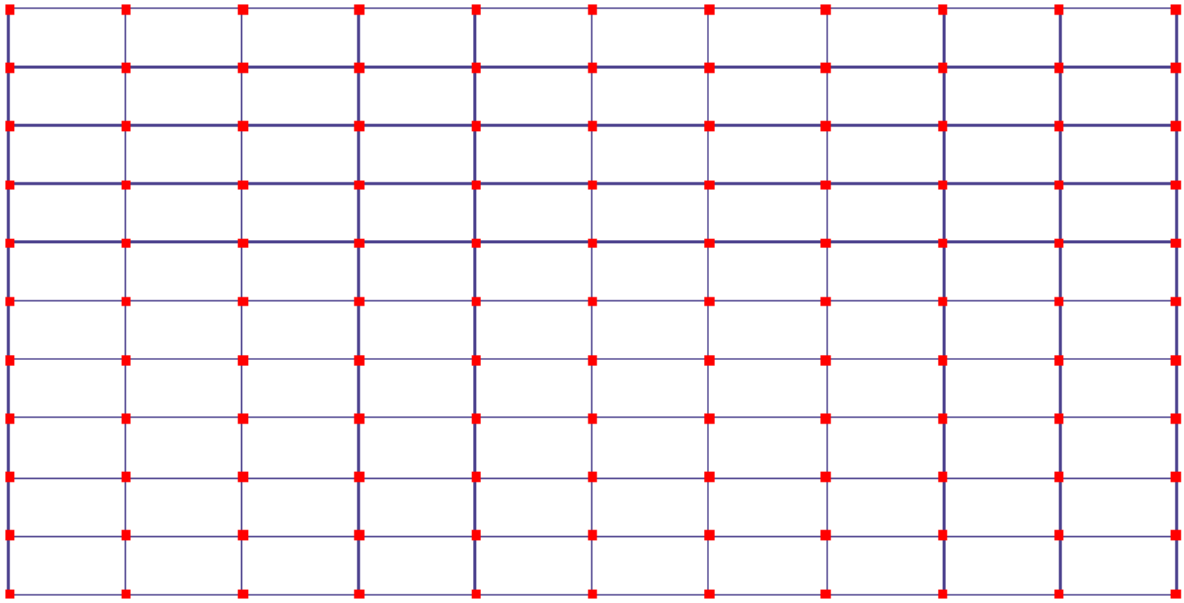
Buckling Analysis of simply supported Plate



Analysis Type: Buckling

Modulus of Elasticity, E = 70000 MPa

Poisson Ratio, $\nu = 0.3$

Cross section =250 *150mm

Load =10KN

Thickness = 3mm

PROCEDURE

STEP

1. Create a surface

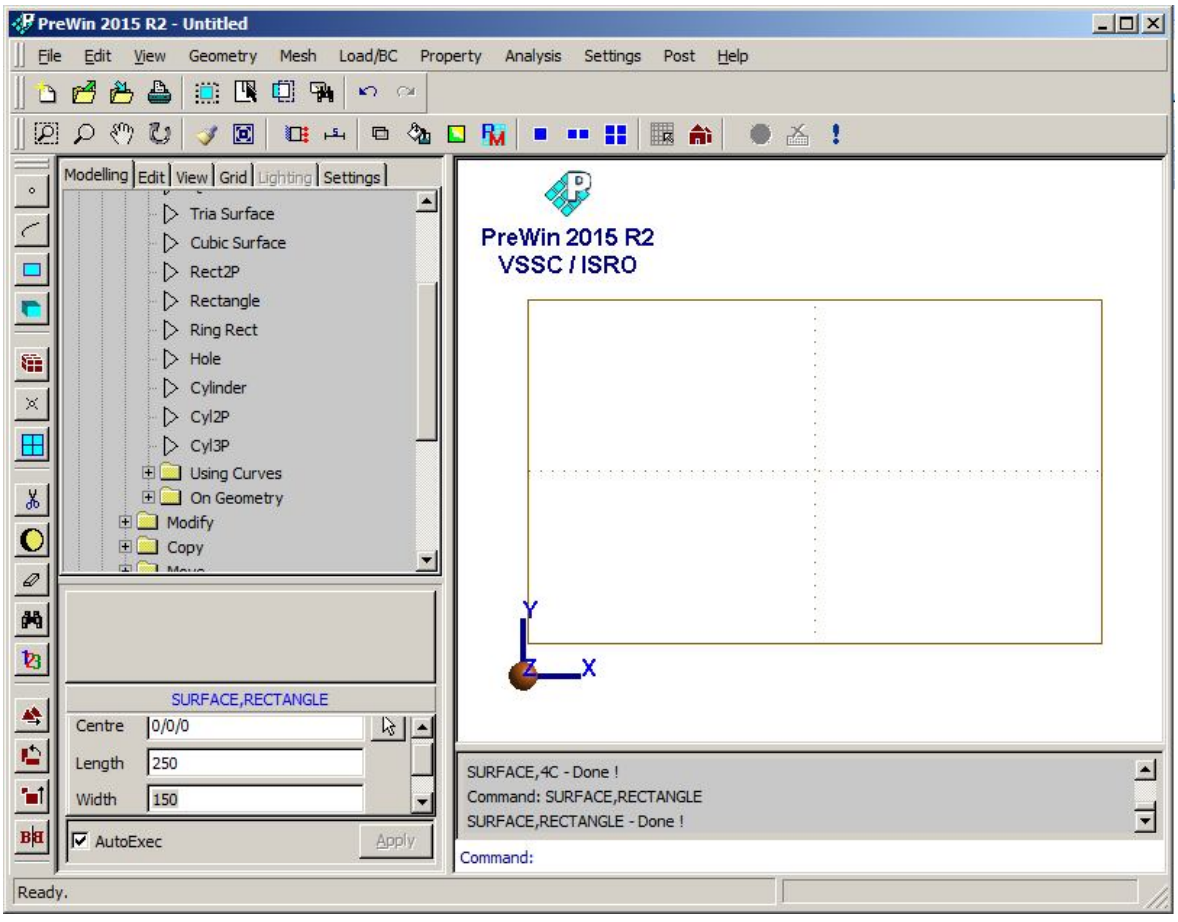
Commands: SURFACE, RECTANGLE

Menu : Geometry ⟶ Surface ⟶ Create ⟶ Rectangle

Parameters : (To be filled by the user)

