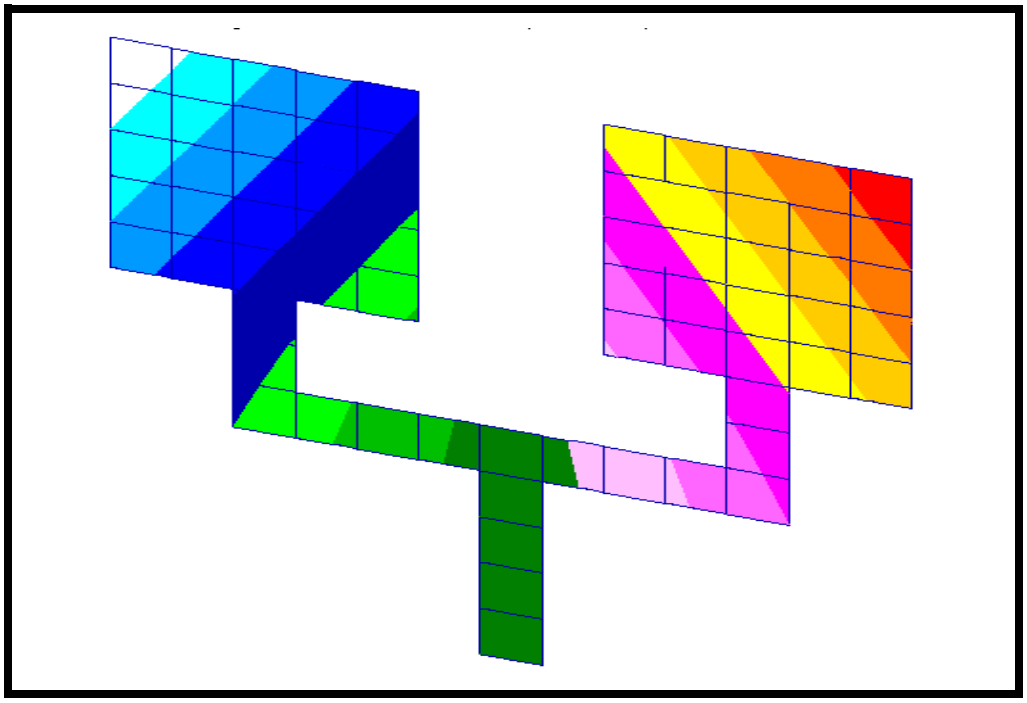
WORKSHOP 1

Linear Static Analysis of a Steel Stamping



Objectives:

- Create a MSC.Nastran analysis model comprised of CQUAD4 elements.
- Create multiple loading conditions.
- Prepare a MSC.Nastran input file for a Linear Static analysis.
- Visualize analysis results.

Model Description:

Below is a finite element representation of the model plate. The plate is 0.05 inches thick; therefore thin-shell theory applies. The entire model is constraint in the Z direction which is the axis out of this page. GRID 1 and GRID 2 are also constrainted in the other 5 DOFs.

Figure 1.1 - Grid Coordinates and Element Connectivities

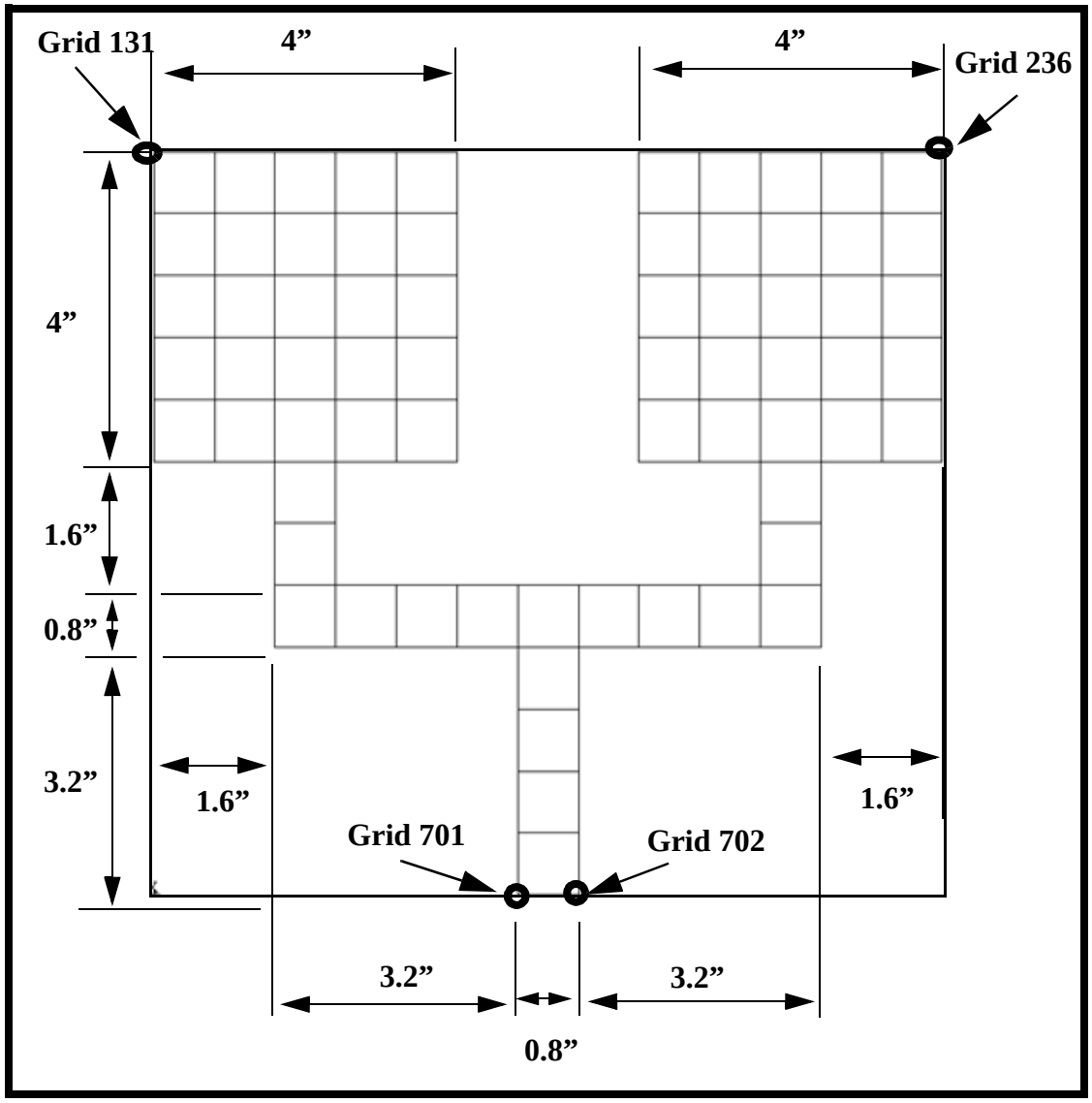


Table 1.1 - Material Properties

Elastic Modulus:	**30E6 psi**
Poisson Ratio	**0.3**
Density:	**0.283 lbs/in^3**
Plate Thickness:	**0.05 in**

Table 1.2 - Loads and Boundary Conditions Sets

Constraint Set	Title	Description
1	**Constraint**	**Nodes 701 and 702 fixed**
2	**Permanent_Constraint**	**All nodes constrained in translational Z**
3	**Combined_Constraint**	**Combined set of Constraint Sets 1 & 2**

Load Set	Title	Description
1	**Pressure**	**1 psi pressure on surfaces 1 & 2**
2	**normal_force1**	**Normal force of 2μ on Node 131**
3	**normal_foce2**	**Normal force of 2μ on Node 236**
4	**normal_force3**	**Normal force of 2μ on Node 236**
5	**combined_set1**	**Combined set of load sets 1, 2, and 3**
6	**combined_set2**	**Combined set of load sets 1, 2 and 4**

Table 1.3 - Subcases

Subcase	Load Set	Constraint Set
1	**1**	**3**
2	**5**	**3**
3	**6**	**3**

Suggested Exercise Steps:

- Explicitly generate a finite element representation of the plate using nodes (GRID), element connectivies (CQUAD4).
- Define material (MAT1) and element properties (PSHELL).
- Define simply-supported boundary constraints and the permanent constraints (SPC1).
- Apply a uniform pressure load to the plate (PLOAD4) and the three point forces (FORCE).
- Use the load and boundary condition sets to define three loadcases (SUBCASE).
- Prepare the model for a Linear Static analysis (SOL 101).
- Generate and submit input file for MSC.Nastran.
- Review the results.

Exercise Procedure:

1. Start up MSC.Nastran for Windows 4.0 and begin to create a new model.

   Double click on the icon labeled **MSC.Nastran for Windows V4.0**.

   On the *Open Model File* form, select **New Model.**

   Open Model File: **New Model**

2. Turn off Advanced Geometry and switch to the Standard Geometry engine.

   Tools/Advanced Geometry...

   Geometry Engine: ● **Standard**

   OK

3. Define a material using the specified Modulus of Elasticity, Poisson Ratio and Density from the model's description.

   Model/Material...

   Title: s**teel**

   Youngs Modulus, E: **30E6**

   Poisson Ratio: 0**.3**

   Mass Density: **0.283**

   OK

   C**ancel**

4. Create the elements properties for the model.

   Model/Property...

   Element/Property Type...

   Plane Elements: ● **Plate**

   OK

   Material: **1..steel**

   Title: **Prop_1**

Thickness, T_{avg} or T1: **0.05**

OK

Cancel

5. Create the surface geometry of the model.

Geometry/Surface/Plane...

Methods^

CSys Plane

Base: *X:* *Y:* *Z:*

0 **5.6** **0**

Direction: ● **Positive**

● **XY Plane**

OK

Width (Along Plane X) **4**

Height (Along Plane Y) **4**

OK

Cancel

6. Refresh the screen and refit the geometry.

View/Autoscale...

7. Turn off the workplane and turn on the surface labels.

First, turn off the workplane.

Tools/Workplane...

(uncheck box) ☐ **Draw Workplane**

Done

View/Regenerate <Ctrl+G>

Turn on the surface ID labels.

View/Options...

