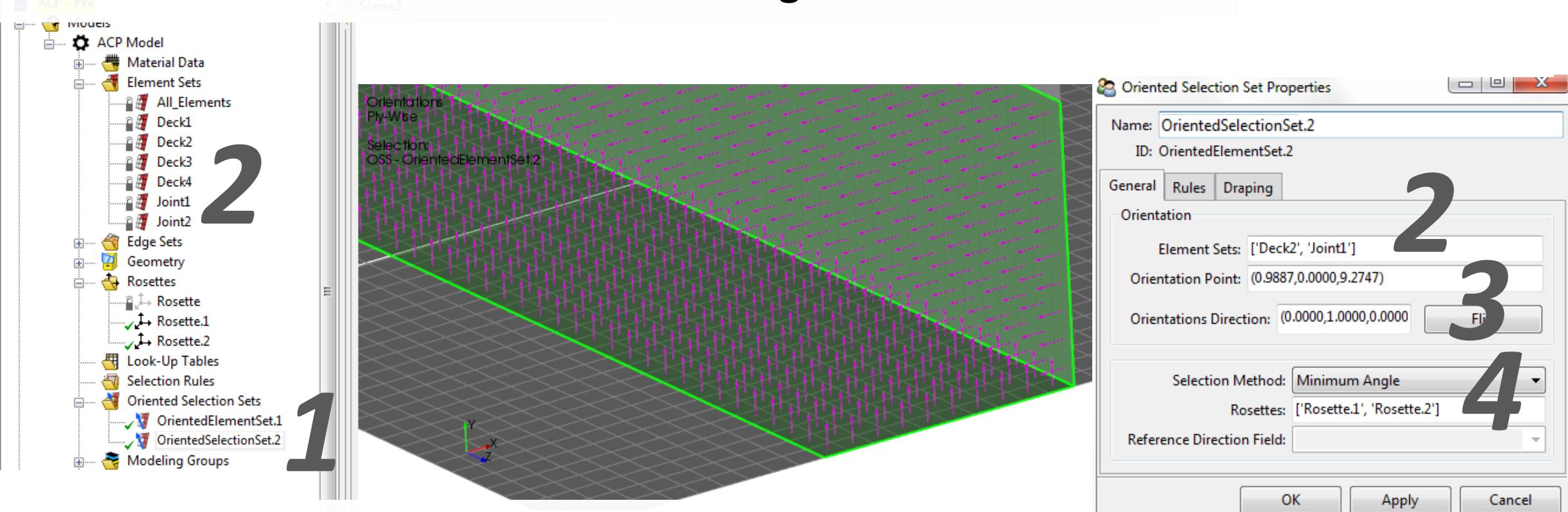
```
db.models[u'ACP Model'].selection.set([db.models[u'ACP Model'].rosettes['Rosette.2']])
```

BIN (in,in^(-1) lbf s^-2,s,lbf,F,USD)

4. Workshop T-Joint

ACP-Pre.acp - ANSYS Composite PrepPost

Create Oriented Selection Set for Bonding



1. Create Oriented Selection Set
2. Select Deck2 and Joint1 as Element Sets
3. Select Orientation Point and define Orientation Direction
4. Select Rosette.1 and Rosette.2 and minimum angle as selection method