Centre	**0/0/0**
Length	**250**
Width	**150**
Work plane ID	**1**
Entity ID	

At the end of the above mentioned operations your screen appears as below



2. Meshing using QUAD Elements

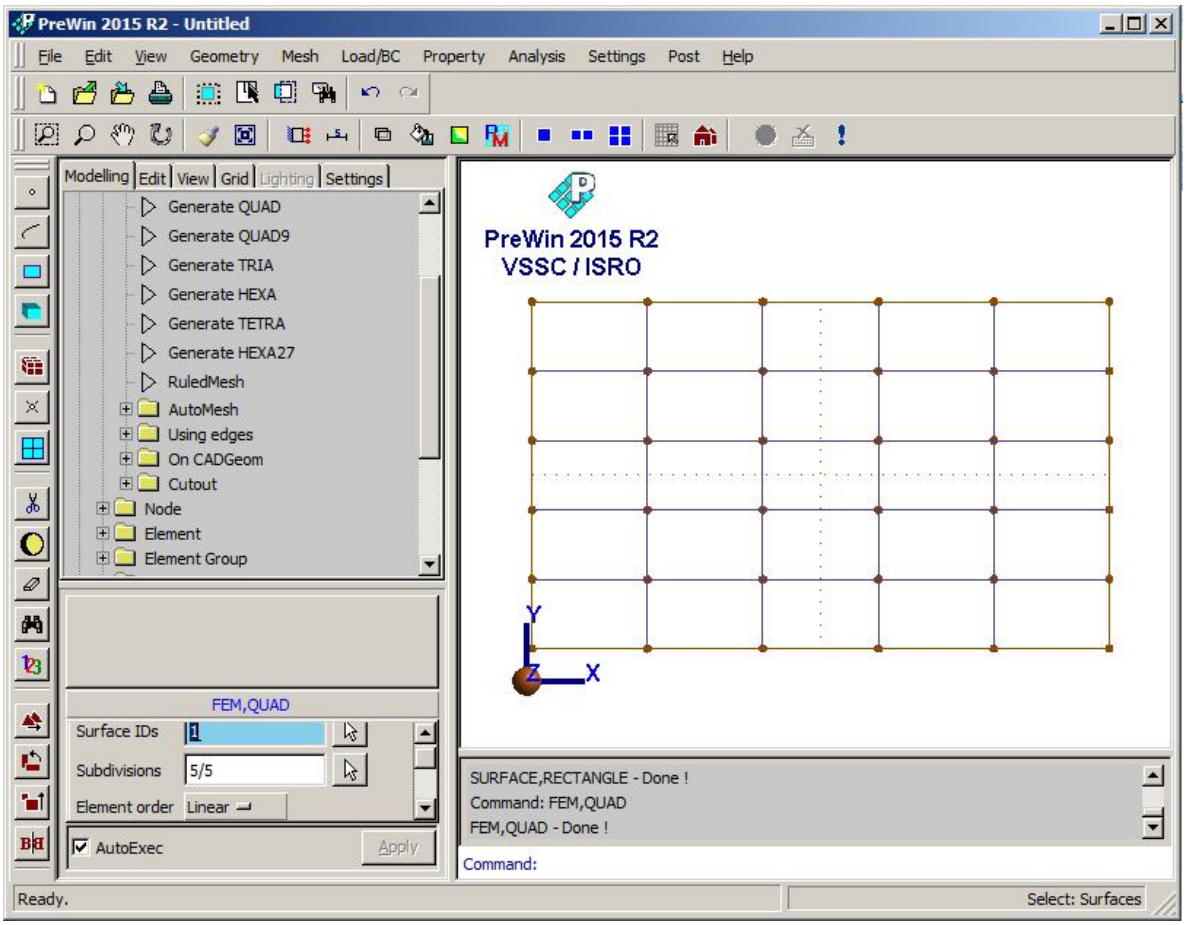
Commands : FEM, QUAD

Menu : Mesh ⟶ FE Mesh ⟶ Generate QUAD

Parameters : (To be filled by the user)

Surface IDs	**1**
Subdivisions	**5/5**
Element Order	**Linear**
Bias Factors	**1/1**

At the end of the above mentioned operations your screen appears as below



3. Specify Displacement Boundary Conditions

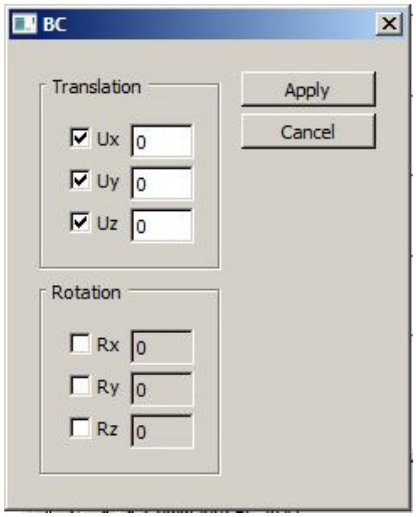
1. **Boundary Condition at left edge Ux, Uy, Uz=0**