Category: ● **Labels, Entities, and Color**

Options (highlight) **surface**

Label Mode: **1..ID**

Apply

OK

8. Create the rest of the surfaces by repeating step #5. Use the table below for reference.

Surface	Base			Width	Height
	X	Y	Z		
2	6.4	5.6	0	4	4
3	1.6	4.0	0	0.8	1.6
4	8	4.0	0	0.8	1.6
5	1.6	3.2	0	3.2	0.8
6	5.6	3.2	0	3.2	0.8
7	4.8	0	0	0.8	4

Click Cancel after the first surface has been created.

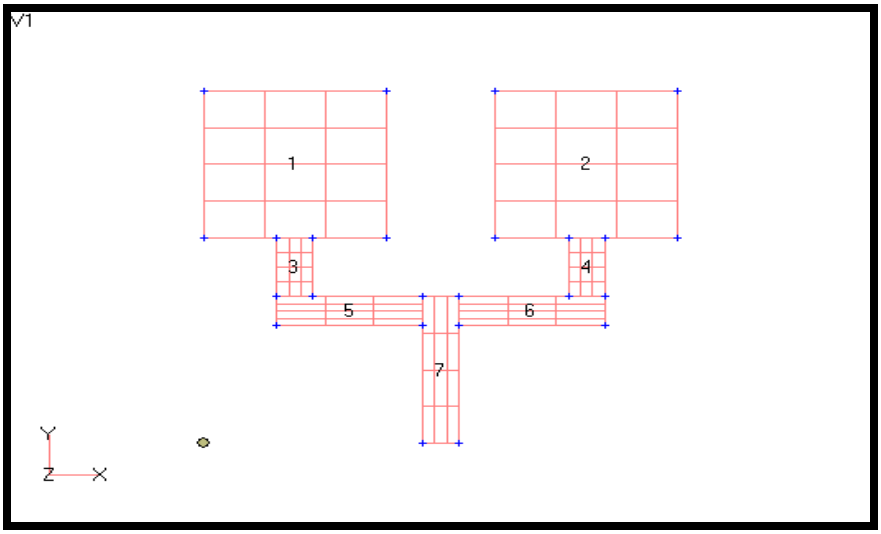
Cancel

Refresh the screen and refit the geometry.

View/Autoscale...

The model should appear as the following

Figure 1.2 -- Geometry Model



9. Set the mesh default size to ensure mesh congruency.

Mesh/Mesh Control/Default Size...

Size: **0.8**

OK

10. Now, mesh surface 1 to discretize it into Quad4 elements with the assigned plate property (prop_1) and the appropriate node and element ID numbering.

Mesh/Geometry/Surface...

<select surface 1>

OK

Node ID: **101**

Element ID: **101**

Property: **1..prop_1**

Generate: ● **Elements and Nodes**

Element Shape: ● **Quad**

OK

11. Repeat step #10 with the other surfaces in the model, making sure that each surface has the appropriate node and element ID numbering. Use the table below for reference.

Surface ID	Node ID	Elem ID	Property	
2	201	201	prop_1	OK
3	301	301	prop_1	OK
4	401	401	prop_1	OK
5	501	501	prop_1	OK
6	601	601	prop_1	OK
7	701	701	prop_1	OK

12. Check for and merge coincident nodes.

Tools/Check/Coincident Nodes...

Select All

OK

Click “No” when asked “OK to Specify Additional Range of Nodes to Merge?”

No

Options: ☒ **Merge Coincident Entities**

OK

13. Turn on the element labels and turn off the surface labels.

View/Options...

Category: ● **Labels, Entities, and Color**

Options (highlight) **Element**

Label Mode: **1..ID**

Apply

Options (highlight) **Surface**

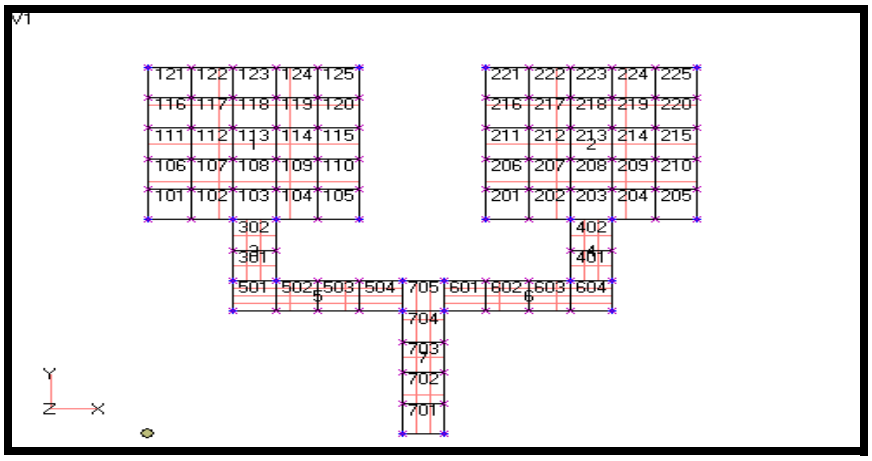
Label Mode: **1..ID**

Apply

OK

The model should now appear as follows:

Figure 1.3



14. Define displacement constraints and apply them to the geometry model.

This first boundary condition represents the simply supported corners of the stiffened plate structure.

Model/Constraint/Set...

ID: **1**

Title: **constraint**

OK

Model/Constraint/Nodal...

Method^

on Curve

Select the lower edge of surface 7 (Curve 25)

OK

DOF (click to select): ☒ **TX** ☒ **TY** ☒ **TZ**

☒ **RX** ☒ **RY** ☐ **RZ**

OK

Cancel

15. Create the permanent constraint for the entire model.

Model/Constraint/Set...

ID: **2**

Title: **permanent_constraint**

OK

Model/Constraint/Nodal...

Method^

on Surface

Select All

OK

DOF (click to select): ☐ **TX** ☐ **TY** ☐ **TZ** ☐ **RX** ☐ **RY** ☒ **RZ**

OK

Click “No” when asked “OK to Overwrite (No=Combine)?

No

Cancel

16. Apply a uniform pressure load to the surface of the plate.

Model/Load/Set...

ID: **1**

Title: **pressure**

OK

Model/Load/On Surface...

<Select surface 1 and surface 2>

OK

On the Create Loads on Surfaces form, <highlight pressure>

Pressure: **1**

OK

Cancel

17. Rotate the model to get a better view.

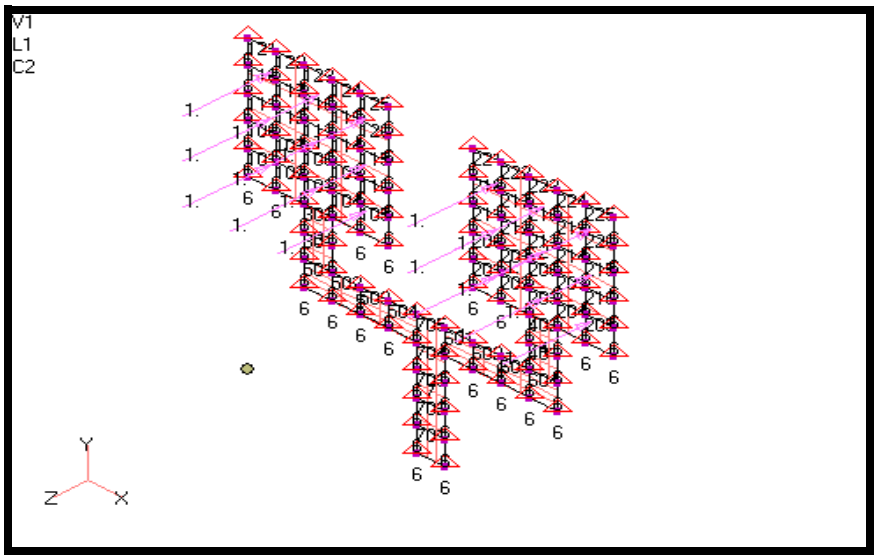
View/Rotate...

Isometric

OK

Your display should appear as follows:

Figure 1.4



18. Apply the nodal forces.

Model/Load/Set...

ID: **2**

Title: **normal_force1**

OK

Model/Load/Nodal...

<Select Node 131> *(see Figure 1.1 for reference)*

OK

under Select Force **FX** ☒ **0**

FY ☒ **0**

FZ ☒ **-2**

OK

Cancel

19. Create the rest of the nodal forces by repeating step #18. Use the table below and Figure 1.1 for reference.

ID	Title	Node	FX	FY	FZ
3	normal_force2	Node 236	0	0	-2
4	normal_force3	Node 236	0	0	2

Click Cancel after applying the last load.

Cancel

20. Create the combined load sets. See table 1.1 for reference.

Model/Load/Combine...

From Set: **1..pressure**

More...

From Set: **2..normal_force1**

More...

From Set: **3..normal_force2**

Last One

This will create “Combined Set” with load set ID 5. Now, create load set 6.

Model/Load/Combine...

From Set: **1..pressure**

More...

From Set: **2..normal_force1**

More...

From Set: **4..normal_force3**

Last One

21. Create the combined constraint set. See table 1.2 for reference.

Model/Constraint/Combine...

● **Combine**

From Set: **1..constraint**

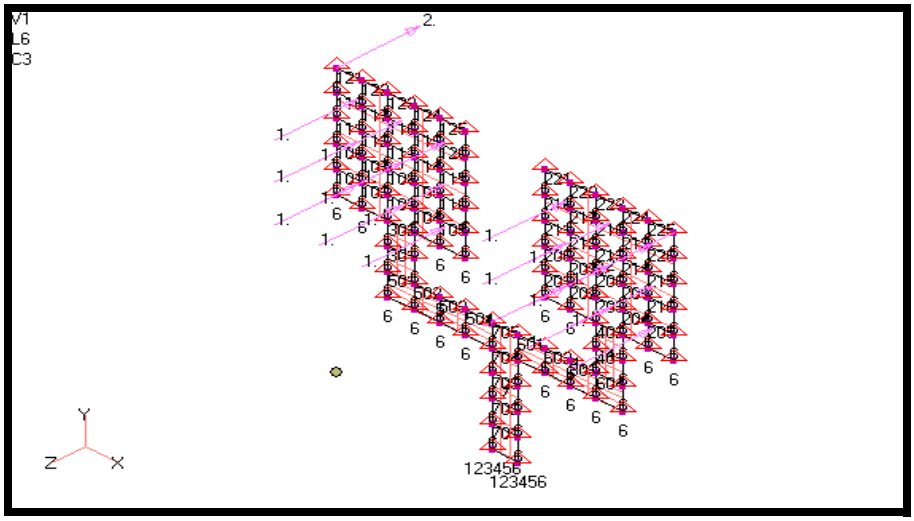
More...

