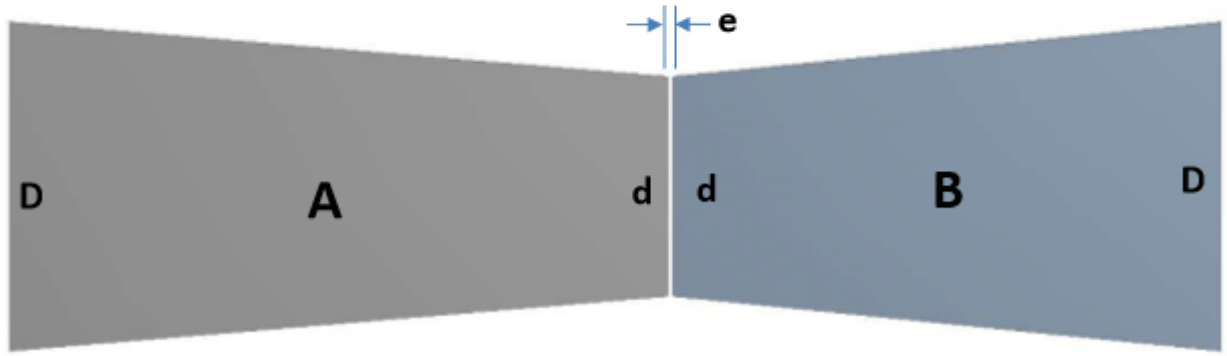
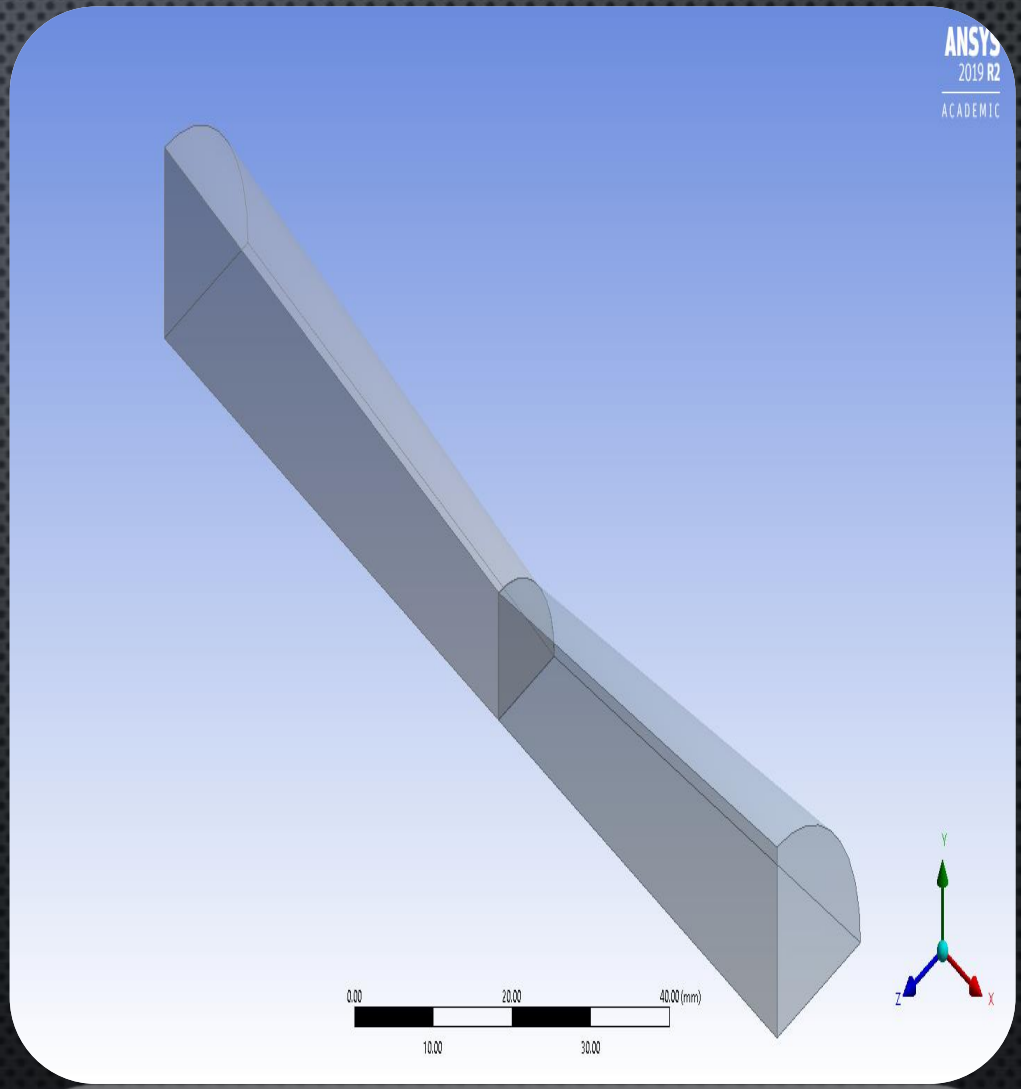
ASSIGNMENT 12

Problem -1

At room temperature 22°C a gap of "**e**" mm exists between ends of the shown two conical steel rods. Rod **A** is 60 mm length and Rod **B** is 50 mm length. Both cones have large diameter 30 mm and small diameter of 20 mm. The working environment of these rods is expected to be (150°C - 250°C). It is required to find the relation between the environment temperature and the contact pressure between the Rods ends at different gap distance. Consider the gap distance between 0.05 to 0.35 mm.