Commands : BC, ADD

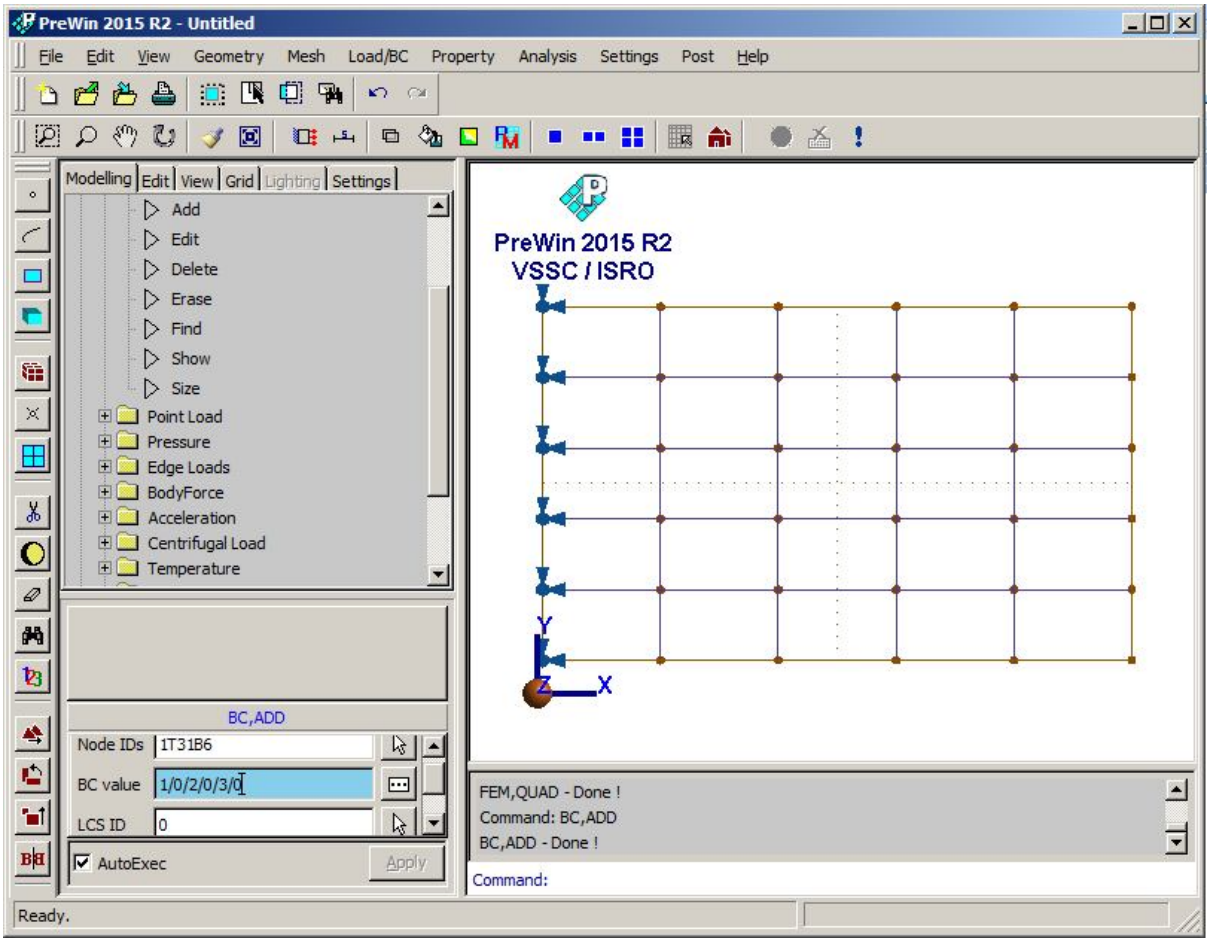
Menu : Load/BC ⟶ Displacement BC ⟶ ADD

Parameters : (To be filled by the user)