From Set: **2..permanent_constraint**

Last One

Your dispaly should resemble the figure shown.

Figure 1.5



22. Write the Nastran bulk data file and submit the model for analysis.

File/Export/Analysis Model...

Analysis Format/Type: **1..Static**

OK

Filename: **stamping**

Write

Additional Info: ☒ **Run Analysis**

Advanced...

OK

Under Output Request, uncheck everything except Displacement and Element Stress

☒ **Displacement**

☒ **Element Stress**

Under Analysis Case Requests,

SUBCASE ID	**1**
Title =	**Subcase_1**
Loads =	**1..pressure**
Constraints (SPC) =	**3..Combined_Set**

Write Case...

Click “OK” on the confirmation screen that subcase 1 was written.

OK

Now, write the second subcase

SUBCASE ID	**2**
Title =	**Subcase_2**
Loads =	**5..Combined_Set**
Constraints (SPC) =	**3..Combined_Set**

Write Case...

Click “OK” on the confirmation screen that subcase 2 was written.

OK

Write the last subcase

SUBCASE ID	**3**
Title =	**Subcase_3**
Loads =	**6..Combined_Set**
Constraints (SPC) =	**3..Combined_Set**

Write Case...

Click “OK” on the confirmation screen that subcase 3 was written.

OK

Done

Type Input...

Current line: **PARAM, USETPRT,0**

OK

OK

When asked “OK to Save Model Now?”

Yes

When the MSC.Nastran manager is through running, MSC.Nastran will be restored on your screen, and the *Message Review* form will appear. To read the messages, you could select **Show Details**. Since the analysis ran successfully, we will not bother with the details this time.