Geometry

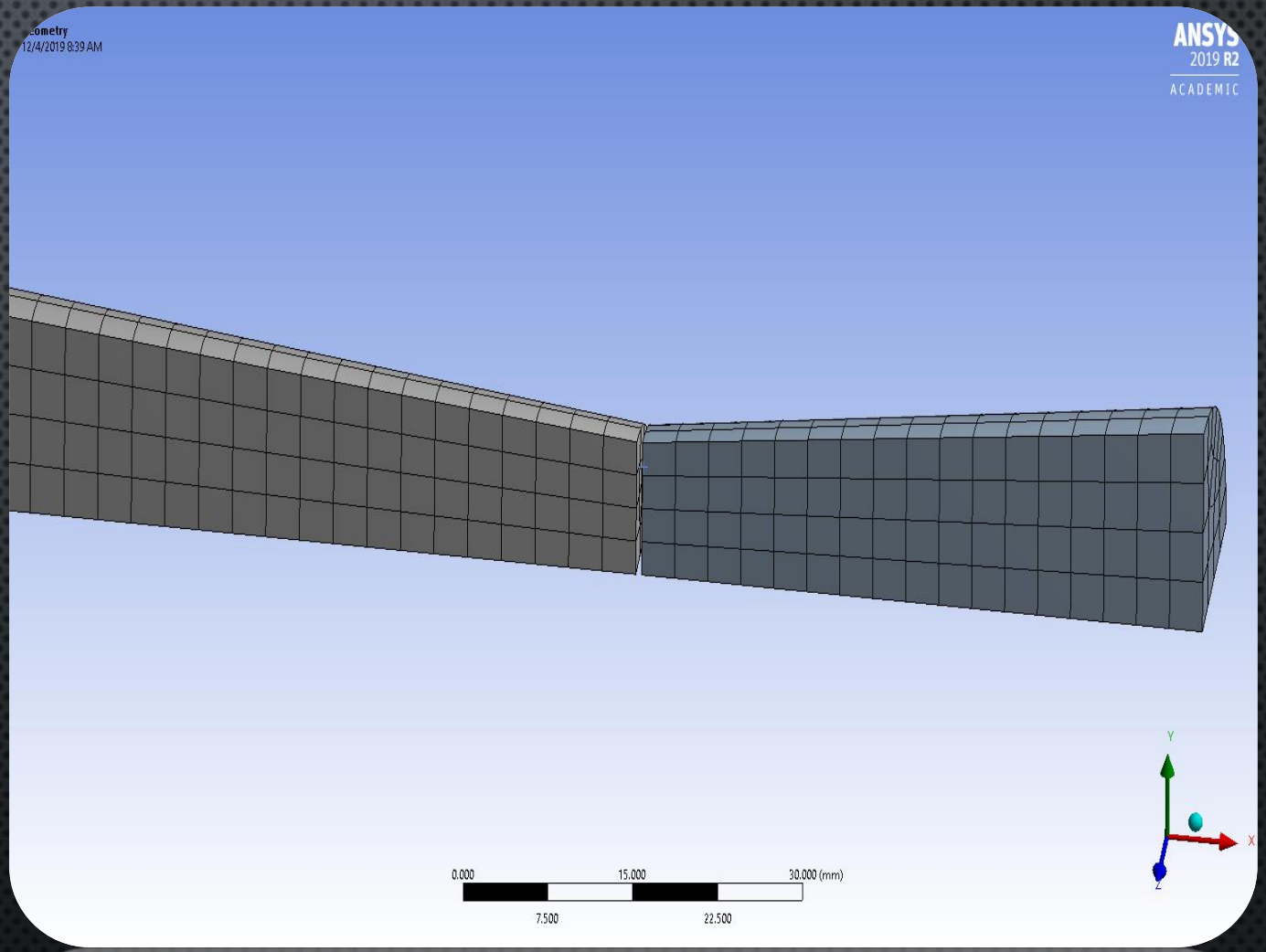


Mesh

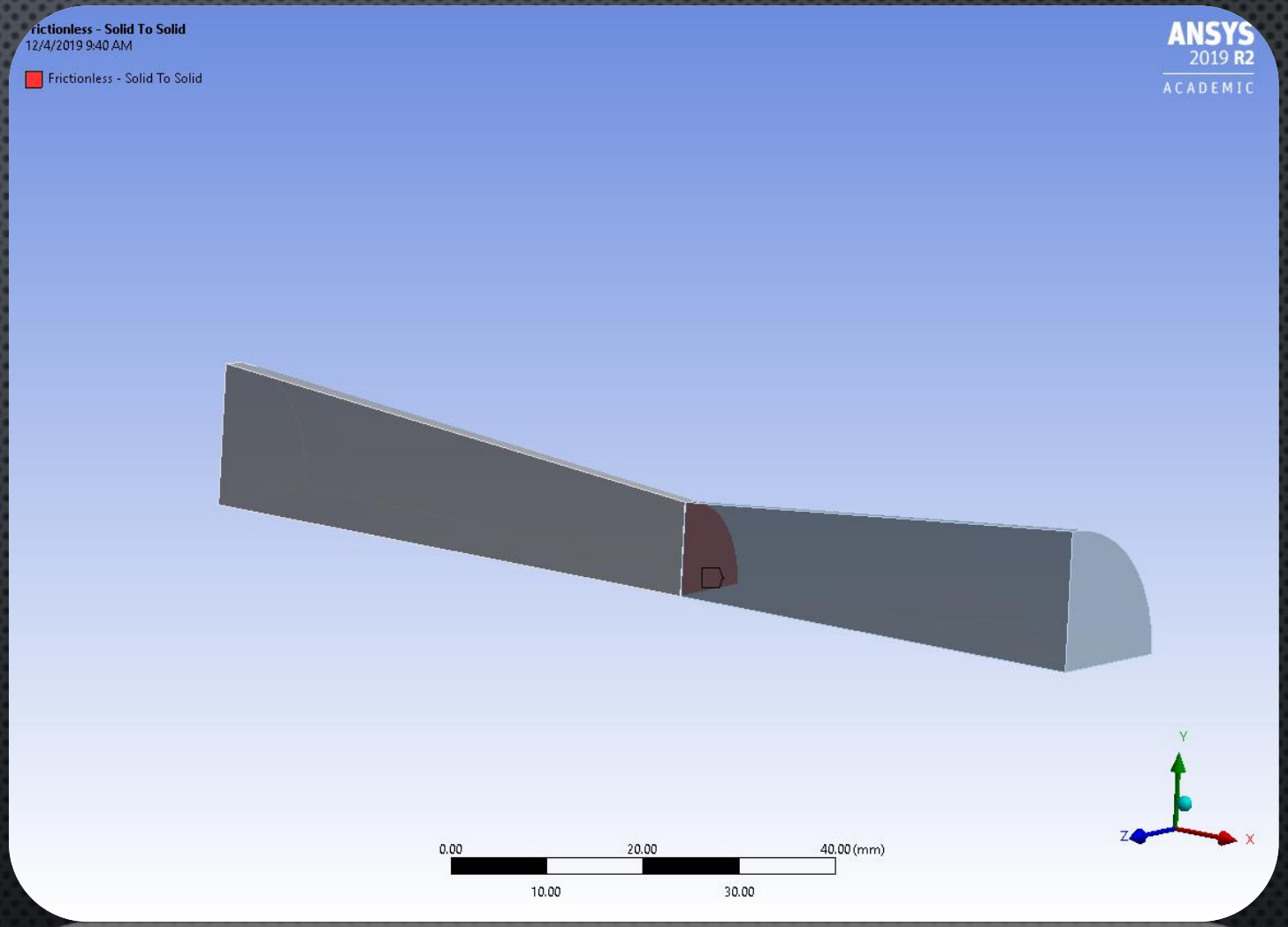
Details of "Mesh"