Node ID	**1T31B6**
BC Value	**1/0/2/0/3/0**
LCS ID	**0**
SET ID	**1**



At the end of the above mentioned operations your screen appears as below



2. Boundary condition at middle edges Uy=Uz=0

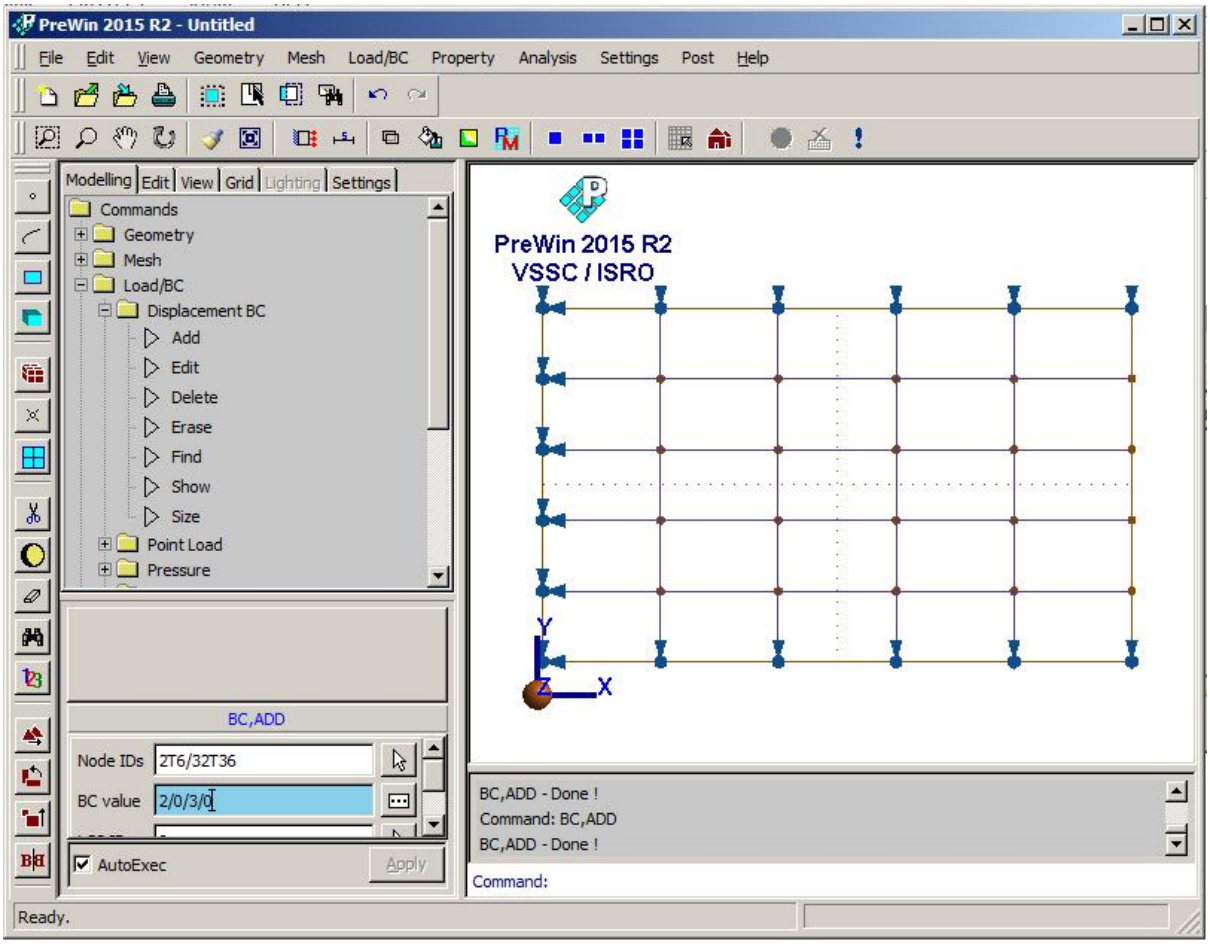
Commands : BC, ADD

Menu : Load/BC ⟶ Displacement BC ⟶ ADD

Parameters : (To be filled by the user)

Node ID	**2T6/32T36**
BC Value	**2/0/3/0**
LCS ID	**0**
SET ID	**2**

At the end of the above mentioned operations your screen appears as below



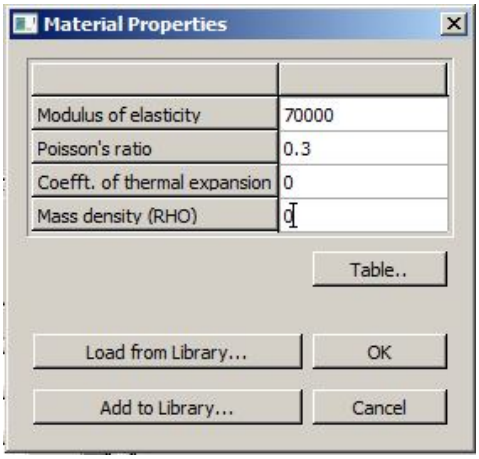
4. Specify Material Properties

Commands : MATERIAL, ISO

Menu : Property ⟶ Material ⟶ Isotropic ⟶ Add

Parameters : (To be filled by the user)