Continue

23. The translation has created a MSC.Nastran input deck called stamping.dat. Go to the C:\temp directory and open this file using Windows Notepad. The file should be similar to what you on the following pages.

```
INIT MASTER(S)
ID D:\scrat,MSC/N
SOL SESTATICS
TIME 10000
CEND
SUBCASE 1
  ECHO = NONE
  TITLE = Subcase_1
  DISPLACEMENT(PLOT) = ALL
  STRESS(PLOT,CORNER) = ALL
  SPC  = 3
  LOAD = 1
SUBCASE 2
  TITLE = Subcase_2
  DISPLACEMENT(PLOT) = ALL
  STRESS(PLOT,CORNER) = ALL
  SPC  = 3
  LOAD = 5
SUBCASE 3
  TITLE = Subcase_3
  DISPLACEMENT(PLOT) = ALL
  STRESS(PLOT,CORNER) = ALL
  SPC  = 3
  LOAD = 6
BEGIN BULK
PARAM, USETPRT, 0
$
********************************************************************************
$   Written by : MSC/NASTRAN for Windows
$   Version    : 6.01
$   Translator : MSC/NASTRAN
$   From Model : D:\scratch\SCRATCH\ws01.MOD
$   Date       : Tue Nov 16 21:36:41 1999
$   Output To  : D:\scratch\stamping
$
********************************************************************************
$
PARAM,POST,-1
PARAM,OGEOM,NO
PARAM,AUTOSPC,YES
PARAM,K6ROT,100.
PARAM,MAXRATIO,1.E+8
PARAM,GRDPNT,0
CORD2C        1       0      0.      0.      0.      0.      0.      1.+MSC/NC1
+MSC/NC1      1.      0.      1.
CORD2S        2       0      0.      0.      0.      0.      0.      1.+MSC/NC2
+MSC/NC2      1.      0.      1.
$ MSC/NASTRAN for Windows Load Set 1 : pressure
PLOAD4        1     101     -1.
PLOAD4        1     102     -1.
PLOAD4        1     103     -1.
```

```
PLOAD4      1     104    -1.
PLOAD4      1     105    -1.
PLOAD4      1     106    -1.
PLOAD4      1     107    -1.
PLOAD4      1     108    -1.
PLOAD4      1     109    -1.
PLOAD4      1     110    -1.
PLOAD4      1     111    -1.
PLOAD4      1     112    -1.
PLOAD4      1     113    -1.
PLOAD4      1     114    -1.
PLOAD4      1     115    -1.
PLOAD4      1     116    -1.
PLOAD4      1     117    -1.
PLOAD4      1     118    -1.
PLOAD4      1     119    -1.
PLOAD4      1     120    -1.
PLOAD4      1     121    -1.
PLOAD4      1     122    -1.
PLOAD4      1     123    -1.
PLOAD4      1     124    -1.
PLOAD4      1     125    -1.
PLOAD4      1     201    -1.
PLOAD4      1     202    -1.
PLOAD4      1     203    -1.
PLOAD4      1     204    -1.
PLOAD4      1     205    -1.
PLOAD4      1     206    -1.
PLOAD4      1     207    -1.
PLOAD4      1     208    -1.
PLOAD4      1     209    -1.
PLOAD4      1     210    -1.
PLOAD4      1     211    -1.
PLOAD4      1     212    -1.
PLOAD4      1     213    -1.
PLOAD4      1     214    -1.
PLOAD4      1     215    -1.
PLOAD4      1     216    -1.
PLOAD4      1     217    -1.
PLOAD4      1     218    -1.
PLOAD4      1     219    -1.
PLOAD4      1     220    -1.
PLOAD4      1     221    -1.
PLOAD4      1     222    -1.
PLOAD4      1     223    -1.
PLOAD4      1     224    -1.
PLOAD4      1     225    -1.
$ MSC/NASTRAN for Windows Load Set 2 : normal_force1
FORCE       2     131      0      1.     0.     0.     -2.
$ MSC/NASTRAN for Windows Load Set 3 : normal_force2
```

```
FORCE        3     236       0      1.      0.      0.     -2.
$ MSC/NASTRAN for Windows Load Set 4 : normal_force3
FORCE        4     236       0      1.      0.      0.      2.
$ MSC/NASTRAN for Windows Load Set 5 : Combined Set
FORCE        5     131       0      1.      0.      0.     -2.
FORCE        5     236       0      1.      0.      0.     -2.
PLOAD4       5     101     -1.
PLOAD4       5     102     -1.
PLOAD4       5     103     -1.
PLOAD4       5     104     -1.
PLOAD4       5     105     -1.
PLOAD4       5     106     -1.
PLOAD4       5     107     -1.
PLOAD4       5     108     -1.
PLOAD4       5     109     -1.
PLOAD4       5     110     -1.
PLOAD4       5     111     -1.
PLOAD4       5     112     -1.
PLOAD4       5     113     -1.
PLOAD4       5     114     -1.
PLOAD4       5     115     -1.
PLOAD4       5     116     -1.
PLOAD4       5     117     -1.
PLOAD4       5     118     -1.
PLOAD4       5     119     -1.
PLOAD4       5     120     -1.
PLOAD4       5     121     -1.
PLOAD4       5     122     -1.
PLOAD4       5     123     -1.
PLOAD4       5     124     -1.
PLOAD4       5     125     -1.
PLOAD4       5     201     -1.
PLOAD4       5     202     -1.
PLOAD4       5     203     -1.
PLOAD4       5     204     -1.
PLOAD4       5     205     -1.
PLOAD4       5     206     -1.
PLOAD4       5     207     -1.
PLOAD4       5     208     -1.
PLOAD4       5     209     -1.
PLOAD4       5     210     -1.
PLOAD4       5     211     -1.
PLOAD4       5     212     -1.
PLOAD4       5     213     -1.
PLOAD4       5     214     -1.
PLOAD4       5     215     -1.
PLOAD4       5     216     -1.
PLOAD4       5     217     -1.
PLOAD4       5     218     -1.
PLOAD4       5     219     -1.
PLOAD4       5     220     -1.
PLOAD4       5     221     -1.
PLOAD4       5     222     -1.
```

```
PLOAD4      5     223     -1.
PLOAD4      5     224     -1.
PLOAD4      5     225     -1.
$ MSC/NASTRAN for Windows Load Set 6 : Combined Set
FORCE       6     131     0       1.      0.      0.      -2.
FORCE       6     236     0       1.      0.      0.      2.
PLOAD4      6     101     -1.
PLOAD4      6     102     -1.
PLOAD4      6     103     -1.
PLOAD4      6     104     -1.
PLOAD4      6     105     -1.
PLOAD4      6     106     -1.
PLOAD4      6     107     -1.
PLOAD4      6     108     -1.
PLOAD4      6     109     -1.
PLOAD4      6     110     -1.
PLOAD4      6     111     -1.
PLOAD4      6     112     -1.
PLOAD4      6     113     -1.
PLOAD4      6     114     -1.
PLOAD4      6     115     -1.
PLOAD4      6     116     -1.
PLOAD4      6     117     -1.
PLOAD4      6     118     -1.
PLOAD4      6     119     -1.
PLOAD4      6     120     -1.
PLOAD4      6     121     -1.
PLOAD4      6     122     -1.
PLOAD4      6     123     -1.
PLOAD4      6     124     -1.
PLOAD4      6     125     -1.
PLOAD4      6     201     -1.
PLOAD4      6     202     -1.
PLOAD4      6     203     -1.
PLOAD4      6     204     -1.
PLOAD4      6     205     -1.
PLOAD4      6     206     -1.
PLOAD4      6     207     -1.
PLOAD4      6     208     -1.
PLOAD4      6     209     -1.
PLOAD4      6     210     -1.
PLOAD4      6     211     -1.
PLOAD4      6     212     -1.
PLOAD4      6     213     -1.
PLOAD4      6     214     -1.
PLOAD4      6     215     -1.
PLOAD4      6     216     -1.
PLOAD4      6     217     -1.
PLOAD4      6     218     -1.
PLOAD4      6     219     -1.
```

```
PLOAD4      6    220    -1.
PLOAD4      6    221    -1.
PLOAD4      6    222    -1.
PLOAD4      6    223    -1.
PLOAD4      6    224    -1.
PLOAD4      6    225    -1.
$ MSC/NASTRAN for Windows Constraint Set 1 : constraint
SPC         1    701   12345     0.
SPC         1    702   12345     0.
$ MSC/NASTRAN for Windows Constraint Set 2 : permanent_constraint
SPC         2    101      6      0.
SPC         2    102      6      0.
SPC         2    103      6      0.
SPC         2    104      6      0.
SPC         2    105      6      0.
SPC         2    106      6      0.
SPC         2    107      6      0.
SPC         2    108      6      0.
SPC         2    109      6      0.
SPC         2    110      6      0.
SPC         2    111      6      0.
SPC         2    112      6      0.
SPC         2    113      6      0.
SPC         2    114      6      0.
SPC         2    115      6      0.
SPC         2    116      6      0.
SPC         2    117      6      0.
SPC         2    118      6      0.
SPC         2    119      6      0.
SPC         2    120      6      0.
SPC         2    121      6      0.
SPC         2    122      6      0.
SPC         2    123      6      0.
SPC         2    124      6      0.
SPC         2    125      6      0.
SPC         2    126      6      0.
SPC         2    127      6      0.
SPC         2    128      6      0.
SPC         2    129      6      0.
SPC         2    130      6      0.
SPC         2    131      6      0.
SPC         2    132      6      0.
SPC         2    133      6      0.
SPC         2    134      6      0.
SPC         2    135      6      0.
SPC         2    136      6      0.
SPC         2    201      6      0.
SPC         2    202      6      0.
SPC         2    205      6      0.
SPC         2    206      6      0.
SPC         2    207      6      0.
SPC         2    208      6      0.
SPC         2    209      6      0.
```

```
SPC     2   210     6   0.
SPC     2   211     6   0.
SPC     2   212     6   0.
SPC     2   213     6   0.
SPC     2   214     6   0.
SPC     2   215     6   0.
SPC     2   216     6   0.
SPC     2   217     6   0.
SPC     2   218     6   0.
SPC     2   219     6   0.
SPC     2   220     6   0.
SPC     2   221     6   0.
SPC     2   222     6   0.
SPC     2   223     6   0.
SPC     2   224     6   0.
SPC     2   225     6   0.
SPC     2   226     6   0.
SPC     2   227     6   0.
SPC     2   228     6   0.
SPC     2   229     6   0.
SPC     2   230     6   0.
SPC     2   231     6   0.
SPC     2   232     6   0.
SPC     2   233     6   0.
SPC     2   234     6   0.
SPC     2   235     6   0.
SPC     2   236     6   0.
SPC     2   301     6   0.
SPC     2   302     6   0.
SPC     2   303     6   0.
SPC     2   304     6   0.
SPC     2   401     6   0.
SPC     2   402     6   0.
SPC     2   403     6   0.
SPC     2   404     6   0.
SPC     2   405     6   0.
SPC     2   406     6   0.
SPC     2   501     6   0.
SPC     2   502     6   0.
SPC     2   503     6   0.
SPC     2   504     6   0.
SPC     2   505     6   0.
SPC     2   508     6   0.
SPC     2   509     6   0.
SPC     2   510     6   0.
SPC     2   602     6   0.
SPC     2   603     6   0.
SPC     2   604     6   0.
SPC     2   605     6   0.
SPC     2   606     6   0.
```

```
SPC             2     607     6       0.
SPC             2     608     6       0.
SPC             2     701     6       0.
SPC             2     702     6       0.
SPC             2     703     6       0.
SPC             2     704     6       0.
SPC             2     705     6       0.
SPC             2     706     6       0.
SPC             2     707     6       0.
SPC             2     708     6       0.
SPC             2     710     6       0.
$ MSC/NASTRAN for Windows Constraint Set 3 : Combined Set
SPC             3     101     6       0.
SPC             3     102     6       0.
SPC             3     103     6       0.
SPC             3     104     6       0.
SPC             3     105     6       0.
SPC             3     106     6       0.
SPC             3     107     6       0.
SPC             3     108     6       0.
SPC             3     109     6       0.
SPC             3     110     6       0.
SPC             3     111     6       0.
SPC             3     112     6       0.
SPC             3     113     6       0.
SPC             3     114     6       0.
SPC             3     115     6       0.
SPC             3     116     6       0.
SPC             3     117     6       0.
SPC             3     118     6       0.
SPC             3     119     6       0.
SPC             3     120     6       0.
SPC             3     121     6       0.
SPC             3     122     6       0.
SPC             3     123     6       0.
SPC             3     124     6       0.
SPC             3     125     6       0.
SPC             3     126     6       0.
SPC             3     127     6       0.
SPC             3     128     6       0.
SPC             3     129     6       0.
SPC             3     130     6       0.
SPC             3     131     6       0.
SPC             3     132     6       0.