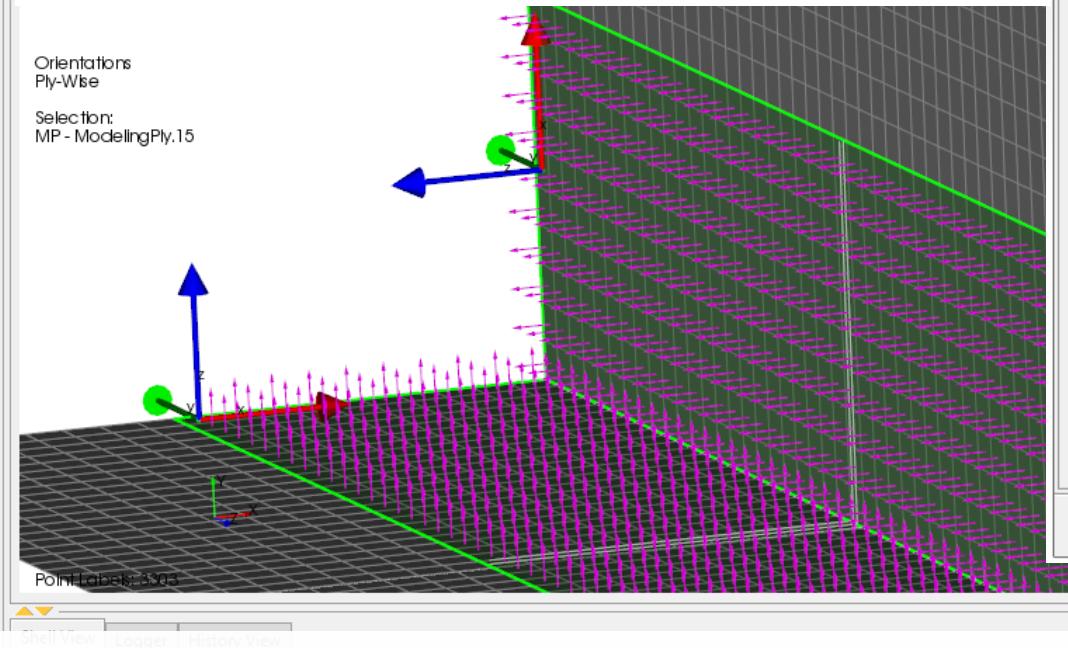
ANSYS®

4. Workshop T-Joint

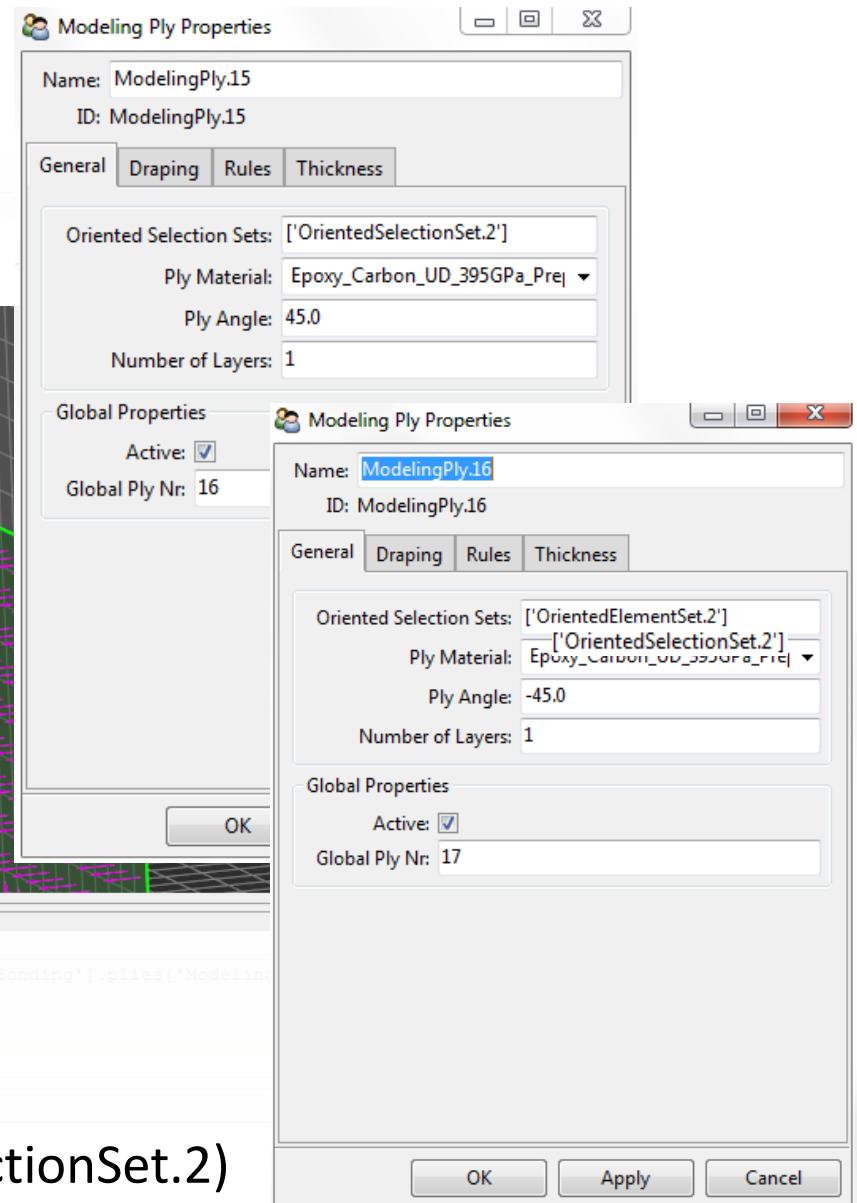
Create Layup for Bonding

2

2
1



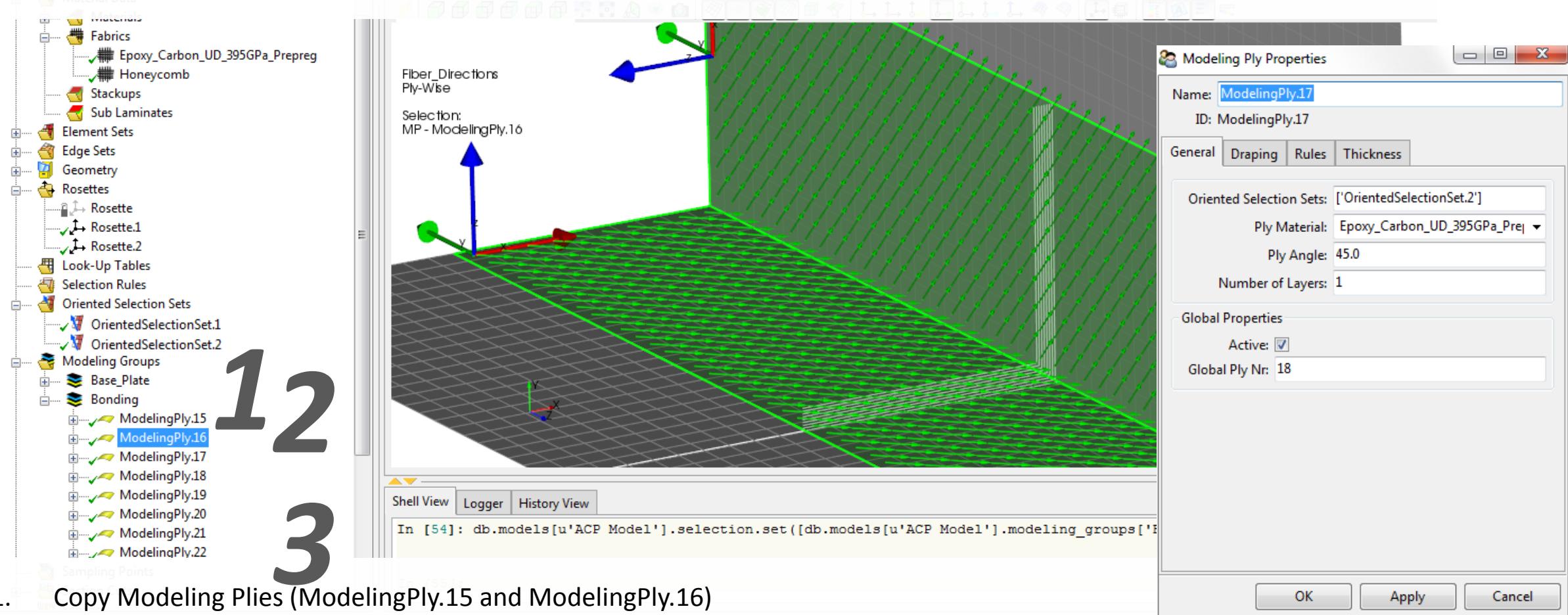
1. Create a new Modeling Ply Group
2. Create a 45° layer and a -45° layer for the bonding
(Fabric Epoxy_Carbon_UD_395GPa_Prepreg, OrientedSelectionSet.2)