Display	
Display Style	Use Geometry Setting
Defaults	
Physics Preference	Nonlinear Mechanical
Element Order	Program Controlled
Element Size	3.0 mm
Sizing	
Quality	
Inflation	
Advanced	
Statistics	
Nodes	3706
Elements	666

Manage Views



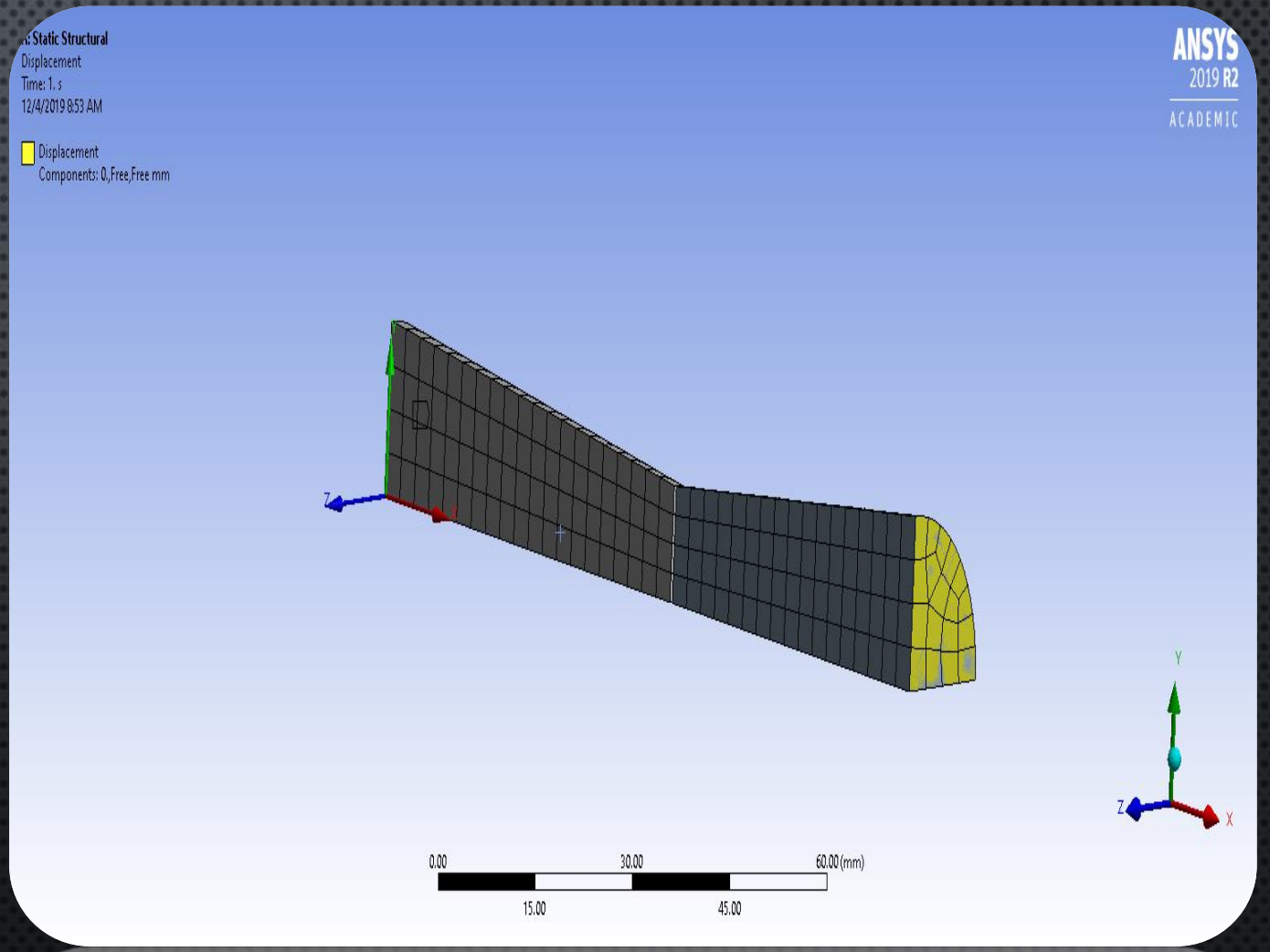
Connection


rictionless - Solid To Solid
12/4/2019 9:40 AM
Frictionless - Solid To Solid
ANSYS
2019 R2
ACADEMIC
0.00
20.00
40.00 (mm)
10.00
30.00
Y
Z
X