Element IDs	**ALL**
Material Data	**70000/0.3/0/0**
Material ID	**1**



5. Specify Thickness

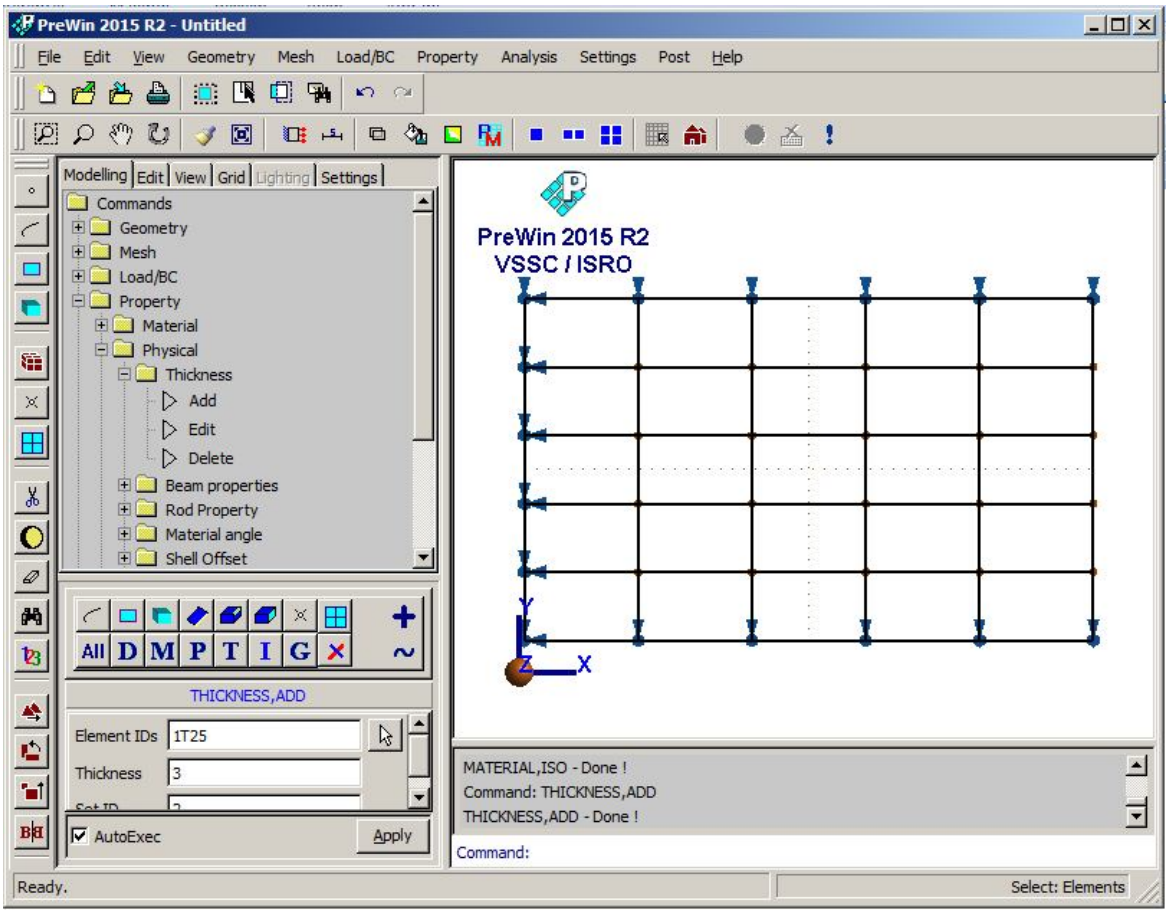
Commands : THICKNESS, ADD

Menu : Property ⟶ Physical ⟶ Thickness ⟶ Add

Parameters :

Element IDs	**1T25**
Thickness	**3**
Set ID	**1**

At the end of the above mentioned operations your screen appears as below



6. Specify Edge load

1. Specify an edge load of 1.25 KN

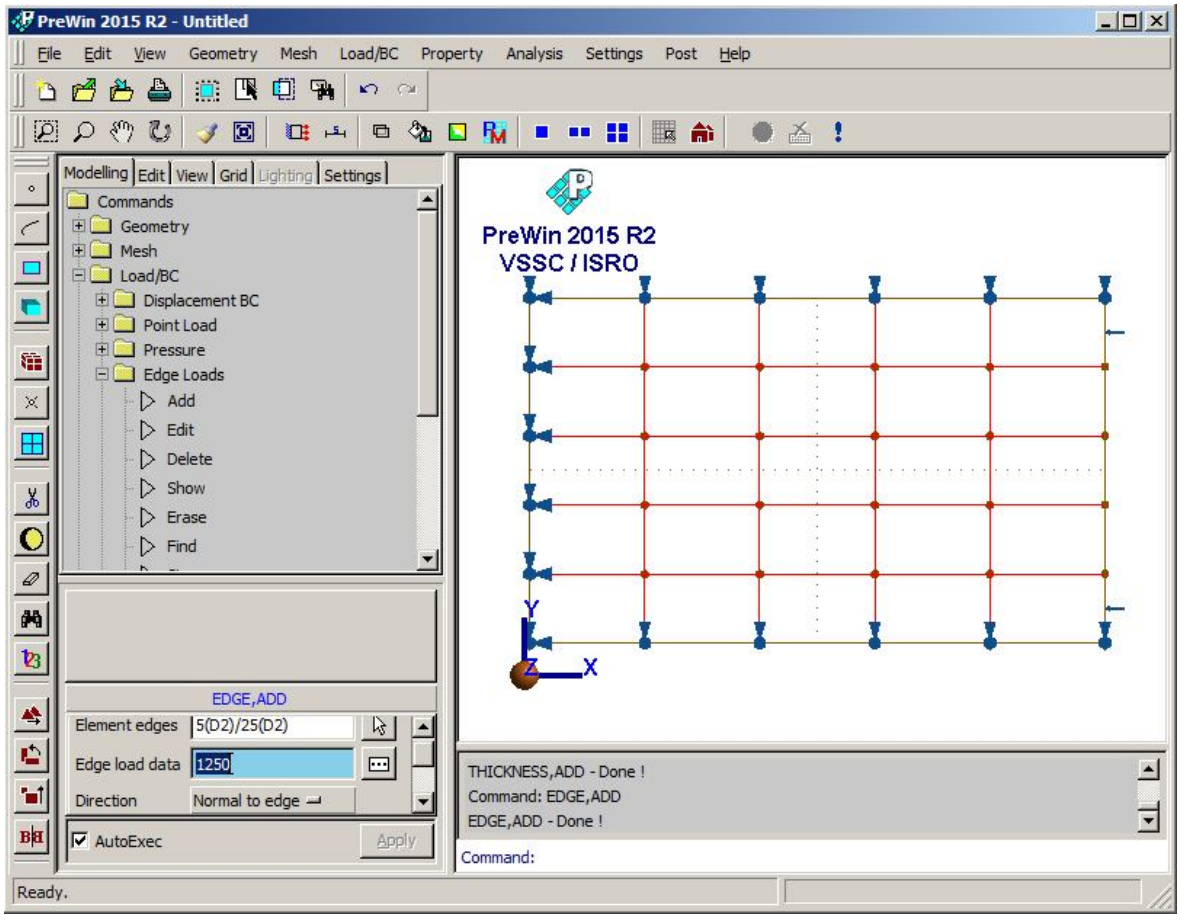
Commands : EDGE, ADD

Menu : Load/BC ⟶ Edge Load ⟶ Add

Parameters : (To be filled by the user)

Element edges	**Select top and bottom edges on right hand side (use**  **button on the top of the parameter box)**
Edge load data	**1250 N**
Component	**Normal to edge**
LCS ID	**0**
Set ID	