4. Workshop T-Joint

Create Layup for Bonding

12
3

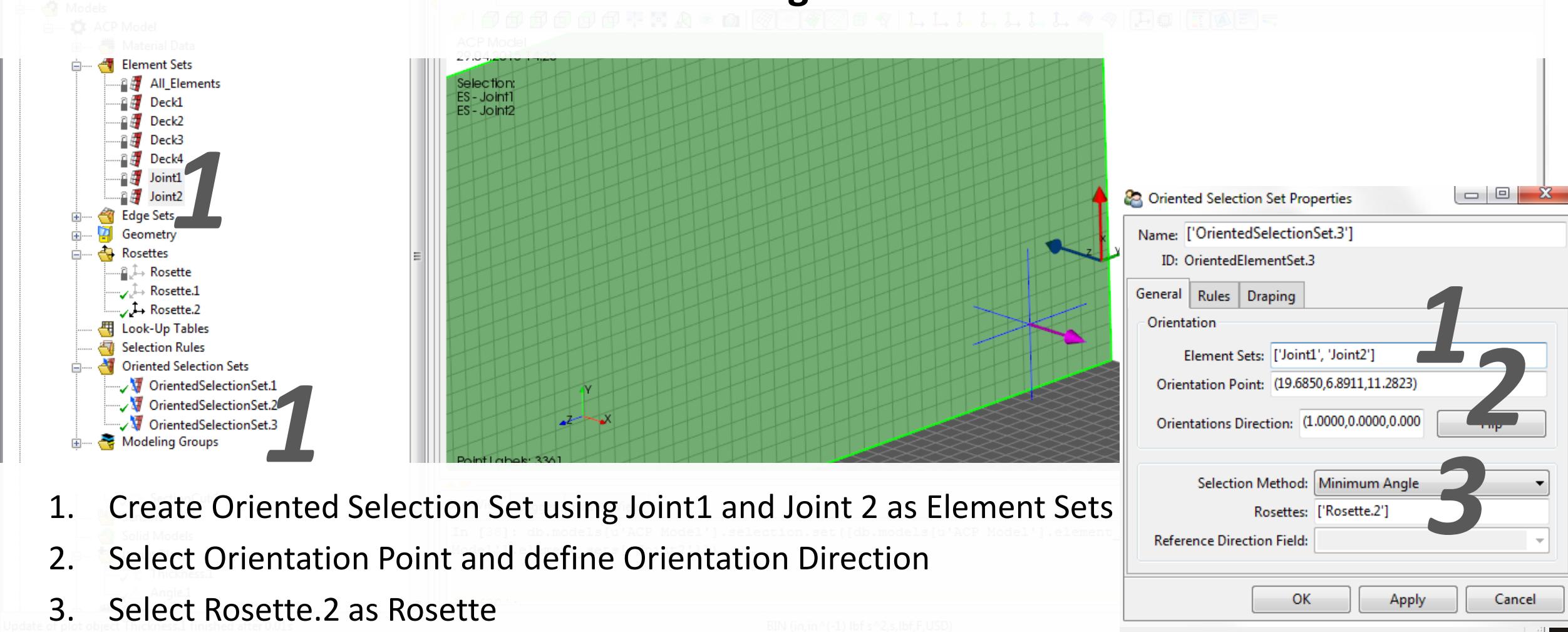


1. Copy Modeling Plies (ModelingPly.15 and ModelingPly.16)
2. Right mouse button on Modeling Ply.16 → Paste after. This creates two new plies.
3. Complete the (45° , -45° , 45° , -45° , 45° , -45° , 0° , 90°) layup

4. Workshop T-Joint

ACP-Pre.acp - ANSYS Composite PrepPost

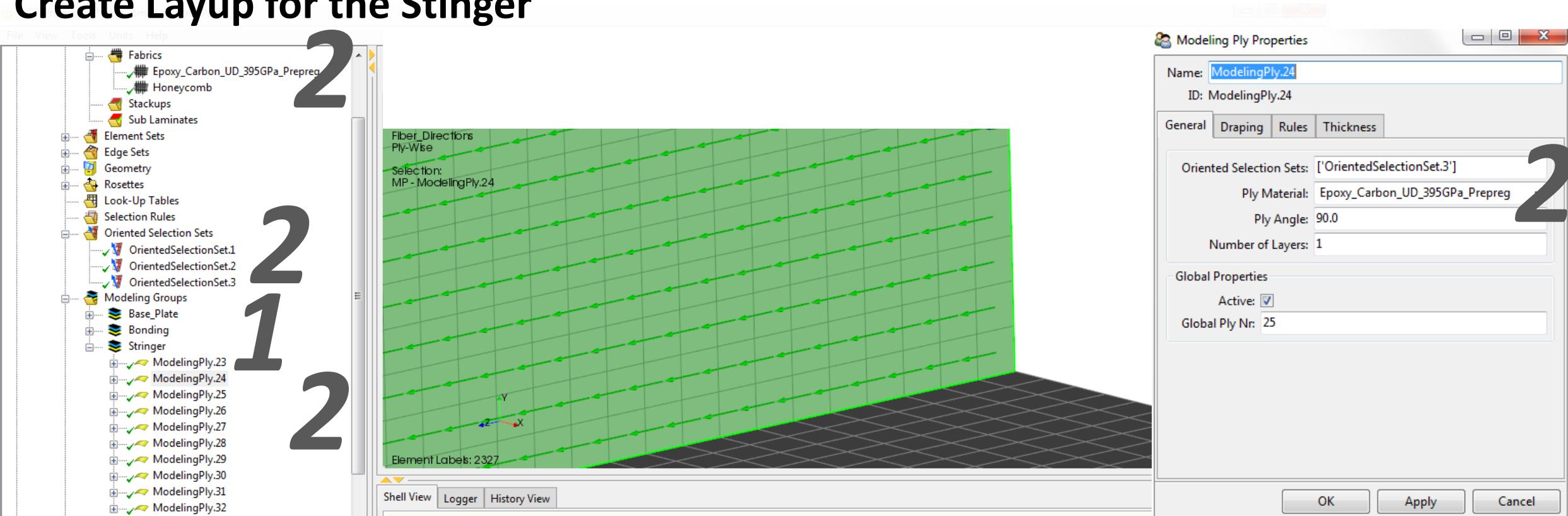
Create Oriented Selection Set for the Stringer