Boundary Conditions

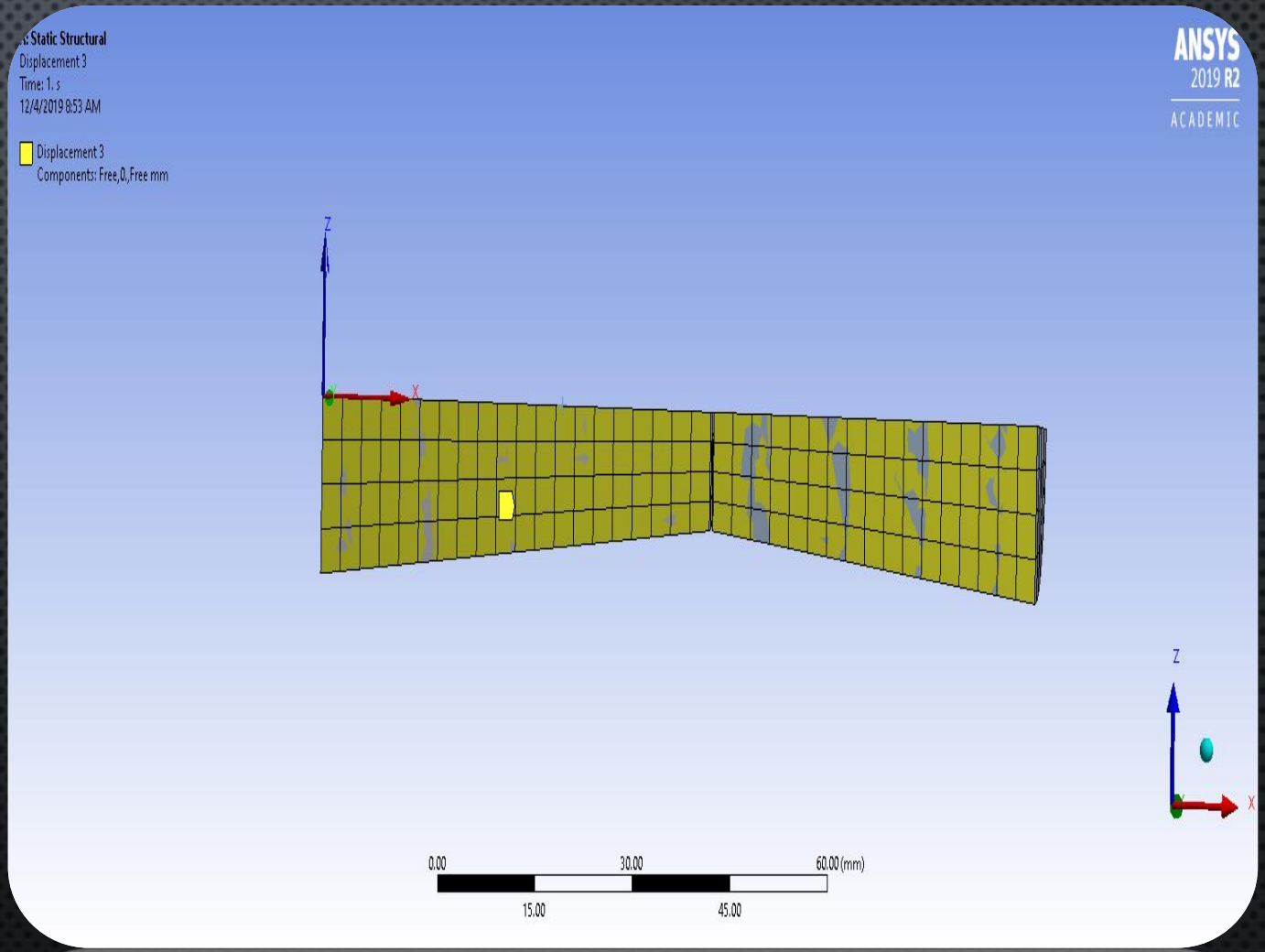
Details of "Displacement"

Scope	
Scoping Method	Geometry Selection
Geometry	2 Faces
Definition	
Type	Displacement
Define By	Components
Coordinate System	Global Coordinate System
X Component	0. mm (ramped)
Y Component	Free
Z Component	Free
Suppressed	No



Boundary Conditions

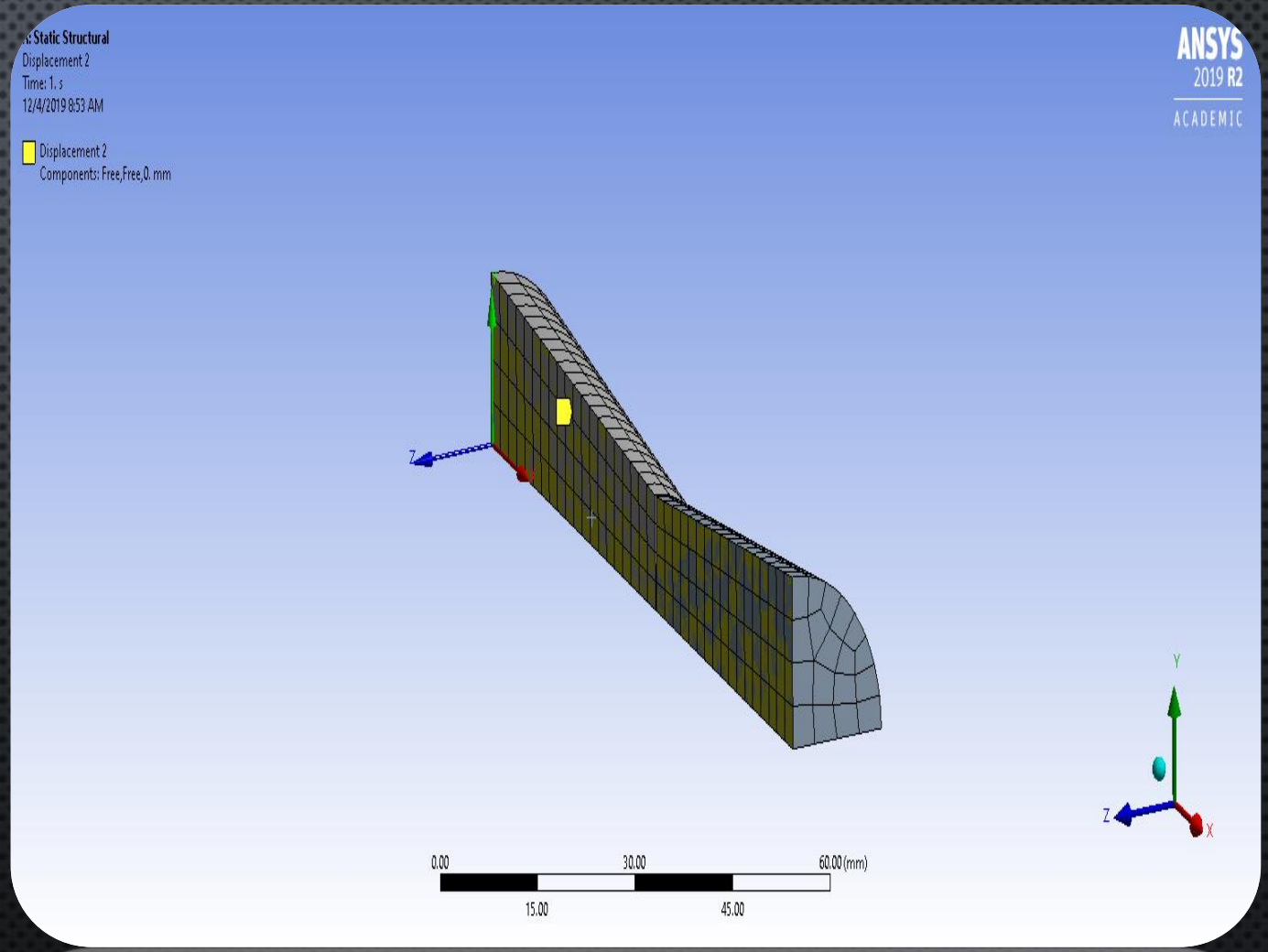
Scope	
Scoping Method	Geometry Selection
Geometry	2 Faces
Definition	
Type	Displacement
Define By	Components
Coordinate System	Global Coordinate System
X Component	Free
Y Component	0. mm (ramped)
Z Component	Free
Suppressed	No