SPC             3     133     6       0.
SPC             3     134     6       0.
SPC             3     135     6       0.
SPC             3     136     6       0.
SPC             3     201     6       0.
SPC             3     202     6       0.
SPC             3     205     6       0.
SPC             3     206     6       0.
SPC             3     207     6       0.
```

```
SPC     3   208     6   0.
SPC     3   209     6   0.
SPC     3   210     6   0.
SPC     3   211     6   0.
SPC     3   212     6   0.
SPC     3   213     6   0.
SPC     3   214     6   0.
SPC     3   215     6   0.
SPC     3   216     6   0.
SPC     3   217     6   0.
SPC     3   218     6   0.
SPC     3   219     6   0.
SPC     3   220     6   0.
SPC     3   221     6   0.
SPC     3   222     6   0.
SPC     3   223     6   0.
SPC     3   224     6   0.
SPC     3   225     6   0.
SPC     3   226     6   0.
SPC     3   227     6   0.
SPC     3   228     6   0.
SPC     3   229     6   0.
SPC     3   230     6   0.
SPC     3   231     6   0.
SPC     3   232     6   0.
SPC     3   233     6   0.
SPC     3   234     6   0.
SPC     3   235     6   0.
SPC     3   236     6   0.
SPC     3   301     6   0.
SPC     3   302     6   0.
SPC     3   303     6   0.
SPC     3   304     6   0.
SPC     3   401     6   0.
SPC     3   402     6   0.
SPC     3   403     6   0.
SPC     3   404     6   0.
SPC     3   405     6   0.
SPC     3   406     6   0.
SPC     3   501     6   0.
SPC     3   502     6   0.
SPC     3   503     6   0.
SPC     3   504     6   0.
SPC     3   505     6   0.
SPC     3   508     6   0.
SPC     3   509     6   0.
SPC     3   510     6   0.
SPC     3   602     6   0.
SPC     3   603     6   0.
SPC     3   604     6   0.
```

```
SPC             3     605       6      0.
SPC             3     606       6      0.
SPC             3     607       6      0.
SPC             3     608       6      0.
SPC             3     701  123456      0.
SPC             3     702  123456      0.
SPC             3     703       6      0.
SPC             3     704       6      0.
SPC             3     705       6      0.
SPC             3     706       6      0.
SPC             3     707       6      0.
SPC             3     708       6      0.
SPC             3     710       6      0.
$ MSC/NASTRAN for Windows Property 1 : prop_1
PSHELL          1       1    0.05       1              1              0.
$ MSC/NASTRAN for Windows Material 1 : steel
MAT1            1   3.E+7             0.3   0.283      0.      0.
GRID          101       0      0.    5.6      0.       0
GRID          102       0     0.8    5.6      0.       0
GRID          103       0     1.6    5.6      0.       0
GRID          104       0     2.4    5.6      0.       0
GRID          105       0     3.2    5.6      0.       0
GRID          106       0      4.    5.6      0.       0
GRID          107       0      0.    6.4      0.       0
GRID          108       0     0.8    6.4      0.       0
GRID          109       0     1.6    6.4      0.       0
GRID          110       0     2.4    6.4      0.       0
GRID          111       0     3.2    6.4      0.       0
GRID          112       0      4.    6.4      0.       0
GRID          113       0      0.    7.2      0.       0
GRID          114       0     0.8    7.2      0.       0
GRID          115       0     1.6    7.2      0.       0
GRID          116       0     2.4    7.2      0.       0
GRID          117       0     3.2    7.2      0.       0
GRID          118       0      4.    7.2      0.       0
GRID          119       0      0.    8.       0.       0
GRID          120       0     0.8    8.       0.       0
GRID          121       0     1.6    8.       0.       0
GRID          122       0     2.4    8.       0.       0
GRID          123       0     3.2    8.       0.       0
GRID          124       0      4.    8.       0.       0
GRID          125       0      0.    8.8      0.       0
GRID          126       0     0.8    8.8      0.       0
GRID          127       0     1.6    8.8      0.       0
GRID          128       0     2.4    8.8      0.       0
GRID          129       0     3.2    8.8      0.       0
GRID          130       0      4.    8.8      0.       0
GRID          131       0      0.    9.6      0.       0
GRID          132       0     0.8    9.6      0.       0
GRID          133       0     1.6    9.6      0.       0
GRID          134       0     2.4    9.6      0.       0
GRID          135       0     3.2    9.6      0.       0
GRID          136       0      4.    9.6      0.       0
```

```
GRID      201     0    6.4    5.6     0.       0
GRID      202     0    7.2    5.6     0.       0
GRID      205     0    9.6    5.6     0.       0
GRID      206     0   10.4    5.6     0.       0
GRID      207     0    6.4    6.4     0.       0
GRID      208     0    7.2    6.4     0.       0
GRID      209     0    8.     6.4     0.       0
GRID      210     0    8.8    6.4     0.       0
GRID      211     0    9.6    6.4     0.       0
GRID      212     0   10.4    6.4     0.       0
GRID      213     0    6.4    7.2     0.       0
GRID      214     0    7.2    7.2     0.       0
GRID      215     0    8.     7.2     0.       0
GRID      216     0    8.8    7.2     0.       0
GRID      217     0    9.6    7.2     0.       0
GRID      218     0   10.4    7.2     0.       0
GRID      219     0    6.4    8.      0.       0
GRID      220     0    7.2    8.      0.       0
GRID      221     0    8.     8.      0.       0
GRID      222     0    8.8    8.      0.       0
GRID      223     0    9.6    8.      0.       0
GRID      224     0   10.4    8.      0.       0
GRID      225     0    6.4    8.8     0.       0
GRID      226     0    7.2    8.8     0.       0
GRID      227     0    8.     8.8     0.       0
GRID      228     0    8.8    8.8     0.       0
GRID      229     0    9.6    8.8     0.       0
GRID      230     0   10.4    8.8     0.       0
GRID      231     0    6.4    9.6     0.       0
GRID      232     0    7.2    9.6     0.       0
GRID      233     0    8.     9.6     0.       0
GRID      234     0    8.8    9.6     0.       0
GRID      235     0    9.6    9.6     0.       0
GRID      236     0   10.4    9.6     0.       0
GRID      301     0    1.6    4.      0.       0
GRID      302     0    2.4    4.      0.       0
GRID      303     0    1.6    4.8     0.       0
GRID      304     0    2.4    4.8     0.       0
GRID      401     0    8.     4.      0.       0
GRID      402     0    8.8    4.      0.       0
GRID      403     0    8.     4.8     0.       0
GRID      404     0    8.8    4.8     0.       0
GRID      405     0    8.     5.6     0.       0
GRID      406     0    8.8    5.6     0.       0
GRID      501     0    1.6    3.2     0.       0
GRID      502     0    2.4    3.2     0.       0
GRID      503     0    3.2    3.2     0.       0
GRID      504     0    4.     3.2     0.       0
GRID      505     0    4.8    3.2     0.       0
GRID      508     0    3.2    4.      0.       0
```

```
GRID     509     0    4.    4.    0.      0
GRID     510     0   4.8    4.    0.      0
GRID     602     0   6.4   3.2    0.      0
GRID     603     0   7.2   3.2    0.      0
GRID     604     0    8.   3.2    0.      0
GRID     605     0   8.8   3.2    0.      0
GRID     606     0   5.6    4.    0.      0
GRID     607     0   6.4    4.    0.      0
GRID     608     0   7.2    4.    0.      0
GRID     701     0   4.8    0.    0.      0
GRID     702     0   5.6    0.    0.      0
GRID     703     0   4.8   0.8    0.      0
GRID     704     0   5.6   0.8    0.      0
GRID     705     0   4.8   1.6    0.      0
GRID     706     0   5.6   1.6    0.      0
GRID     707     0   4.8   2.4    0.      0
GRID     708     0   5.6   2.4    0.      0
GRID     710     0   5.6   3.2    0.      0
CQUAD4     101       1     101     102     108     107
CQUAD4     102       1     102     103     109     108
CQUAD4     103       1     103     104     110     109
CQUAD4     104       1     104     105     111     110
CQUAD4     105       1     105     106     112     111
CQUAD4     106       1     107     108     114     113
CQUAD4     107       1     108     109     115     114
CQUAD4     108       1     109     110     116     115
CQUAD4     109       1     110     111     117     116
CQUAD4     110       1     111     112     118     117
CQUAD4     111       1     113     114     120     119
CQUAD4     112       1     114     115     121     120
CQUAD4     113       1     115     116     122     121
CQUAD4     114       1     116     117     123     122
CQUAD4     115       1     117     118     124     123
CQUAD4     116       1     119     120     126     125
CQUAD4     117       1     120     121     127     126
CQUAD4     118       1     121     122     128     127
CQUAD4     119       1     122     123     129     128
CQUAD4     120       1     123     124     130     129
CQUAD4     121       1     125     126     132     131
CQUAD4     122       1     126     127     133     132
CQUAD4     123       1     127     128     134     133
CQUAD4     124       1     128     129     135     134
CQUAD4     125       1     129     130     136     135
CQUAD4     201       1     201     202     208     207
CQUAD4     202       1     202     405     209     208
CQUAD4     203       1     405     406     210     209
CQUAD4     204       1     406     205     211     210
CQUAD4     205       1     205     206     212     211
CQUAD4     206       1     207     208     214     213
CQUAD4     207       1     208     209     215     214
CQUAD4     208       1     209     210     216     215
CQUAD4     209       1     210     211     217     216
CQUAD4     210       1     211     212     218     217
```

```
CQUAD4     211       1     213     214     220     219
CQUAD4     212       1     214     215     221     220
CQUAD4     213       1     215     216     222     221
CQUAD4     214       1     216     217     223     222
CQUAD4     215       1     217     218     224     223
CQUAD4     216       1     219     220     226     225
CQUAD4     217       1     220     221     227     226
CQUAD4     218       1     221     222     228     227
CQUAD4     219       1     222     223     229     228
CQUAD4     220       1     223     224     230     229
CQUAD4     221       1     225     226     232     231
CQUAD4     222       1     226     227     233     232
CQUAD4     223       1     227     228     234     233
CQUAD4     224       1     228     229     235     234
CQUAD4     225       1     229     230     236     235
CQUAD4     301       1     301     302     304     303
CQUAD4     302       1     303     304     104     103
CQUAD4     401       1     401     402     404     403
CQUAD4     402       1     403     404     406     405
CQUAD4     501       1     501     502     302     301
CQUAD4     502       1     502     503     508     302
CQUAD4     503       1     503     504     509     508
CQUAD4     504       1     504     505     510     509
CQUAD4     601       1     710     602     607     606
CQUAD4     602       1     602     603     608     607
CQUAD4     603       1     603     604     401     608
CQUAD4     604       1     604     605     402     401
CQUAD4     701       1     701     702     704     703
CQUAD4     702       1     703     704     706     705
CQUAD4     703       1     705     706     708     707
CQUAD4     704       1     707     708     710     505
CQUAD4     705       1     505     710     606     510
ENDDATA 7795a5bf
```