1. Create Oriented Selection Set using Joint1 and Joint 2 as Element Sets
2. Select Orientation Point and define Orientation Direction
3. Select Rosette.2 as Rosette

4. Workshop T-Joint

Create Layup for the Stinger



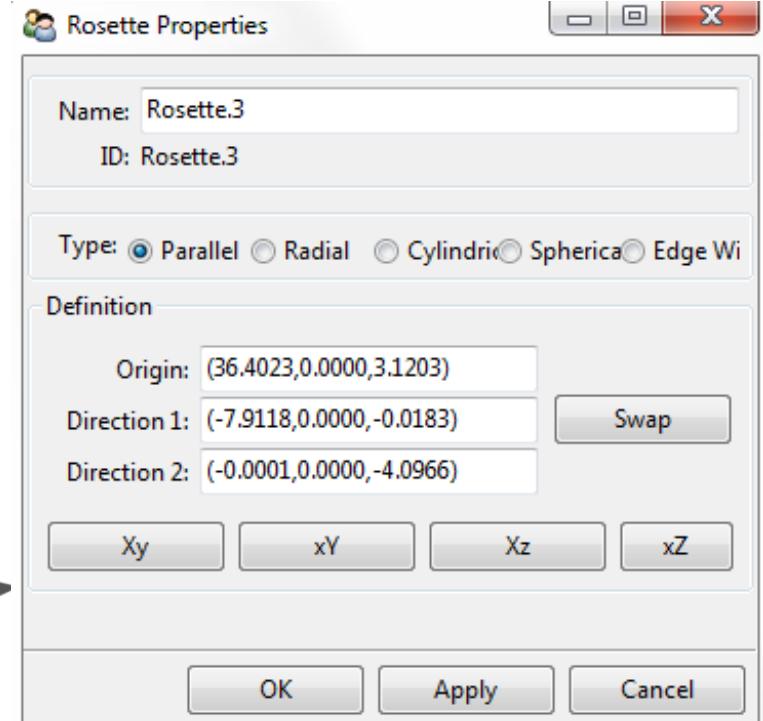
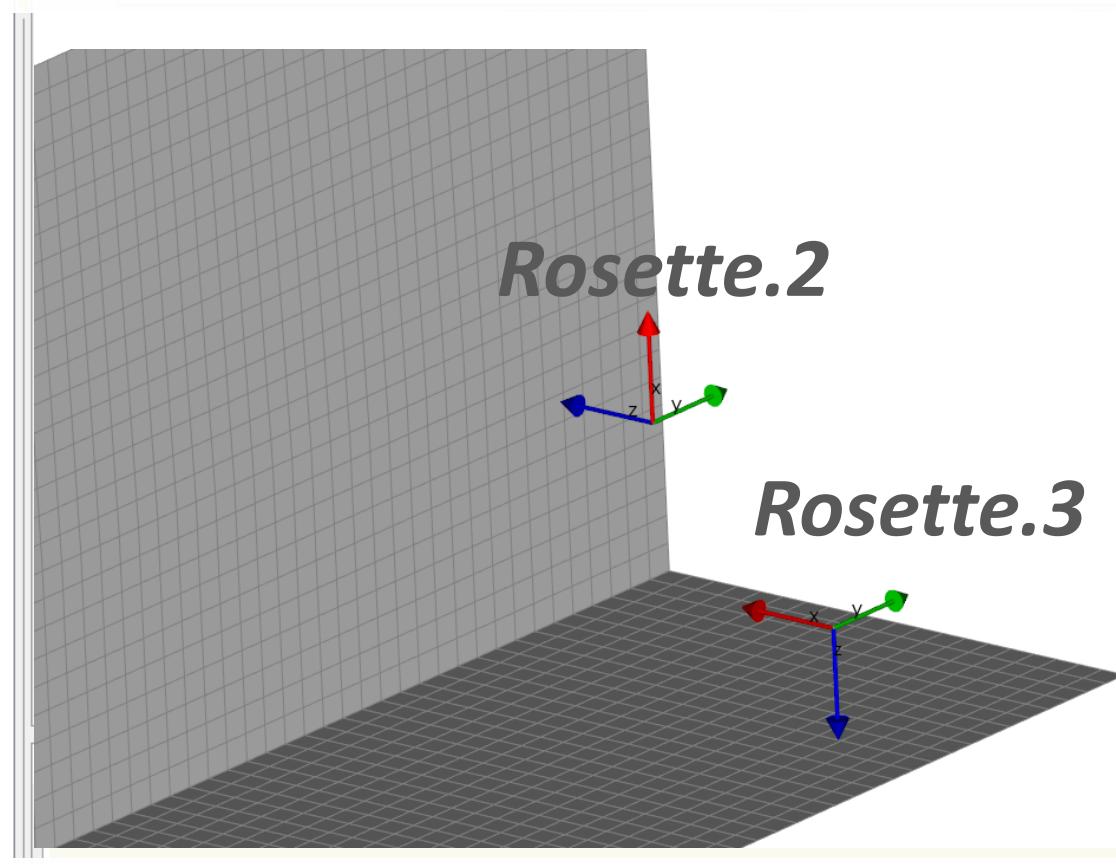
1. Create a new Ply Group Stringer
2. Create ten layers for the stringer ($0^\circ, 90^\circ, 0^\circ, 90^\circ, 0^\circ, 0^\circ, 90^\circ, 0^\circ, 90^\circ, 0^\circ$) on the OrientedSelectionSet.3 using the Epoxy Carbon UD fabric.