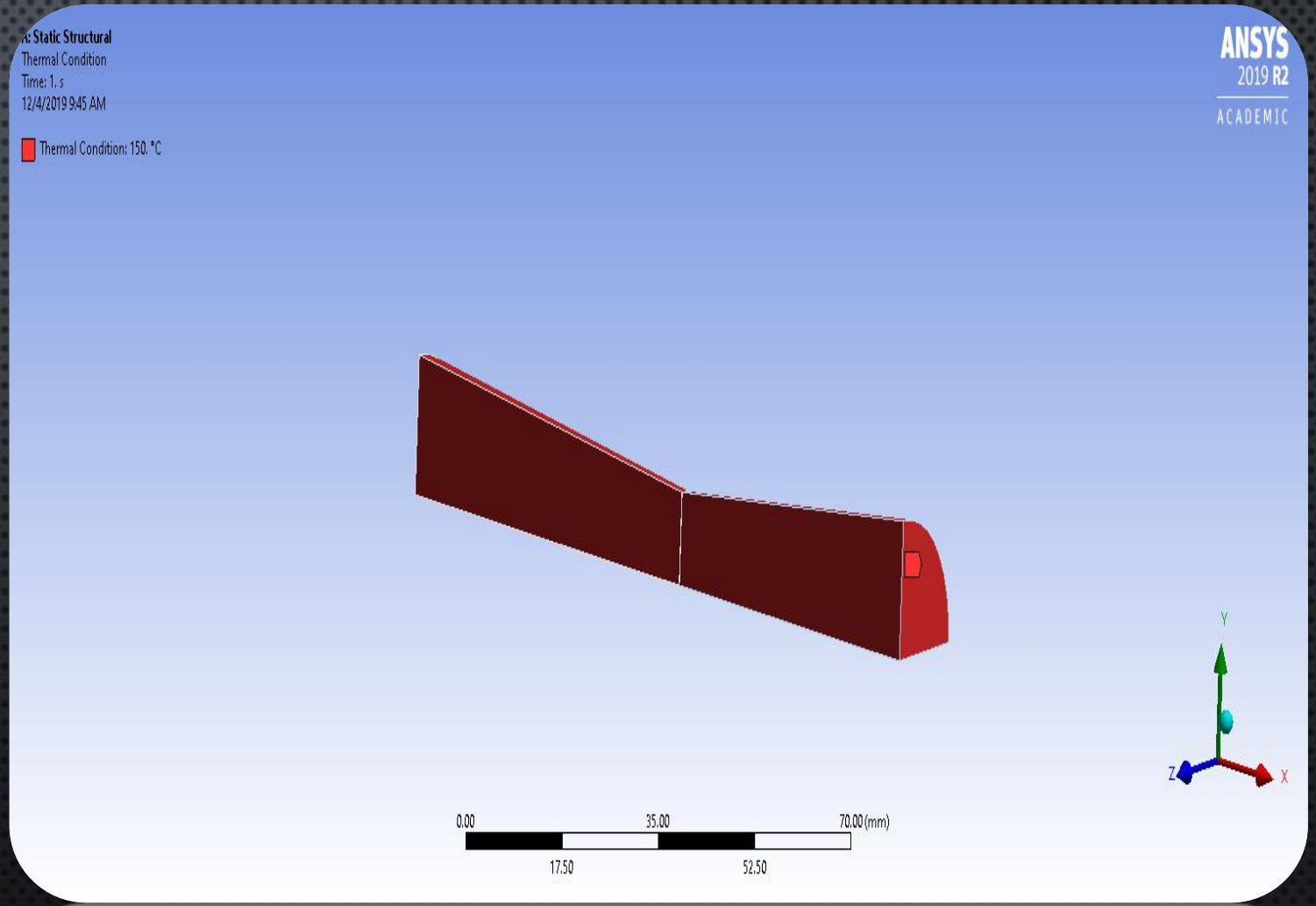
Boundary Conditions

Details of "Displacement 2"