At the end of the above operations your screen looks as below



2. Specify an edge load of 2.5 KN

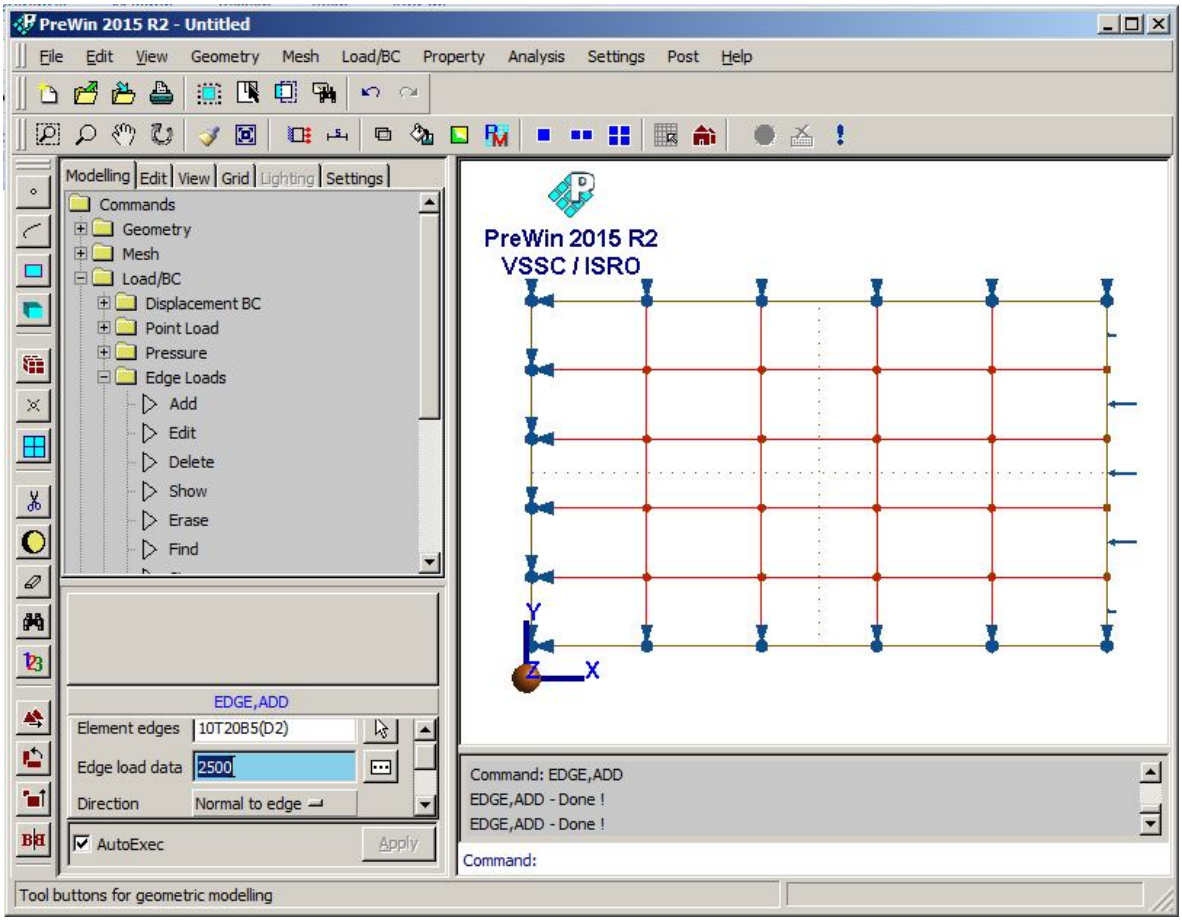
Commands : EDGE, ADD

Menu : Load/BC ⟶ Edge Load ⟶ Add

Parameters : (To be filled by the user)

Element edges	**Select middle 3 edges on right hand side**
Edge load data	**2500 N**
Component	**Normal to edge**
LCS ID	**0**
Set ID	

At the end of the above mentioned operations your screen appears as below



7. Set the Analysis Type

Command : ANTYPE, SET

Menu : Analysis ⟶ Analysis Type

Analysis Type	**Buckling**

8. Set the Analysis Option

Command : ANOPTION, SET
Menu : Analysis ⟶ Analysis Option

Parameter :