4. Workshop T-Joint

ACP-Pre.acp - ANSYS Composite PrepPost

Create a Third Rosette

1



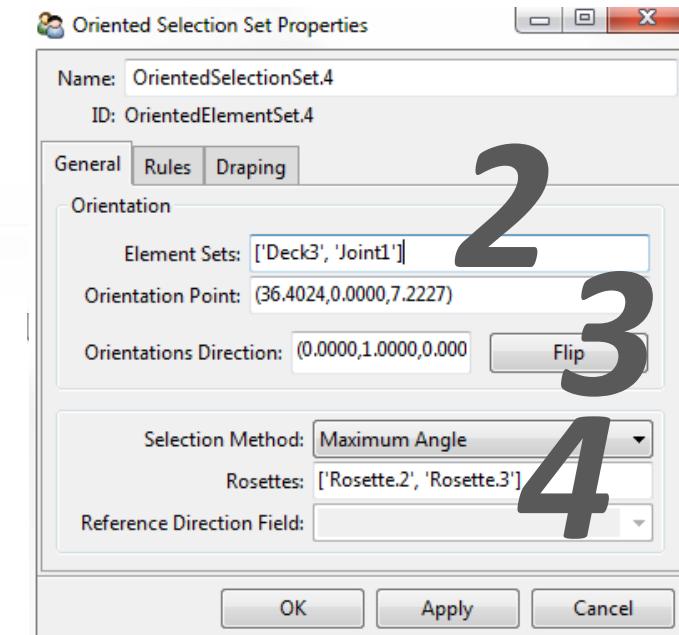
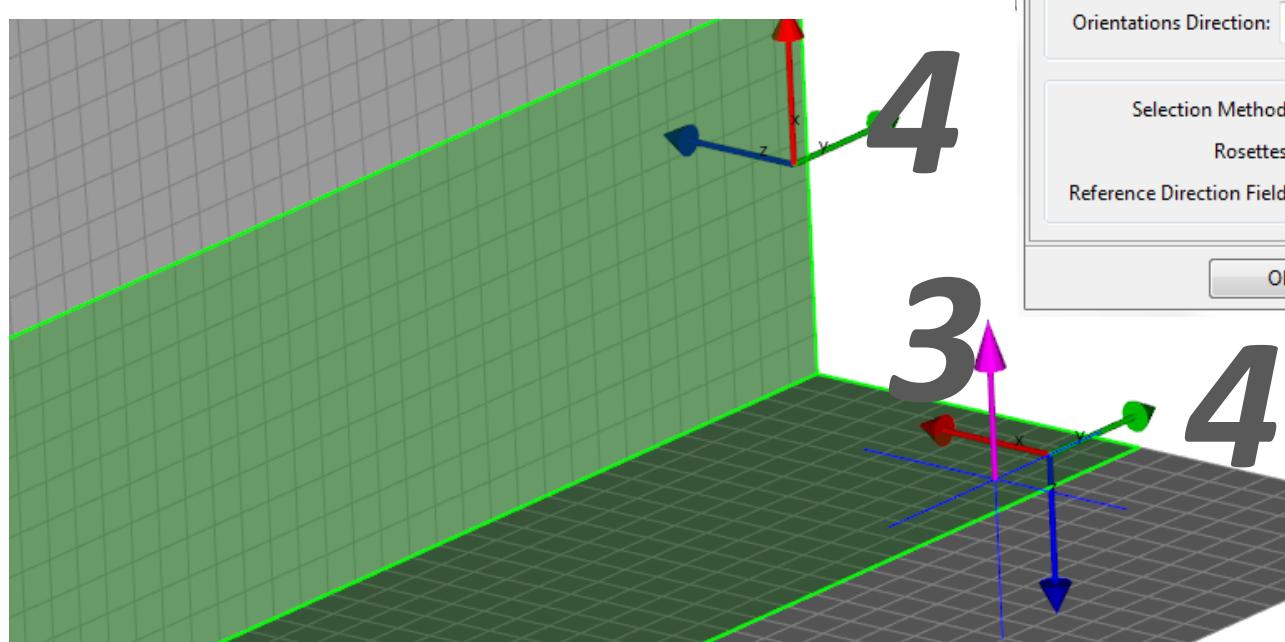
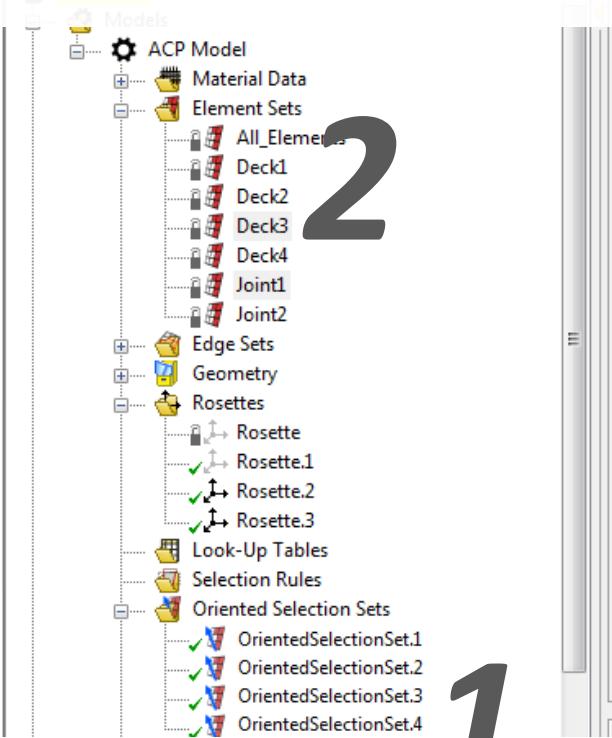
1. Create a third Rosette
2. Orient Rosette as shown above