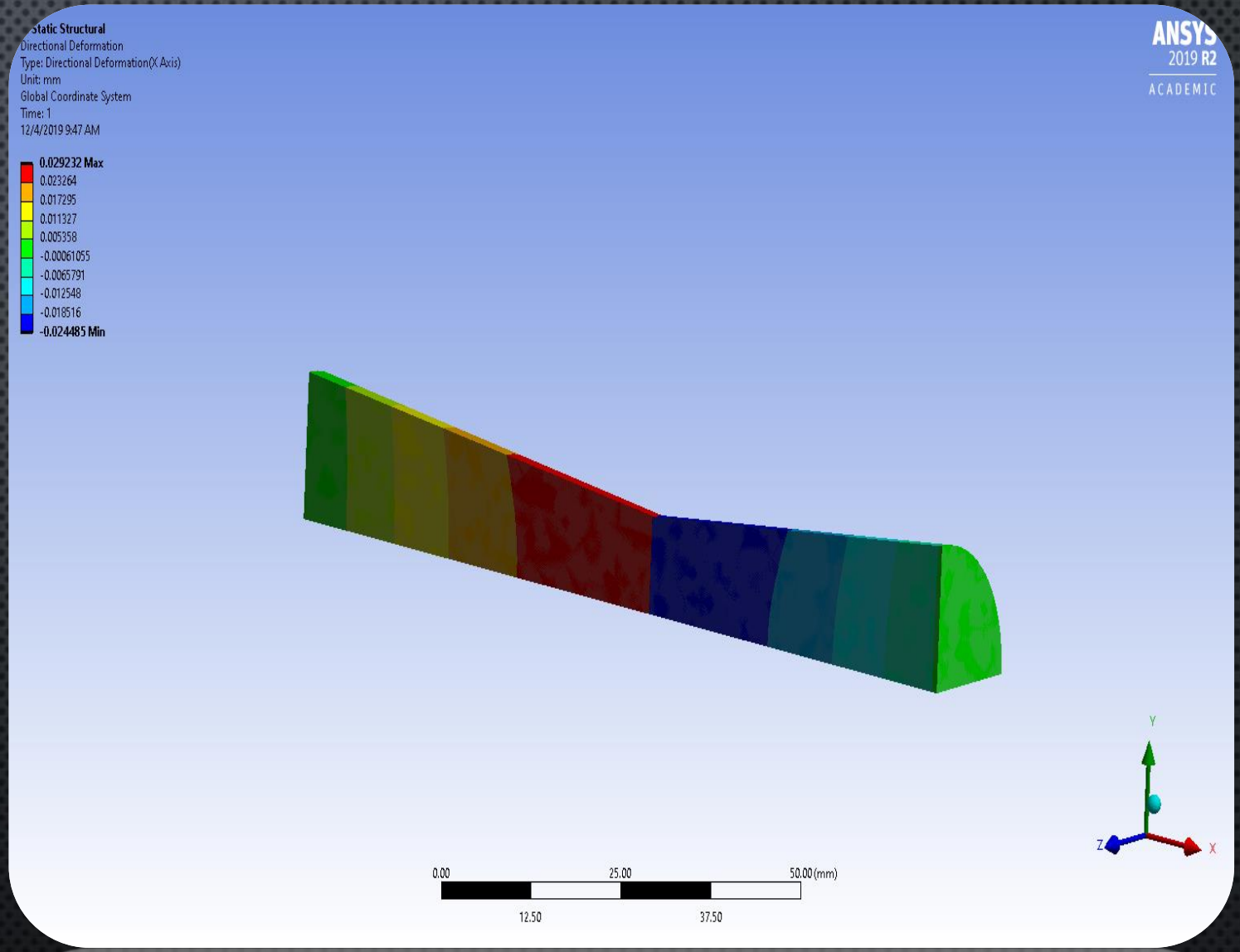
Scope	
Scoping Method	Geometry Selection
Geometry	2 Faces
Definition	
Type	Displacement
Define By	Components
Coordinate System	Global Coordinate System
X Component	Free
Y Component	Free
Z Component	0. mm (ramped)
Suppressed	No