24. List the results of the analysis to answer the following questions:

What are the components of the displacement vector for Node 236 in SubCases 1, 2, and 3 (translation only)?

Subcase1, T3 = _____

Subcase2, T3 = _____

Subcase 3, T3 = _____

What are the components of the displacement vector for Node 131 in Subcase 3 (translation only)?

Subcase3, T3 = _____

List/Output/Query...

Output Set:	**1..MSC/NASTRAN Case 1**
Category:	**1..Displacement**
Entity:	● **Node**
ID:	**236**

More

This will list the displacements results for Node 236 in Subcase 1.

Repeat the same steps to find the displacement results for Node 236 in Subcase 2, Subcase 3, and also Node 131 in Subcase 3.

Upon completion,

OK

Double-click on the messages and list window to view the results you've requested.

Double-click on the messages and list window again to reduce the window size.

25. Open the stamping.f06 file generated from the run in Notepad

USET DEFINITION TABLE (INTERNAL SEQUENCE, ROW SORT)
A DISPLACEMENT SET

0	-1-	-2-	-3-	-4-	-5-	-6-	-7-	-8-	-9-	-10-
1=	101-1	101-2	101-3	101-4	101-5	102-1	102-2	102-3	102-4	102-5 = 10
11=	103-1	103-2	103-3	103-4	103-5	104-1	104-2	104-3	104-4	104-5 = 20
21=	105-1	105-2	105-3	105-4	105-5	106-1	106-2	106-3	106-4	106-5 = 30
31=	107-1	107-2	107-3	107-4	107-5	108-1	108-2	108-3	108-4	108-5 = 40
41=	109-1	109-2	109-3	109-4	109-5	110-1	110-2	110-3	110-4	110-5 = 50
51=	111-1	111-2	111-3	111-4	111-5	112-1	112-2	112-3	112-4	112-5 = 60
61=	113-1	113-2	113-3	113-4	113-5	114-1	114-2	114-3	114-4	114-5 = 70
71=	115-1	115-2	115-3	115-4	115-5	116-1	116-2	116-3	116-4	116-5 = 80
81=	117-1	117-2	117-3	117-4	117-5	118-1	118-2	118-3	118-4	118-5 = 90
91=	119-1	119-2	119-3	119-4	119-5	120-1	120-2	120-3	120-4	120-5 = 100
101=	121-1	121-2	121-3	121-4	121-5	122-1	122-2	122-3	122-4	122-5 = 110
111=	123-1	123-2	123-3	123-4	123-5	124-1	124-2	124-3	124-4	124-5 = 120
121=	125-1	125-2	125-3	125-4	125-5	126-1	126-2	126-3	126-4	126-5 = 130
131=	127-1	127-2	127-3	127-4	127-5	128-1	128-2	128-3	128-4	128-5 = 140
141=	129-1	129-2	129-3	129-4	129-5	130-1	130-2	130-3	130-4	130-5 = 150
151=	131-1	131-2	131-3	131-4	131-5	132-1	132-2	132-3	132-4	132-5 = 160
161=	133-1	133-2	133-3	133-4	133-5	134-1	134-2	134-3	134-4	134-5 = 170
171=	135-1	135-2	135-3	135-4	135-5	136-1	136-2	136-3	136-4	136-5 = 180
181=	201-1	201-2	201-3	201-4	201-5	202-1	202-2	202-3	202-4	202-5 = 190
191=	205-1	205-2	205-3	205-4	205-5	206-1	206-2	206-3	206-4	206-5 = 200
201=	207-1	207-2	207-3	207-4	207-5	208-1	208-2	208-3	208-4	208-5 = 210
211=	209-1	209-2	209-3	209-4	209-5	210-1	210-2	210-3	210-4	210-5 = 220
221=	211-1	211-2	211-3	211-4	211-5	212-1	212-2	212-3	212-4	212-5 = 230

```
   231=    213-1    213-2    213-3    213-4    213-5    214-1    214-2    214-3
214-4    214-5  =  240
   241=    215-1    215-2    215-3    215-4    215-5    216-1    216-2    216-3
216-4    216-5  =  250
   251=    217-1    217-2    217-3    217-4    217-5    218-1    218-2    218-3
218-4    218-5  =  260
   261=    219-1    219-2    219-3    219-4    219-5    220-1    220-2    220-3
220-4    220-5  =  270
   271=    221-1    221-2    221-3    221-4    221-5    222-1    222-2    222-3
222-4    222-5  =  280
   281=    223-1    223-2    223-3    223-4    223-5    224-1    224-2    224-3
224-4    224-5  =  290
   291=    225-1    225-2    225-3    225-4    225-5    226-1    226-2    226-3
226-4    226-5  =  300
   301=    227-1    227-2    227-3    227-4    227-5    228-1    228-2    228-3
228-4    228-5  =  310
   311=    229-1    229-2    229-3    229-4    229-5    230-1    230-2    230-3
230-4    230-5  =  320
   321=    231-1    231-2    231-3    231-4    231-5    232-1    232-2    232-3
232-4    232-5  =  330
   331=    233-1    233-2    233-3    233-4    233-5    234-1    234-2    234-3
234-4    234-5  =  340
   341=    235-1    235-2    235-3    235-4    235-5    236-1    236-2    236-3
236-4    236-5  =  350
   351=    301-1    301-2    301-3    301-4    301-5    302-1    302-2    302-3
302-4    302-5  =  360
   361=    303-1    303-2    303-3    303-4    303-5    304-1    304-2    304-3
304-4    304-5  =  370
   371=    401-1    401-2    401-3    401-4    401-5    402-1    402-2    402-3
402-4    402-5  =  380
   381=    403-1    403-2    403-3    403-4    403-5    404-1    404-2    404-3
404-4    404-5  =  390
   391=    405-1    405-2    405-3    405-4    405-5    406-1    406-2    406-3
406-4    406-5  =  400
   401=    501-1    501-2    501-3    501-4    501-5    502-1    502-2    502-3
502-4    502-5  =  410
   411=    503-1    503-2    503-3    503-4    503-5    504-1    504-2    504-3
504-4    504-5  =  420
   421=    505-1    505-2    505-3    505-4    505-5    508-1    508-2    508-3
508-4    508-5  =  430
   431=    509-1    509-2    509-3    509-4    509-5    510-1    510-2    510-3
510-4    510-5  =  440
   441=    602-1    602-2    602-3    602-4    602-5    603-1    603-2    603-3
603-4    603-5  =  450
   451=    604-1    604-2    604-3    604-4    604-5    605-1    605-2    605-3
605-4    605-5  =  460
   461=    606-1    606-2    606-3    606-4    606-5    607-1    607-2    607-3
607-4    607-5  =  470
   471=    608-1    608-2    608-3    608-4    608-5    703-1    703-2    703-3
703-4    703-5  =  480
1                                  NOVEMBER  16, 1999  MSC/NASTRAN
6/22/99   PAGE     8
```

```
0                                                                    SUBCASE 1
                                        A   DISPLACEMENT SET
0          -1-       -2-       -3-       -4-       -5-       -6-       -7-       -8-       -9-       -10-

   481=     704-1     704-2     704-3     704-4     704-5     705-1     705-2     705-3
705-4     705-5   =   490
   491=     706-1     706-2     706-3     706-4     706-5     707-1     707-2     707-3
707-4     707-5   =   500
   501=     708-1     708-2     708-3     708-4     708-5     710-1     710-2     710-3
710-4     710-5   =   510
1                                                  NOVEMBER  16, 1999  MSC/NASTRAN
6/22/99   PAGE     9

0                                                                    SUBCASE 1
                                        S   DISPLACEMENT SET
0          -1-       -2-       -3-       -4-       -5-       -6-       -7-       -8-       -9-       -10-

     1=     101-6     102-6     103-6     104-6     105-6     106-6     107-6     108-6
109-6     110-6   =    10
    11=     111-6     112-6     113-6     114-6     115-6     116-6     117-6     118-6
119-6     120-6   =    20
    21=     121-6     122-6     123-6     124-6     125-6     126-6     127-6     128-6
129-6     130-6   =    30
    31=     131-6     132-6     133-6     134-6     135-6     136-6     201-6     202-6
205-6     206-6   =    40
    41=     207-6     208-6     209-6     210-6     211-6     212-6     213-6     214-6
215-6     216-6   =    50
    51=     217-6     218-6     219-6     220-6     221-6     222-6     223-6     224-6
225-6     226-6   =    60
    61=     227-6     228-6     229-6     230-6     231-6     232-6     233-6     234-6
235-6     236-6   =    70
    71=     301-6     302-6     303-6     304-6     401-6     402-6     403-6     404-6
405-6     406-6   =    80
    81=     501-6     502-6     503-6     504-6     505-6     508-6     509-6     510-6
602-6     603-6   =    90
    91=     604-6     605-6     606-6     607-6     608-6     701-1     701-2     701-3
701-4     701-5   =   100
   101=     701-6     702-1     702-2     702-3     702-4     702-5     702-6     703-6
704-6     705-6   =   110
   111=     706-6     707-6     708-6     710-6
1                                                  NOVEMBER  16, 1999  MSC/NASTRAN
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0                                                                    SUBCASE 1
                                        G   DISPLACEMENT SET
0          -1-       -2-       -3-       -4-       -5-       -6-       -7-       -8-       -9-       -10-

     1=     101-1     101-2     101-3     101-4     101-5     101-6     102-1     102-2
102-3     102-4   =    10
```