Linear Solver	**MultiFrontal**
Eigen Solver	**Lanczos**

9. Specify Control data for buckling analysis

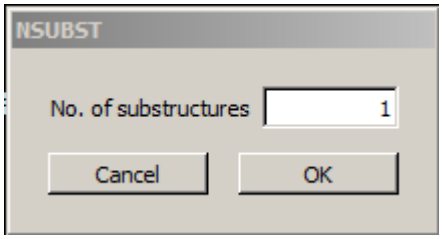
Command : BUCKLING, ADD

Menu : Analysis ⟶ Buckling ⟶ General ⟶ Add

10. Specify the No: of Substructures

Command : SET, NSUBST

Menu : Settings ⟶ Substructures

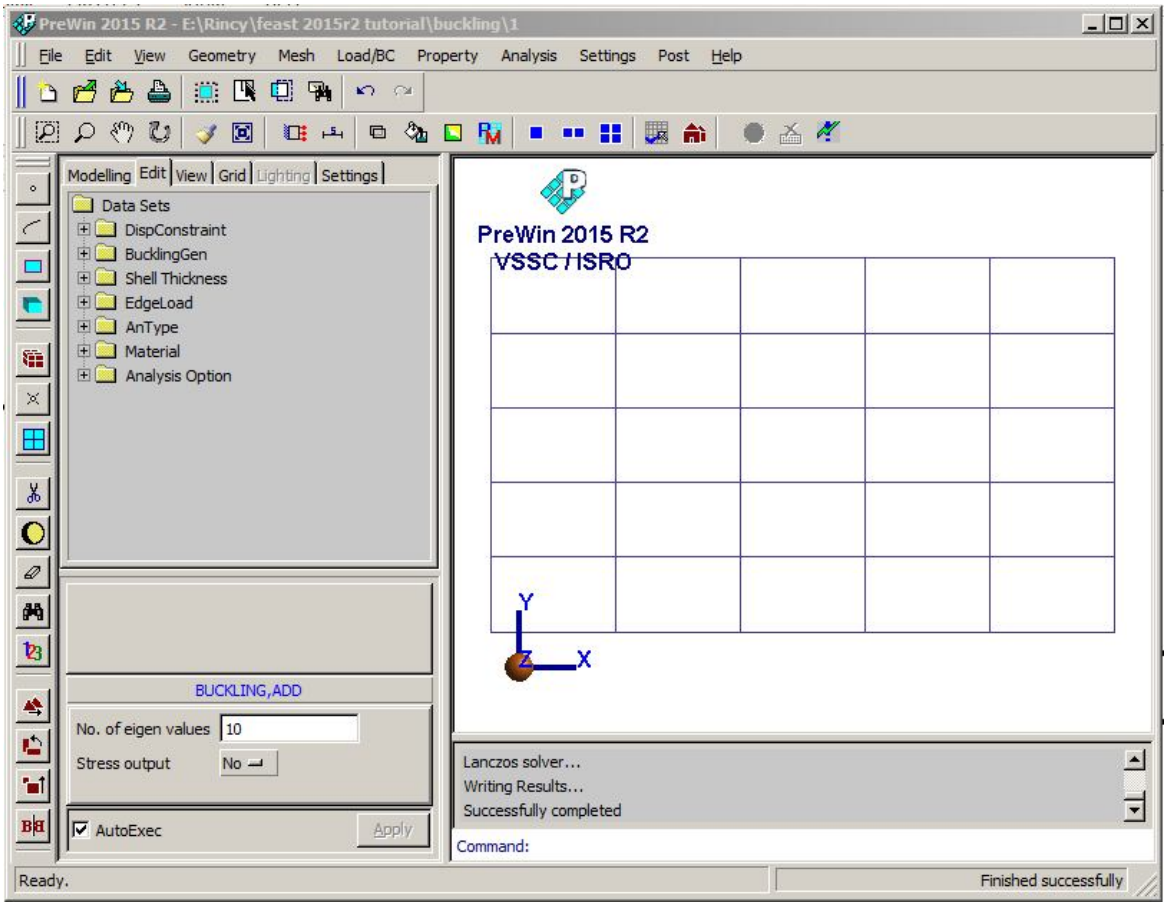


11. Save the Project File

Menu : File ⟶ Save

12. Submit the job into FEAST

Menu : Analysis ⟶ Run Solver



13. Perform post processing

a) Critical Load

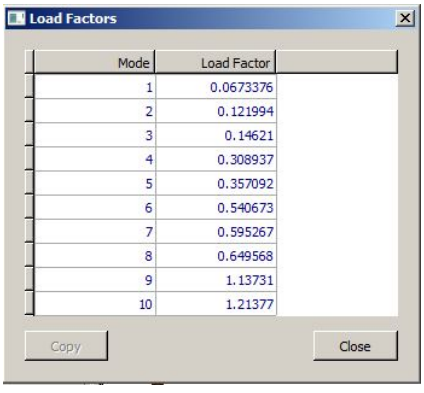
Command : POST, VIEWRESULTS

Menu : Post ⟶ View Results

Parameters :

Item	Critical Loads

At the end of the above operations, your screen should look like this.



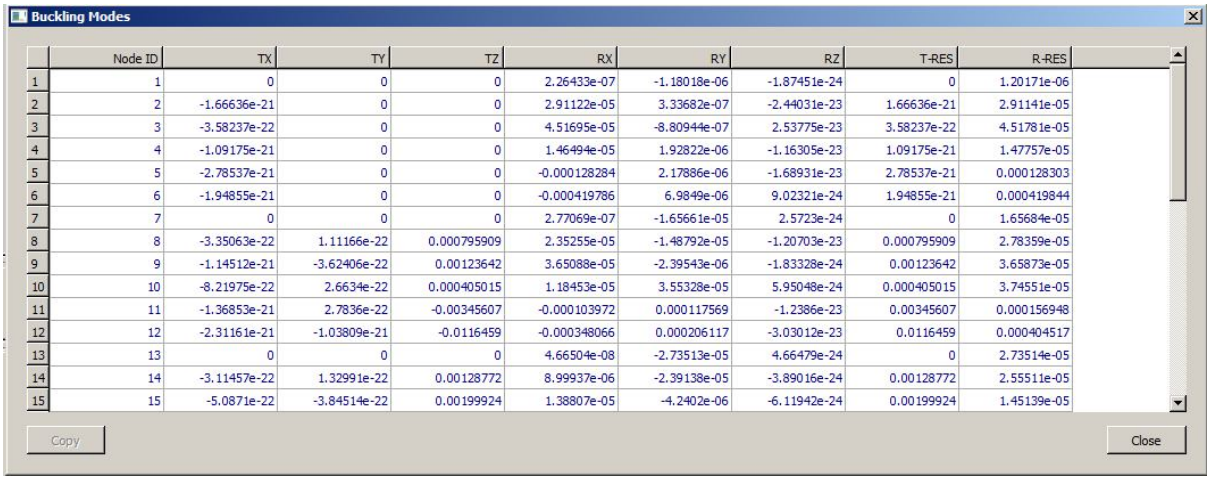
b) Buckling modes

Command : POST, VIEWRESULTS

Menu : Post ⟶ View results

Parameters :