ANSYS®

4. Workshop T-Joint

ACP-Pre.app - ANSYS Composite PrepPost

Create Oriented Selection Set for Bonding

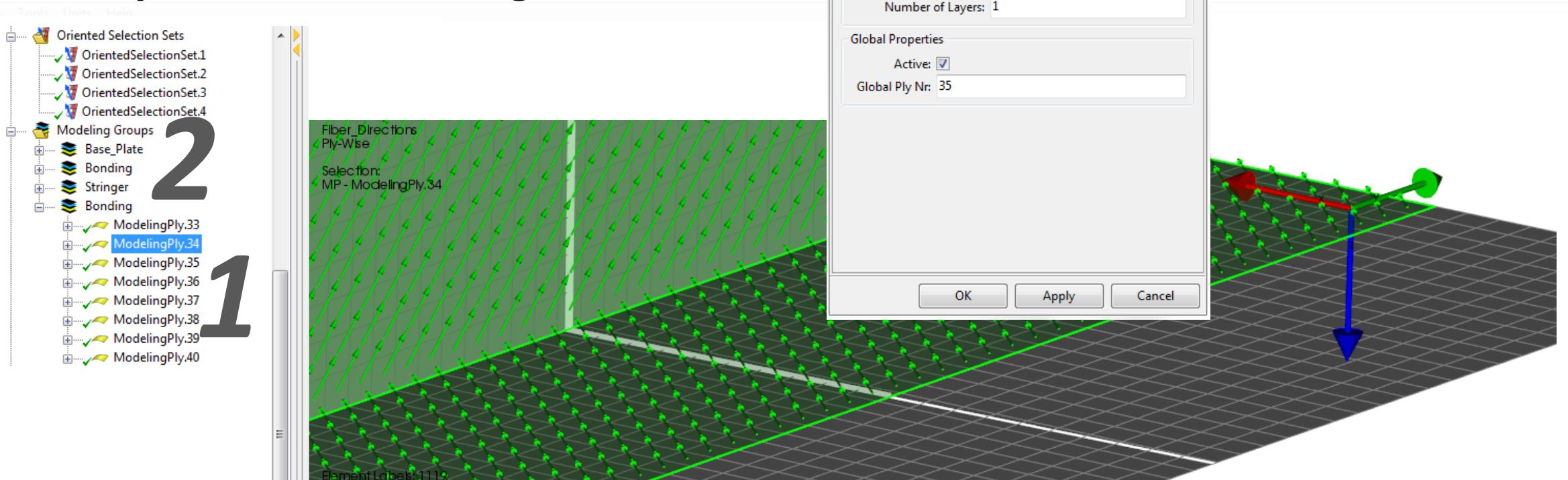


1. Create an Oriented Selection Set
2. Select Deck3 and Joint1 as Element Sets
3. Select Orientation Point and define Orientation Direction
4. Select Rosette.2 and Rosette.3 and maximum angle as selection method

ANSYS®

4. Workshop T-Joint

Create Layers for the Bonding

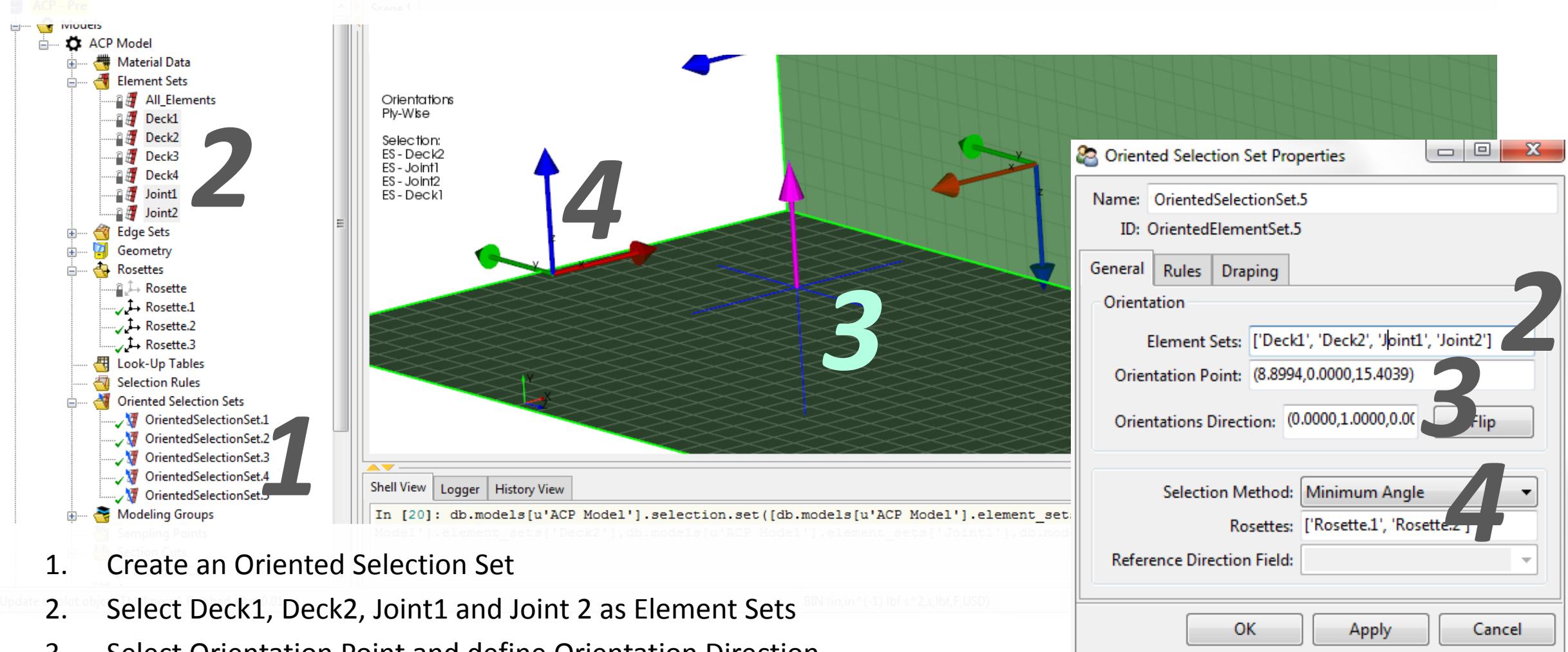


1. Create a new Modeling Group named Bonding
2. Create eight layers for the bonding (45° , -45° , 45° , -45° , 45° , -45° , 0° , 90°) on the OrientedSelectionSet.4 using the Epoxy Carbon UD fabric.