11= 102-5 102-6 103-1 103-2 103-3 103-4 103-5 103-6
104-1 104-2 = 20
21= 104-3 104-4 104-5 104-6 105-1 105-2 105-3 105-4
105-5 105-6 = 30
31= 106-1 106-2 106-3 106-4 106-5 106-6 107-1 107-2
107-3 107-4 = 40
41= 107-5 107-6 108-1 108-2 108-3 108-4 108-5 108-6
109-1 109-2 = 50
51= 109-3 109-4 109-5 109-6 110-1 110-2 110-3 110-4
110-5 110-6 = 60
61= 111-1 111-2 111-3 111-4 111-5 111-6 112-1 112-2
112-3 112-4 = 70
71= 112-5 112-6 113-1 113-2 113-3 113-4 113-5 113-6
114-1 114-2 = 80
81= 114-3 114-4 114-5 114-6 115-1 115-2 115-3 115-4
115-5 115-6 = 90
91= 116-1 116-2 116-3 116-4 116-5 116-6 117-1 117-2
117-3 117-4 = 100
101= 117-5 117-6 118-1 118-2 118-3 118-4 118-5 118-6
119-1 119-2 = 110
111= 119-3 119-4 119-5 119-6 120-1 120-2 120-3 120-4
120-5 120-6 = 120
121= 121-1 121-2 121-3 121-4 121-5 121-6 122-1 122-2
122-3 122-4 = 130
131= 122-5 122-6 123-1 123-2 123-3 123-4 123-5 123-6
124-1 124-2 = 140
141= 124-3 124-4 124-5 124-6 125-1 125-2 125-3 125-4
125-5 125-6 = 150
151= 126-1 126-2 126-3 126-4 126-5 126-6 127-1 127-2
127-3 127-4 = 160
161= 127-5 127-6 128-1 128-2 128-3 128-4 128-5 128-6
129-1 129-2 = 170
171= 129-3 129-4 129-5 129-6 130-1 130-2 130-3 130-4
130-5 130-6 = 180
181= 131-1 131-2 131-3 131-4 131-5 131-6 132-1 132-2
132-3 132-4 = 190
191= 132-5 132-6 133-1 133-2 133-3 133-4 133-5 133-6
134-1 134-2 = 200
201= 134-3 134-4 134-5 134-6 135-1 135-2 135-3 135-4
135-5 135-6 = 210
211= 136-1 136-2 136-3 136-4 136-5 136-6 201-1 201-2
201-3 201-4 = 220
221= 201-5 201-6 202-1 202-2 202-3 202-4 202-5 202-6
205-1 205-2 = 230
231= 205-3 205-4 205-5 205-6 206-1 206-2 206-3 206-4
206-5 206-6 = 240
241= 207-1 207-2 207-3 207-4 207-5 207-6 208-1 208-2
208-3 208-4 = 250
251= 208-5 208-6 209-1 209-2 209-3 209-4 209-5 209-6
210-1 210-2 = 260
261= 210-3 210-4 210-5 210-6 211-1 211-2 211-3 211-4
211-5 211-6 = 270

```
   271=    212-1   212-2   212-3   212-4   212-5   212-6   213-1   213-2
213-3   213-4   =  280
   281=    213-5   213-6   214-1   214-2   214-3   214-4   214-5   214-6
215-1   215-2   =  290
   291=    215-3   215-4   215-5   215-6   216-1   216-2   216-3   216-4
216-5   216-6   =  300
   301=    217-1   217-2   217-3   217-4   217-5   217-6   218-1   218-2
218-3   218-4   =  310
   311=    218-5   218-6   219-1   219-2   219-3   219-4   219-5   219-6
220-1   220-2   =  320
   321=    220-3   220-4   220-5   220-6   221-1   221-2   221-3   221-4
221-5   221-6   =  330
   331=    222-1   222-2   222-3   222-4   222-5   222-6   223-1   223-2
223-3   223-4   =  340
   341=    223-5   223-6   224-1   224-2   224-3   224-4   224-5   224-6
225-1   225-2   =  350
   351=    225-3   225-4   225-5   225-6   226-1   226-2   226-3   226-4
226-5   226-6   =  360
   361=    227-1   227-2   227-3   227-4   227-5   227-6   228-1   228-2
228-3   228-4   =  370
   371=    228-5   228-6   229-1   229-2   229-3   229-4   229-5   229-6
230-1   230-2   =  380
   381=    230-3   230-4   230-5   230-6   231-1   231-2   231-3   231-4
231-5   231-6   =  390
   391=    232-1   232-2   232-3   232-4   232-5   232-6   233-1   233-2
233-3   233-4   =  400
   401=    233-5   233-6   234-1   234-2   234-3   234-4   234-5   234-6
235-1   235-2   =  410
   411=    235-3   235-4   235-5   235-6   236-1   236-2   236-3   236-4
236-5   236-6   =  420
   421=    301-1   301-2   301-3   301-4   301-5   301-6   302-1   302-2
302-3   302-4   =  430
   431=    302-5   302-6   303-1   303-2   303-3   303-4   303-5   303-6
304-1   304-2   =  440
   441=    304-3   304-4   304-5   304-6   401-1   401-2   401-3   401-4
401-5   401-6   =  450
   451=    402-1   402-2   402-3   402-4   402-5   402-6   403-1   403-2
403-3   403-4   =  460
   461=    403-5   403-6   404-1   404-2   404-3   404-4   404-5   404-6
405-1   405-2   =  470
   471=    405-3   405-4   405-5   405-6   406-1   406-2   406-3   406-4
406-5   406-6   =  480
   481=    501-1   501-2   501-3   501-4   501-5   501-6   502-1   502-2
502-3   502-4   =  490
   491=    502-5   502-6   503-1   503-2   503-3   503-4   503-5   503-6
504-1   504-2   =  500
   501=    504-3   504-4   504-5   504-6   505-1   505-2   505-3   505-4
505-5   505-6   =  510
1                                  NOVEMBER  16, 1999  MSC/NASTRAN
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```

0 SUBCASE 1

G DISPLACEMENT SET

0 -1- -2- -3- -4- -5- -6- -7- -8- -9- -10-

511= 508-1 508-2 508-3 508-4 508-5 508-6 509-1 509-2 509-3 509-4 = 520
521= 509-5 509-6 510-1 510-2 510-3 510-4 510-5 510-6 602-1 602-2 = 530
531= 602-3 602-4 602-5 602-6 603-1 603-2 603-3 603-4 603-5 603-6 = 540
541= 604-1 604-2 604-3 604-4 604-5 604-6 605-1 605-2 605-3 605-4 = 550
551= 605-5 605-6 606-1 606-2 606-3 606-4 606-5 606-6 607-1 607-2 = 560
561= 607-3 607-4 607-5 607-6 608-1 608-2 608-3 608-4 608-5 608-6 = 570
571= 701-1 701-2 701-3 701-4 701-5 701-6 702-1 702-2 702-3 702-4 = 580
581= 702-5 702-6 703-1 703-2 703-3 703-4 703-5 703-6 704-1 704-2 = 590
591= 704-3 704-4 704-5 704-6 705-1 705-2 705-3 705-4 705-5 705-6 = 600
601= 706-1 706-2 706-3 706-4 706-5 706-6 707-1 707-2 707-3 707-4 = 610
611= 707-5 707-6 708-1 708-2 708-3 708-4 708-5 708-6 710-1 710-2 = 620
621= 710-3 710-4 710-5 710-6

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0 SUBCASE 1

B DISPLACEMENT SET

0 -1- -2- -3- -4- -5- -6- -7- -8- -9- -10-

1= 101-1 101-2 101-3 101-4 101-5 102-1 102-2 102-3 102-4 102-5 = 10
11= 103-1 103-2 103-3 103-4 103-5 104-1 104-2 104-3 104-4 104-5 = 20
21= 105-1 105-2 105-3 105-4 105-5 106-1 106-2 106-3 106-4 106-5 = 30
31= 107-1 107-2 107-3 107-4 107-5 108-1 108-2 108-3 108-4 108-5 = 40
41= 109-1 109-2 109-3 109-4 109-5 110-1 110-2 110-3 110-4 110-5 = 50
51= 111-1 111-2 111-3 111-4 111-5 112-1 112-2 112-3 112-4 112-5 = 60
61= 113-1 113-2 113-3 113-4 113-5 114-1 114-2 114-3 114-4 114-5 = 70
71= 115-1 115-2 115-3 115-4 115-5 116-1 116-2 116-3 116-4 116-5 = 80
81= 117-1 117-2 117-3 117-4 117-5 118-1 118-2 118-3 118-4 118-5 = 90

91= 119-1 119-2 119-3 119-4 119-5 120-1 120-2 120-3 120-4 120-5 = 100
101= 121-1 121-2 121-3 121-4 121-5 122-1 122-2 122-3 122-4 122-5 = 110
111= 123-1 123-2 123-3 123-4 123-5 124-1 124-2 124-3 124-4 124-5 = 120
121= 125-1 125-2 125-3 125-4 125-5 126-1 126-2 126-3 126-4 126-5 = 130
131= 127-1 127-2 127-3 127-4 127-5 128-1 128-2 128-3 128-4 128-5 = 140
141= 129-1 129-2 129-3 129-4 129-5 130-1 130-2 130-3 130-4 130-5 = 150
151= 131-1 131-2 131-3 131-4 131-5 132-1 132-2 132-3 132-4 132-5 = 160
161= 133-1 133-2 133-3 133-4 133-5 134-1 134-2 134-3 134-4 134-5 = 170
171= 135-1 135-2 135-3 135-4 135-5 136-1 136-2 136-3 136-4 136-5 = 180
181= 201-1 201-2 201-3 201-4 201-5 202-1 202-2 202-3 202-4 202-5 = 190
191= 205-1 205-2 205-3 205-4 205-5 206-1 206-2 206-3 206-4 206-5 = 200
201= 207-1 207-2 207-3 207-4 207-5 208-1 208-2 208-3 208-4 208-5 = 210
211= 209-1 209-2 209-3 209-4 209-5 210-1 210-2 210-3 210-4 210-5 = 220
221= 211-1 211-2 211-3 211-4 211-5 212-1 212-2 212-3 212-4 212-5 = 230
231= 213-1 213-2 213-3 213-4 213-5 214-1 214-2 214-3 214-4 214-5 = 240
241= 215-1 215-2 215-3 215-4 215-5 216-1 216-2 216-3 216-4 216-5 = 250
251= 217-1 217-2 217-3 217-4 217-5 218-1 218-2 218-3 218-4 218-5 = 260
261= 219-1 219-2 219-3 219-4 219-5 220-1 220-2 220-3 220-4 220-5 = 270
271= 221-1 221-2 221-3 221-4 221-5 222-1 222-2 222-3 222-4 222-5 = 280
281= 223-1 223-2 223-3 223-4 223-5 224-1 224-2 224-3 224-4 224-5 = 290
291= 225-1 225-2 225-3 225-4 225-5 226-1 226-2 226-3 226-4 226-5 = 300
301= 227-1 227-2 227-3 227-4 227-5 228-1 228-2 228-3 228-4 228-5 = 310
311= 229-1 229-2 229-3 229-4 229-5 230-1 230-2 230-3 230-4 230-5 = 320
321= 231-1 231-2 231-3 231-4 231-5 232-1 232-2 232-3 232-4 232-5 = 330
331= 233-1 233-2 233-3 233-4 233-5 234-1 234-2 234-3 234-4 234-5 = 340

341= 235-1 235-2 235-3 235-4 235-5 236-1 236-2 236-3
236-4 236-5 = 350
351= 301-1 301-2 301-3 301-4 301-5 302-1 302-2 302-3