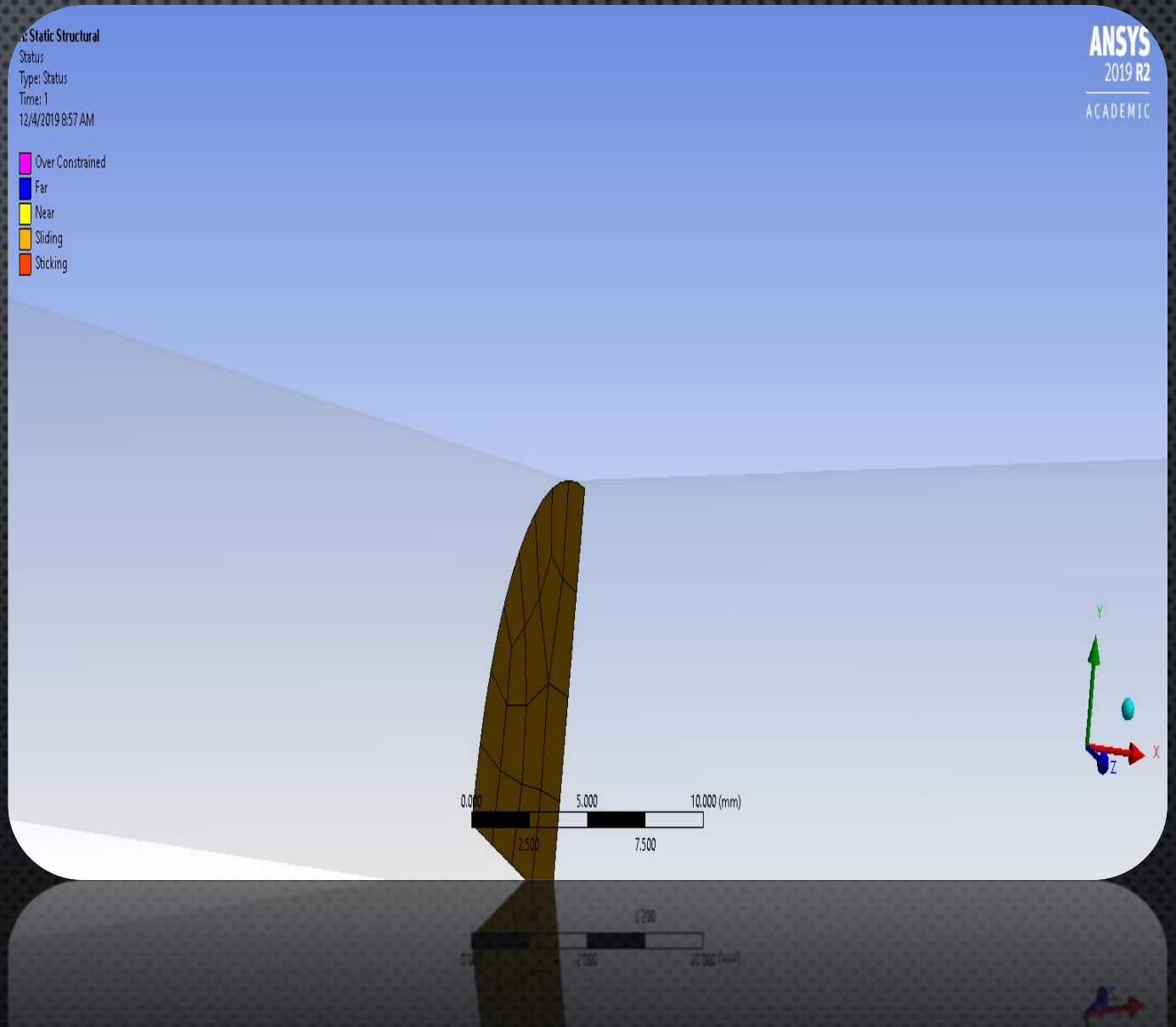
Boundary Conditions



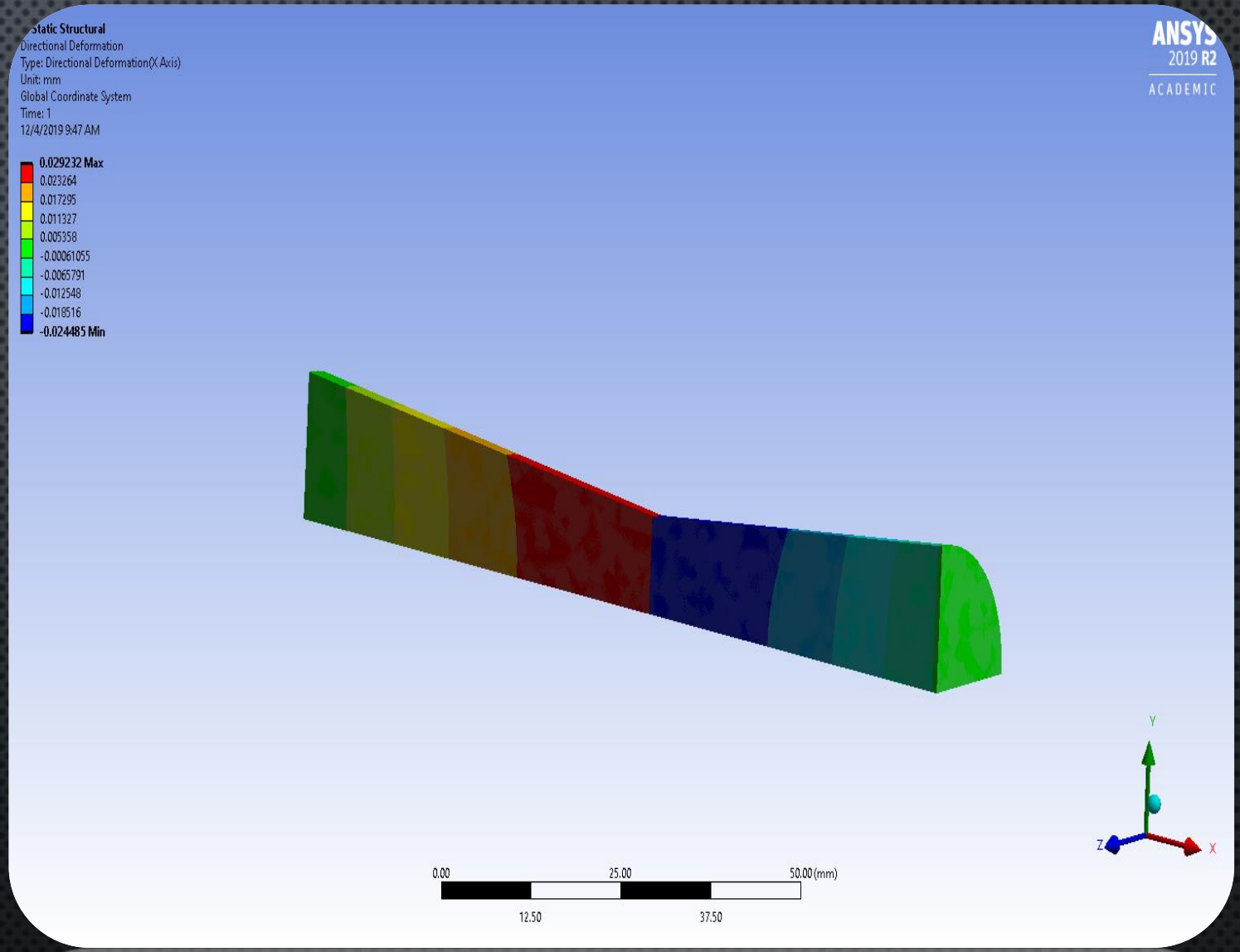
Results:


Static Structural
Directional Deformation
Type: Directional Deformation(X Axis)
Unit: mm
Global Coordinate System
Time: 1
12/4/2019 9:47 AM
0.029232 Max
0.023264
0.017295
0.011327
0.005358
-0.00061055
-0.0065791
-0.012548
-0.018516
-0.024485 Min
ANSYS
2019 R2
ACADEMIC
0.00
25.00
50.00 (mm)
12.50
37.50
Y
Z
X