4. Workshop T-Joint

ACP-Pre.acp - ANSYS Composite PrepPost

Create Oriented Selection Set for the Cover

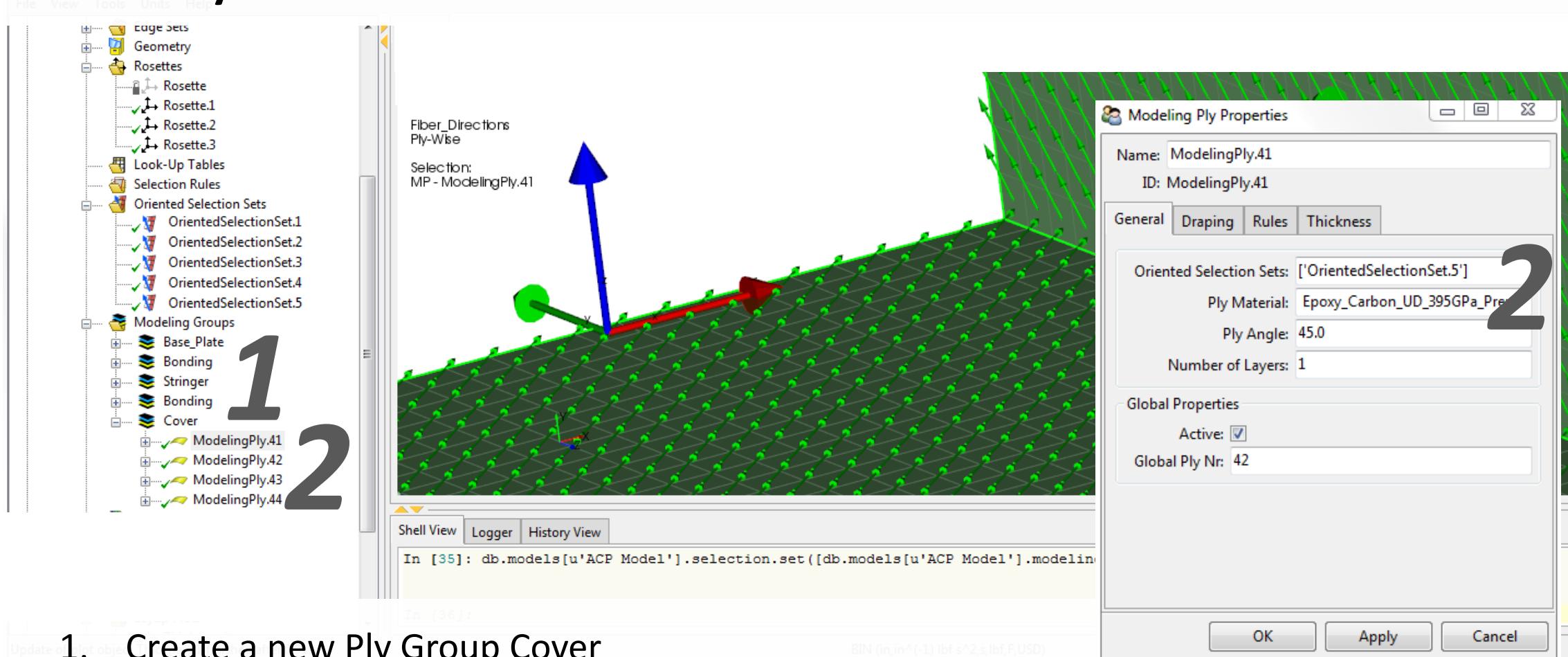


1. Create an Oriented Selection Set
2. Select Deck1, Deck2, Joint1 and Joint 2 as Element Sets
3. Select Orientation Point and define Orientation Direction
4. Select Rosette.1 and Rosette.2 and minimum angle as selection method

