NARLabs
國家實驗研究院

Applications of PISA3D

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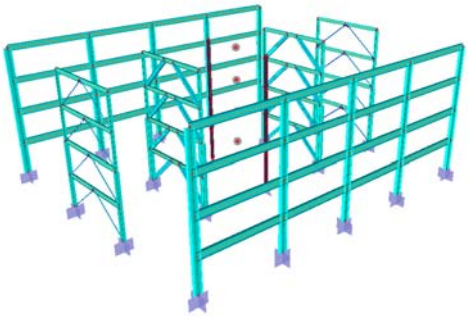
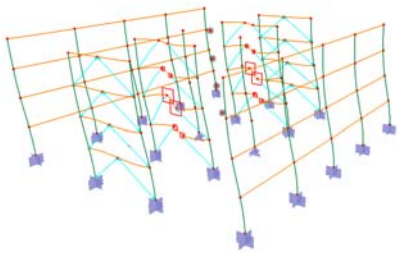
The Example for Demonstration

1. Import the model exported from ETABS/SAP2000





2. Perform nonlinear analyses

4-story Structure system:
Longitudinal direction: MRF in Lines 1 and 4 only.
Transverse direction: BRBF in Lines A and E, EBF in Lines B and D.

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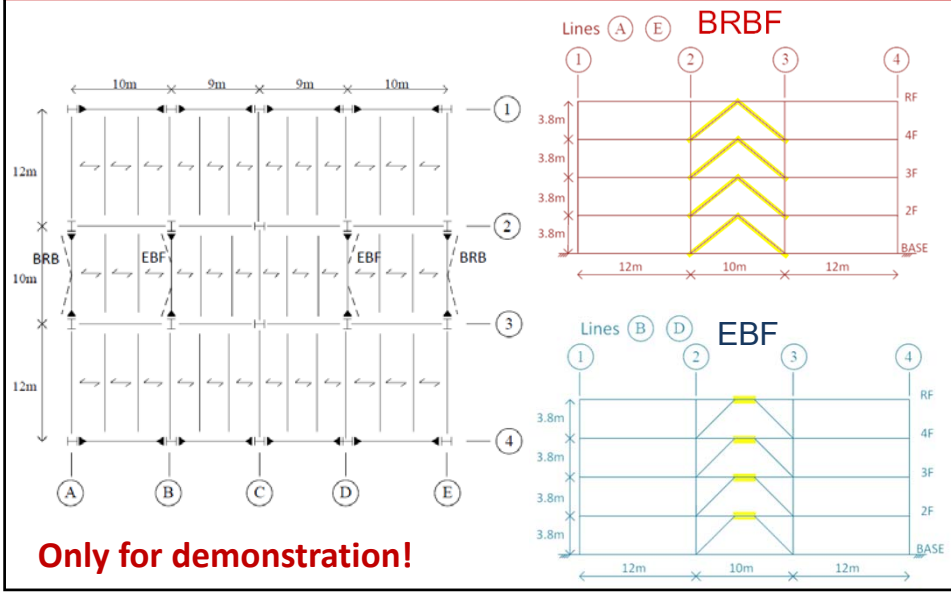
Floor Framing Plan & Elevations (1/2)



Only for demonstration!

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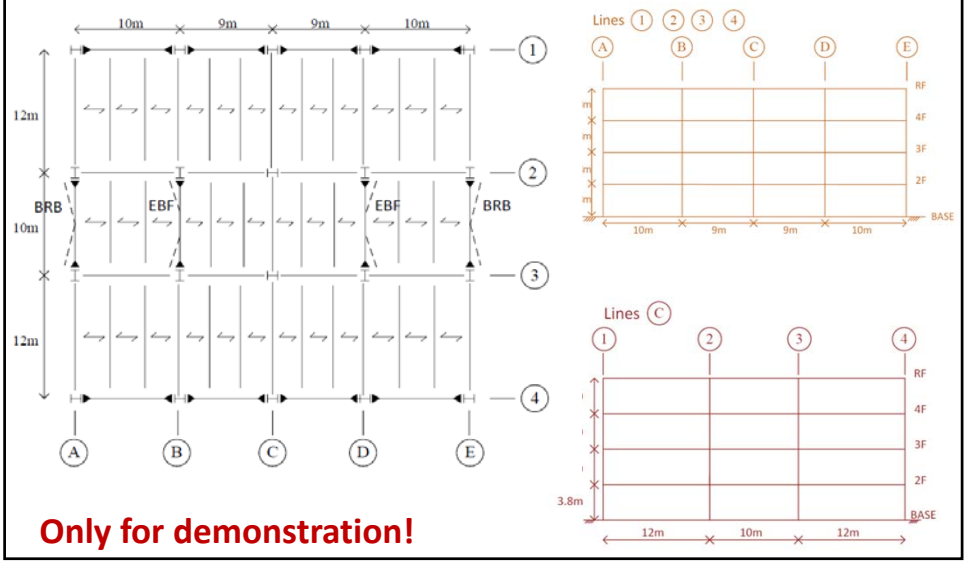
Floor Framing Plan & Elevations (2/2)



Only for demonstration!