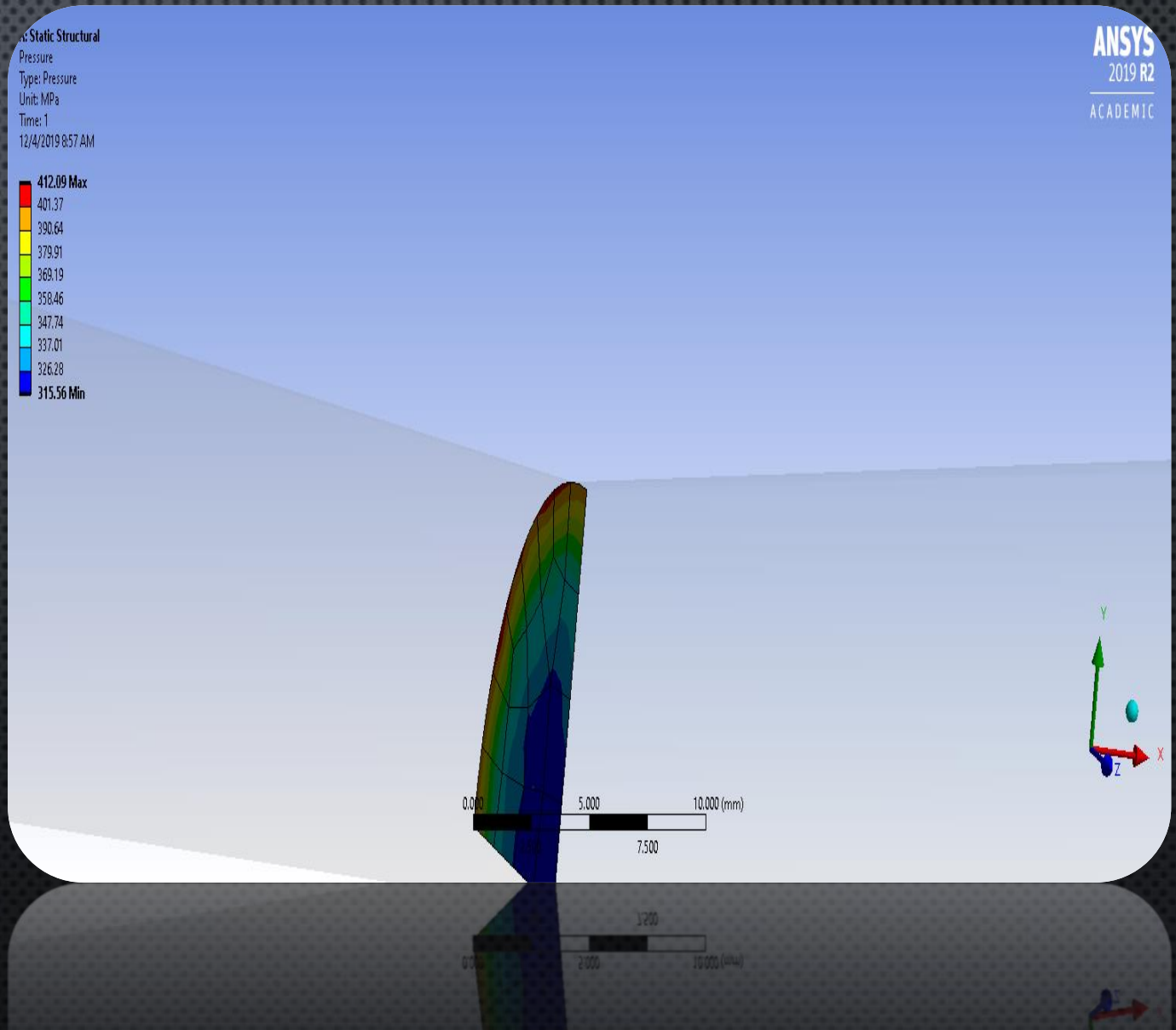
Results:


Static Structural
Status
Type: Status
Time: 1
12/4/2019 8:57 AM
Over Constrained
Far
Near
Sliding
Sticking
ANSYS
2019 R2
ACADEMIC
0.000
5.000
10.000 (mm)
2.500
7.500
Y
X
Z

Results:


Static Structural
Directional Deformation
Type: Directional Deformation(X Axis)
Unit: mm
Global Coordinate System
Time: 1
12/4/2019 9:47 AM
0.029232 Max
0.023264
0.017295
0.011327
0.005358
-0.00061055
-0.0065791
-0.012548
-0.018516
-0.024485 Min
ANSYS
2019 R2
ACADEMIC
0.00
25.00
50.00 (mm)
12.50
37.50
Y
Z
X

Results:


Static Structural
Pressure
Type: Pressure
Unit: MPa
Time: 1
12/4/2019 8:57 AM
412.09 Max
401.37
390.64
379.91
369.19
358.46
347.74
337.01
326.28
315.56 Min
ANSYS
2019 R2
ACADEMIC
0.000
5.000
10.000 (mm)
7.500
Y
X
Z

Parametric

P1 is the gap distance between the two bodies

Outline of All Parameters

	A	B	C	D
1	ID	Parameter Name	Value	Unit
2	Input Parameters			
3	Static Structural (A1)			
4	P1	XYPlane.H6	0.05	mm
5	P2	Thermal Condition Magnitude	150	C
*	New input parameter	New name	New expression	
7	Output Parameters			
8	Static Structural (A1)			
9	P3	Pressure Average	323.38	MPa
*	New output parameter		New expression	
11	Charts			

Parametric

As can seen from the table ,pressure increase as the temperature increase while it decrease if the gap between the ends increase.

Table of Design Points

	A	B	C	D
1	Name	P1 - XYPlane.H6	P2 - Thermal Condition Magnitude	P3 - Pressure Average
2	Units	mm	C	MPa
3	DP 0 (Current)	0.05	150	323.38
4	DP 1	0.05	200	502.8
5	DP 2	0.05	250	682.21
6	DP 3	0.2	150	0
7	DP 4	0.2	200	95.035
8	DP 5	0.2	250	274.45
9	DP 6	0.35	150	0
10	DP 7	0.35	200	0
11	DP 8	0.35	250	0