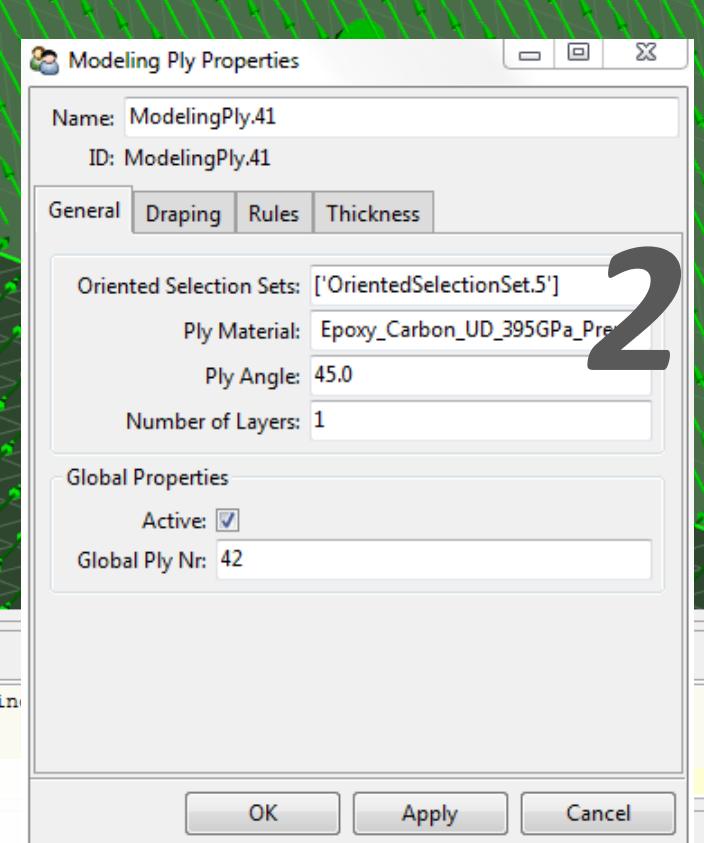
ANSYS®

4. Workshop T-Joint

Create Layers for the Cover

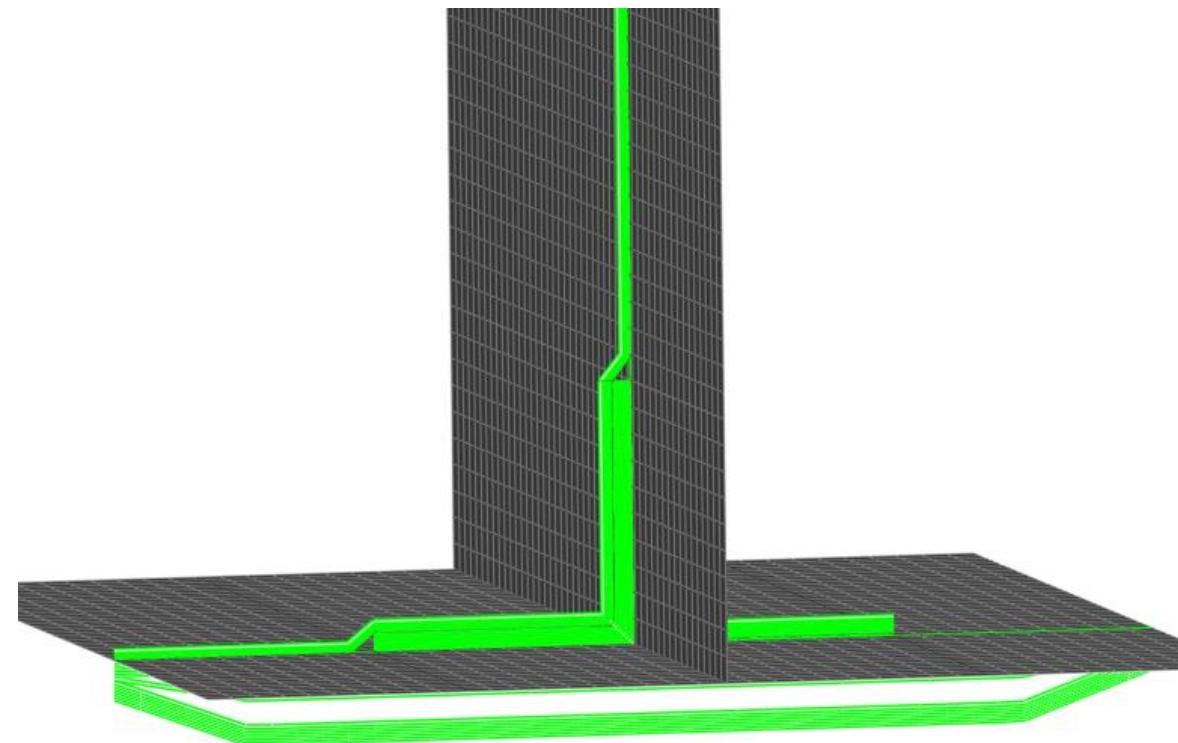
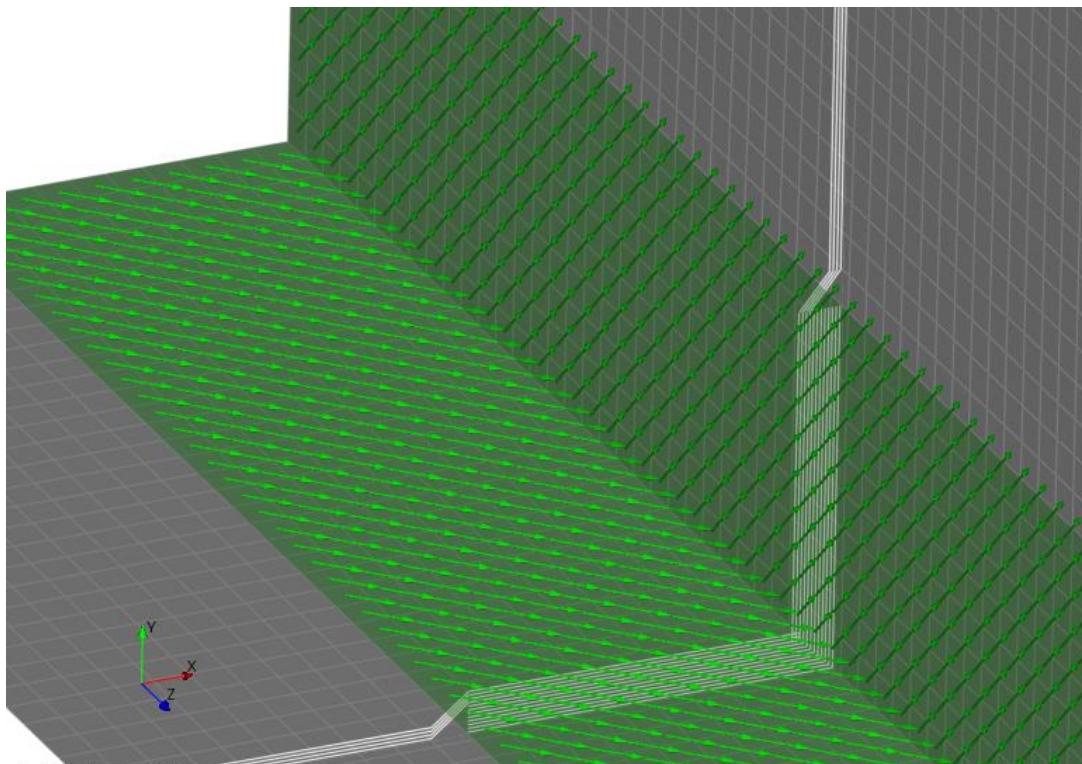


1. Create a new Ply Group Cover
2. Create four layers for the cover(45° , -45° , 0° , 90°) on the OrientedSelectionSet.5 using the Epoxy Carbon UD fabric.



4. Workshop T-Joint

- Check Layup and Fiber Directions using Section Cuts, Sampling Points and fiber direction vectors



Change section cut orientation from default, if layup is not shown correctly