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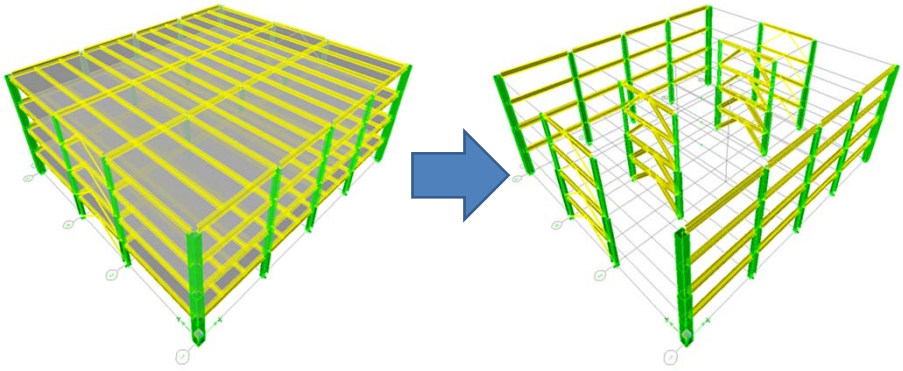
Before you export the ETABS Model

Simplify the model and simulate the seismic resisting system only .



Original

Simplified

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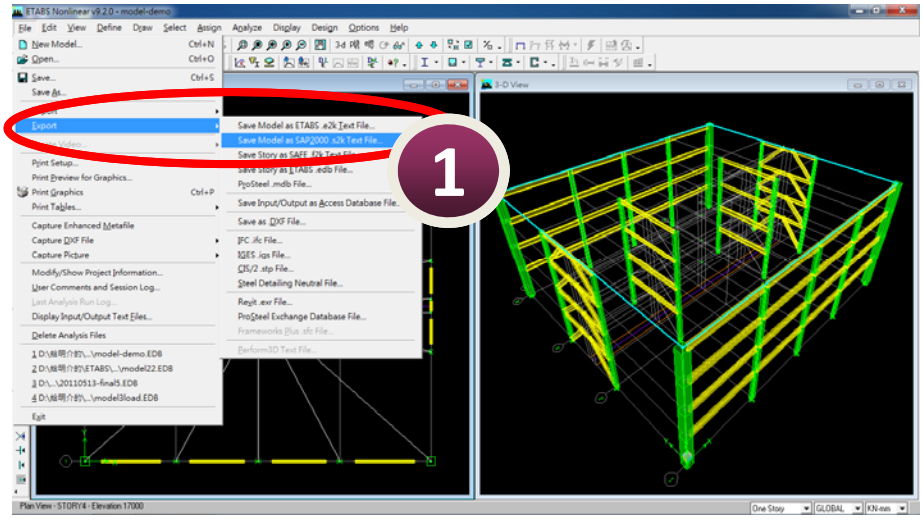
Export the ETABS Model (v9.7.3)

1.Click the ***File>Export>Save Model as SAP2000 .s2k Text File*** to export your model.



Import the *.s2k file exported from ETABS Model

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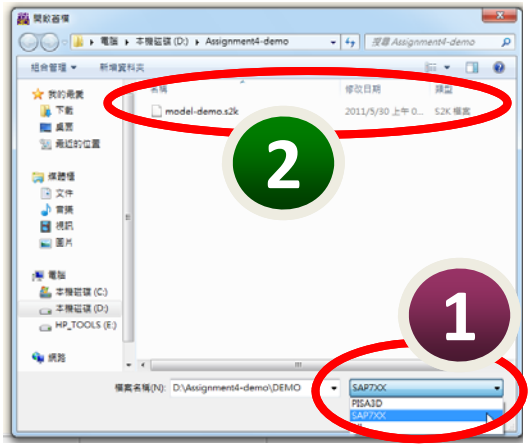
1.Open File and Select file format of ***SAP7XX*** from the drop-down list. 2.Double clicks on the ****.s2k file*** to open the project.