302-4 302-5 = 360
361= 303-1 303-2 303-3 303-4 303-5 304-1 304-2 304-3
304-4 304-5 = 370
371= 401-1 401-2 401-3 401-4 401-5 402-1 402-2 402-3
402-4 402-5 = 380
381= 403-1 403-2 403-3 403-4 403-5 404-1 404-2 404-3
404-4 404-5 = 390
391= 405-1 405-2 405-3 405-4 405-5 406-1 406-2 406-3
406-4 406-5 = 400
401= 501-1 501-2 501-3 501-4 501-5 502-1 502-2 502-3
502-4 502-5 = 410
411= 503-1 503-2 503-3 503-4 503-5 504-1 504-2 504-3
504-4 504-5 = 420
421= 505-1 505-2 505-3 505-4 505-5 508-1 508-2 508-3
508-4 508-5 = 430
431= 509-1 509-2 509-3 509-4 509-5 510-1 510-2 510-3
510-4 510-5 = 440
441= 602-1 602-2 602-3 602-4 602-5 603-1 603-2 603-3
603-4 603-5 = 450
451= 604-1 604-2 604-3 604-4 604-5 605-1 605-2 605-3
605-4 605-5 = 460
461= 606-1 606-2 606-3 606-4 606-5 607-1 607-2 607-3
607-4 607-5 = 470
471= 608-1 608-2 608-3 608-4 608-5 703-1 703-2 703-3
703-4 703-5 = 480
481= 704-1 704-2 704-3 704-4 704-5 705-1 705-2 705-3
705-4 705-5 = 490
491= 706-1 706-2 706-3 706-4 706-5 707-1 707-2 707-3
707-4 707-5 = 500
501= 708-1 708-2 708-3 708-4 708-5 710-1 710-2 710-3
710-4 710-5 = 510

26. Proceed with post-processing the results in N4W.

View/Select...

Deformed Style: ● **Deform**

Contour Style: ● **Contour**

Deformed and Contour Data...

Output Set: **1..MSC/NASTRAN Case 1**

Deformation: **1..Total Translation**

Contour: **7033..PlateTopVonMises Stress**

OK

OK

Turn off the labels and Loads/Constraint.

View/Options..

Quick Options...

Labels Off

Load/Constraint Off

Done

Apply

OK

Repeat this process with the other two subcases and compare your results with the following figures.

Figure 1.6 -- Subcase 1

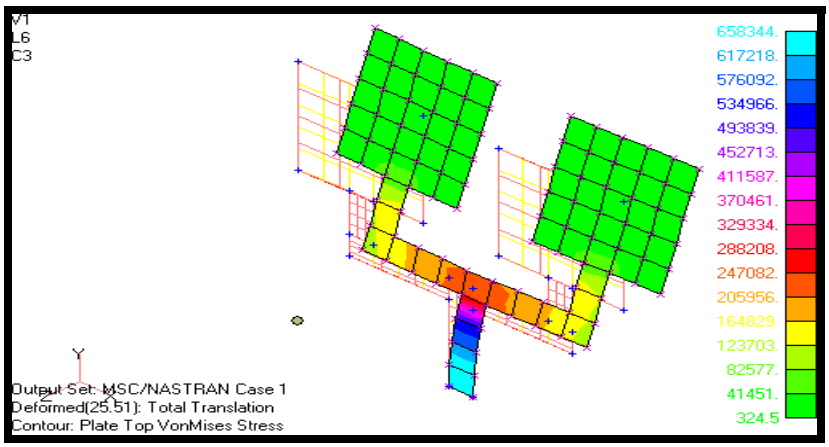


Figure 1.7 -- Subcase 2

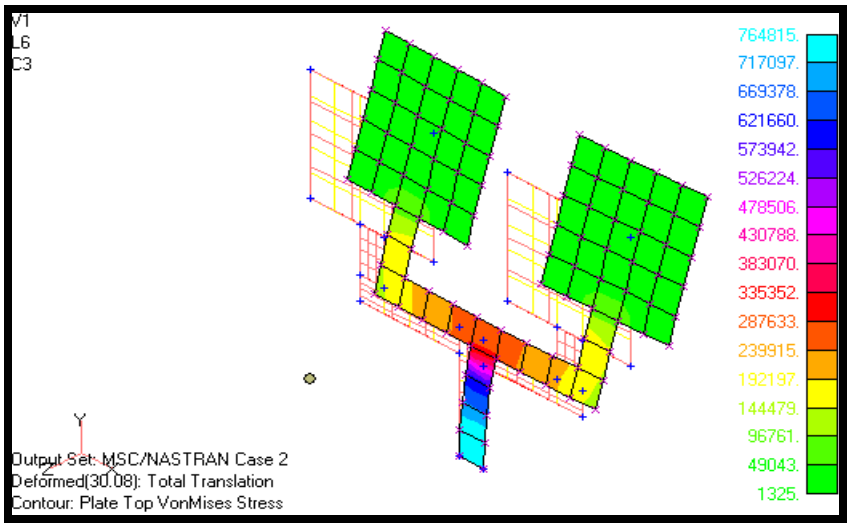
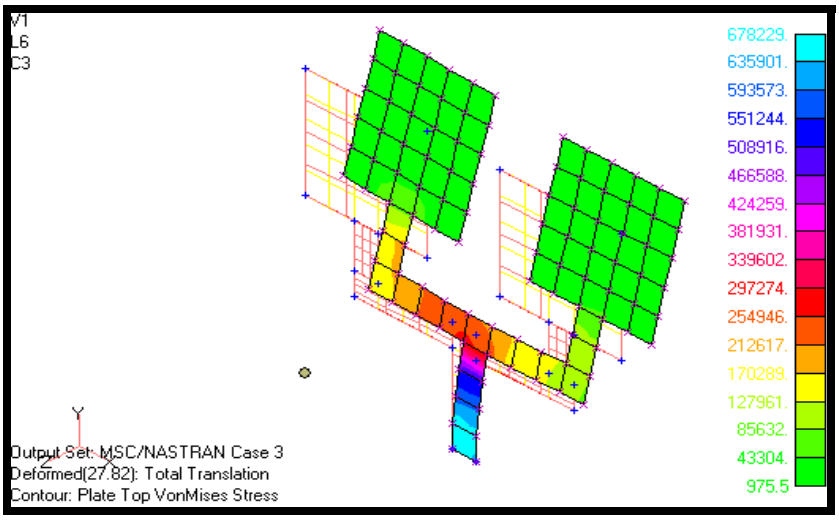


Figure 1.8 -- Subcase 3



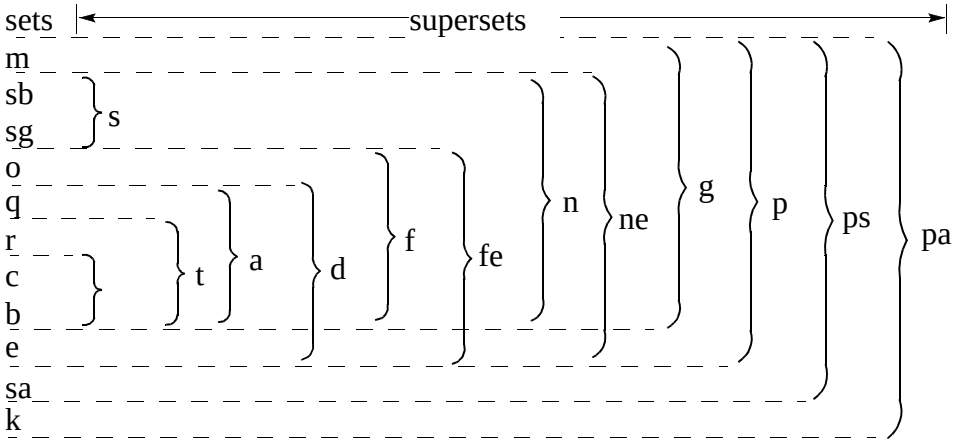
Degree of Freedom Set Definitions

Each degree of freedom is a member of one mutually exclusive set. Set names have the following definitions:

Set Name	Definition
m	degrees of freedom eliminated by multipoint constraints
sb*	degrees of freedom eliminated by single-point constraints that are included in boundary condition changes and by the AUTOSPC feature
sg*	degrees of freedom eliminated by single-point constraints that are specified on the PS field on GRID Bulk Data entries
o	degrees of freedom omitted by structural matrix partitioning
q	generalized degrees of freedom for dynamic reduction or component mode synthesis
r	reference degrees of freedom used to determine free body motion
c	degrees of freedom that are free during component mode synthesis or dynamic reduction
b	degrees of freedom fixed during component mode analysis or dynamic reduction
e	extra degrees of freedom introduced in dynamic analysis
sa	permanently constrained aerodynamic degrees of freedom
k	aerodynamic degrees of freedom

*Strictly speaking, sb and sg are not exclusive with respect to one another. Degrees of freedom may exist in both sets simultaneously. Since these sets are not used explicitly in the solution sequences, this need not concern the user. However, those who use these sets in their own DMAPs should avoid redundant specifications when using these sets for partitioning or merging operations. That is, a degree of freedom should not be specified on both a PS field of a GRID entry (sg set) and on a selected SPC entry (sb set). Redundant specifications will cause UFM 2120 in the VEC module and behavior listed in MSC/NASTRAN DMAP Module Dictionary for the UPARTN module. These sets are exclusive, however, from the other mutually exclusive sets.

Each degree of freedom is also a member of one or more combined sets called “supersets.” Supersets have the following definitions:



Set Name	**Meaning** (+ indicates union of two sets)
s = sb + sg	all degrees of freedom eliminated by single point constraints
l = b + c	the structural degrees of freedom remaining after the reference degrees of freedom are removed (degrees of freedom left over)
t = *l* + r	the total set of physical boundary degrees of freedom for superelements
a = t + q	the set assembled in superelement analysis
d = a + e	the set used in dynamic analysis by the direct method
f = a + o	unconstrained (free) structural degrees of freedom
fe = f + s	free structural degrees of freedom plus extra degrees of freedom
n = f + e	all structural degrees of freedom not constrained by multipoint constraints
ne = n + e	all structural degrees of freedom not constrained by multipoint constraints plus extra degrees of freedom
g = n + m	all structural (grid) degrees of freedom including scalar degrees of freedom
p = g + e	all physical degrees of freedom
ps = p + sa	physical and constrained (SPCi) aerodynamic degrees of freedom
pa = ps + k	physical set for aerodynamics

Set Name	**Meaning** (+ indicates union of two sets)
(fr = o) + *l*	statically independent set minus the statically determinate supports (fr = f – q – r)
v = o + c + r	the set free to vibrate in dynamic reduction and component mode synthesis

The a-set and o-set are created in the following ways:

1. If only OMITi entries are present, then the o-set consists of degrees of freedom listed explicitly on OMITi entries. The remaining f-set degrees of freedom are placed in the b-set, which is a subset of the a-set.
2. If ASETi or QSETi entries are present, then the a-set consists of all degrees of freedom listed on ASETi entries and any entries listing its subsets, such as QSETi, SUPORTi, CSETi, and BSETi entries. Any OMITi entries are redundant. The remaining f-set degrees of freedom are placed in the o-set.
3. If there are no ASETi, QSETi, or OMITi entries present but there are SUPORTi, BSETi, or CSETi entries present, then the entire f-set is placed in the a-set and the o-set is not created.
4. There must be at least one explicity ASETi, QSETi, or OMITi entry for the o-set to exist, even if the ASETi, QSETi, or OMITi entry is redundant.

In dynamic analysis, additional vector sets are obtained by a modal transformation derived from real eigenvalue analysis of the a-set. These sets are as follows:

ξ_o = rigid body (zero frequency) modal degrees of freedom

ξ_f = finite frequency modal degrees of freedom

ξ_i = $\xi_o + \xi_f$, the set of all modal degrees of freedom

One vector set is defined that combines physical and modal degrees of freedom:

u_h = $\xi_i + u_e$, the set of all modal degrees of freedom

The membership of each degree of freedom can be printed by use of the Bulk Data entries PARAM,USETPRT and PARAM,USETSEL.

Degree of Freedom Set Bulk Data Entries

Degrees of freedom are placed in sets as specified by the user on the following Bulk Data entries:

Name	Bulk Data Entry Name
m	MPC, MPCADD, MPCAX, POlNTAX, RBAR, RBE1, RBE2, RBE3, RROD, RSPLINE, RTRPLT, GMBC, GMSPC*
sb	SPC, SPC1, SPCADD, SPCAX, FLSYM, GMSPC*, BNDGRID, (PARAM,AUTOSPC,YES)
sg	GRID, GRIDB, GRDSET (PS field)
o	OMIT, OMIT1, OMlTAX, GRID (SEID field), SESET
q	QSET, QSET1
r	SUPORT, SUPORT1, SUPAX
c	CSET, CSET1
b	BSET, BSET1
e	EPOINT
sa	CAEROi
k	CAEROi
a	ASET, ASET1, Superelement exterior degrees of freedom, CSUPEXT

*Placed in set only if constraints are not specified in the basic coordinate system.

In superelement analysis, the appropriate entry names are preceded by the letters SE, and have a field reserved for the superelement identification number. This identification is used because a boundary (exterior) grid point may be in one mutually exclusive set in one superelement and in a different set in the adjoining superelement. The SE-type entries are internally translated to the following types of entry for the referenced superelement:

Entry Type	Equivalent Type
SEQSETi	QSETi
SESUP	SUPORT
SECSETi	CSETi
SEBSETi	BSETi

	Grid 236 (T3)
Case 1	-26.39
Case 2	-4.726
Case 3	2.391

	Grid 131 (T3)
Case 3	-2.391