Item	Modes
Nodes	All



	Node ID	TX	TY	TZ	RX	RY	RZ	T-RES	R-RES
1	1	0	0	0	2.26433e-07	-1.18018e-06	-1.87451e-24	0	1.20171e-06
2	2	-1.66636e-21	0	0	2.91122e-05	3.33682e-07	-2.44031e-23	1.66636e-21	2.91141e-05
3	3	-3.58237e-22	0	0	4.51695e-05	-8.80944e-07	2.53775e-23	3.58237e-22	4.51781e-05
4	4	-1.09175e-21	0	0	1.46494e-05	1.92822e-06	-1.16305e-23	1.09175e-21	1.47757e-05
5	5	-2.78537e-21	0	0	-0.000128284	2.17886e-06	-1.68931e-23	2.78537e-21	0.000128303
6	6	-1.94855e-21	0	0	-0.000419786	6.9849e-06	9.02321e-24	1.94855e-21	0.000419844
7	7	0	0	0	2.77069e-07	-1.65661e-05	2.5723e-24	0	1.65684e-05
8	8	-3.35063e-22	1.11166e-22	0.000795909	2.35255e-05	-1.48792e-05	-1.20703e-23	0.000795909	2.78359e-05
9	9	-1.14512e-21	-3.62406e-22	0.00123642	3.65088e-05	-2.39543e-06	-1.83328e-24	0.00123642	3.65873e-05
10	10	-8.21975e-22	2.6634e-22	0.000405015	1.18453e-05	3.55328e-05	5.95048e-24	0.000405015	3.74551e-05
11	11	-1.36853e-21	2.7836e-22	-0.00345607	-0.000103972	0.000117569	-1.2386e-23	0.00345607	0.000156948
12	12	-2.31161e-21	-1.03809e-21	-0.0116459	-0.000348066	0.000206117	-3.03012e-23	0.0116459	0.000404517
13	13	0	0	0	4.66504e-08	-2.73513e-05	4.66479e-24	0	2.73514e-05
14	14	-3.11457e-22	1.32991e-22	0.00128772	8.99937e-06	-2.39138e-05	-3.89016e-24	0.00128772	2.55511e-05
15	15	-5.0871e-22	-3.84514e-22	0.00199924	1.38807e-05	-4.2402e-06	-6.11942e-24	0.00199924	1.45139e-05

c) Mode Shape

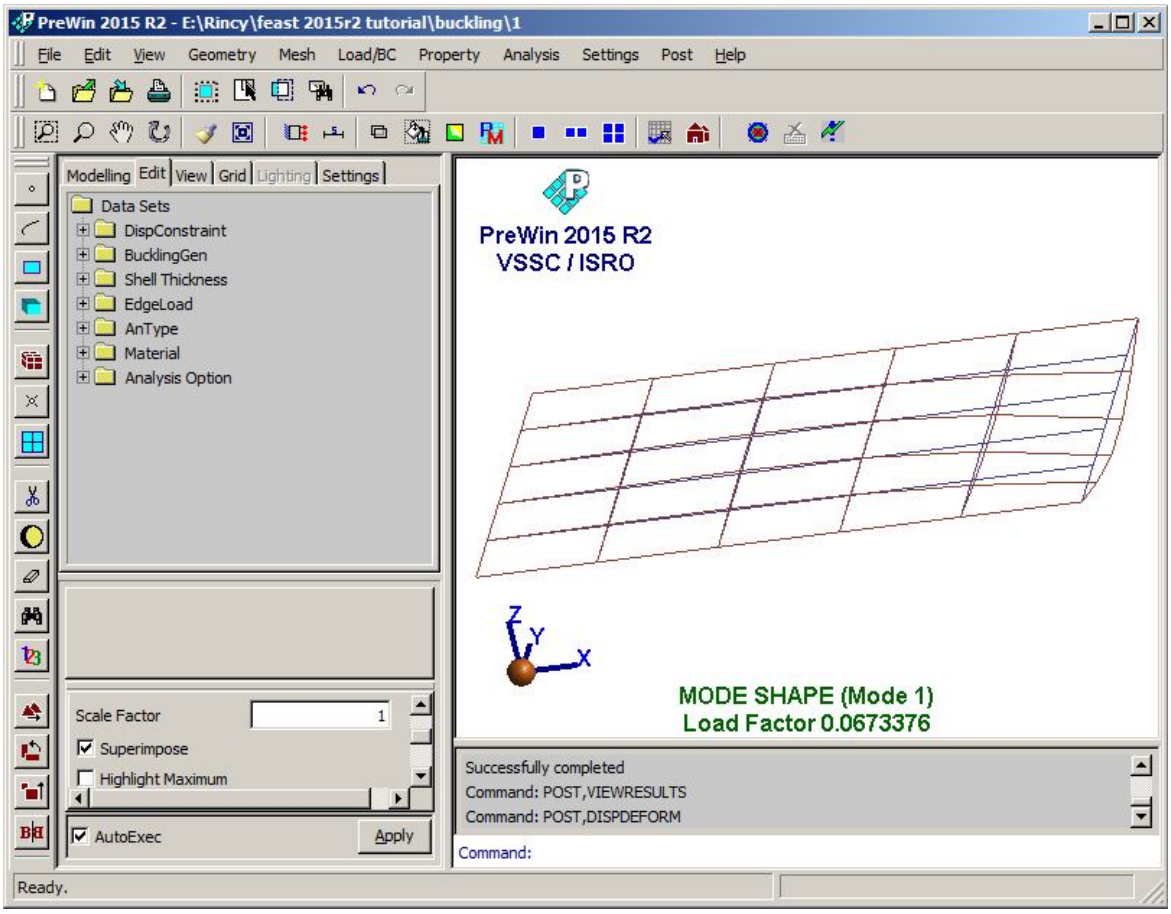
Command : POST, DISPDEFORM

Menu : Post ⟶ Deformed Shape

Parameters :

Mode	1
Scale factor	0

At the end of the above operations a graph as shown appears in the viewport



d) Output file can be seen in *.OUT