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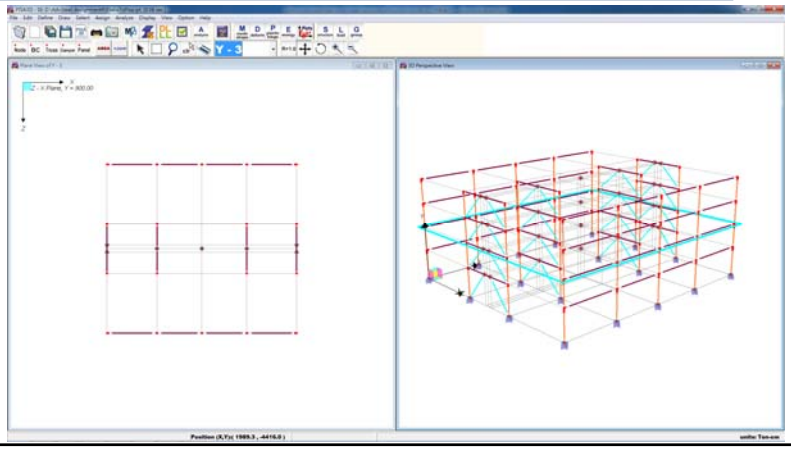
Migrate Your Model from ETABS to PISA3D

1.Save the Model as the *.ipt of file format.

2.**Close All.**

3.**Re-open** the *.ipt to check your model.



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What You Have to Check and Modify

1.Nodes and Elements

Check Nodes.

Check BeamColumn elements for beams and columns.

Use Truss elements to simulate braces in BRBF and EBF.

2.Nonlinear Materials

Define the nonlinear materials for simulation of SMRF, EBF and BRBF.

3.Section

Check the properties and the specified materials.

4.Rigid End Zone

Check/remove the settings of the rigid end offset.

5.Lumped Masses and Constraints

Specify the lumped masses and constraints.

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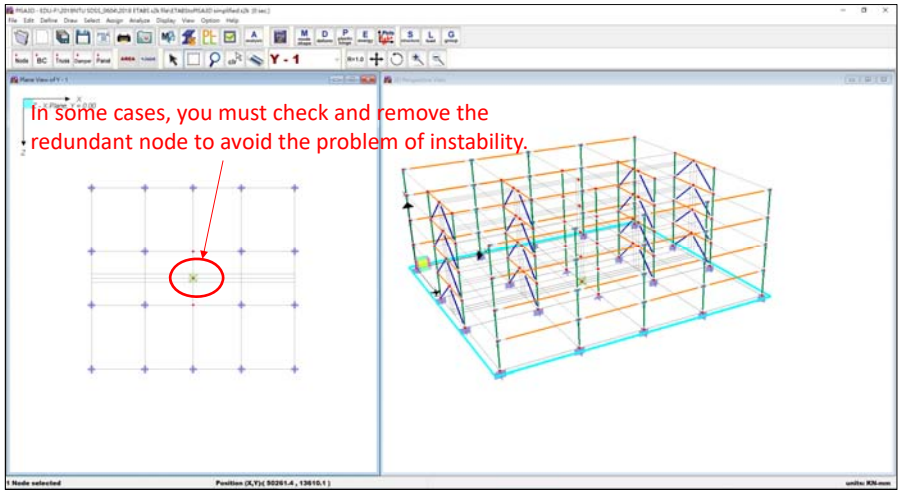
Check Nodes



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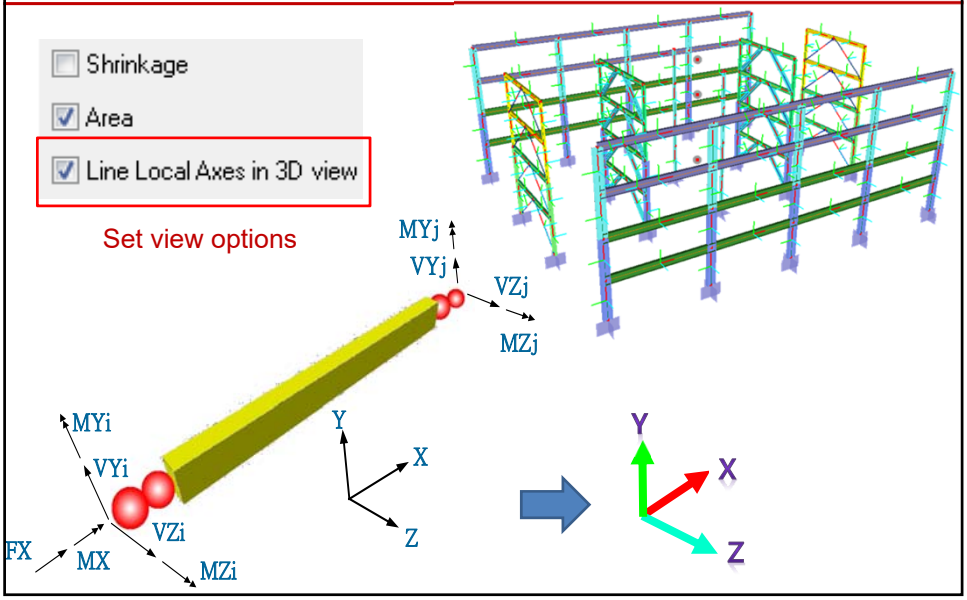
Display the Local Coordinate Systems



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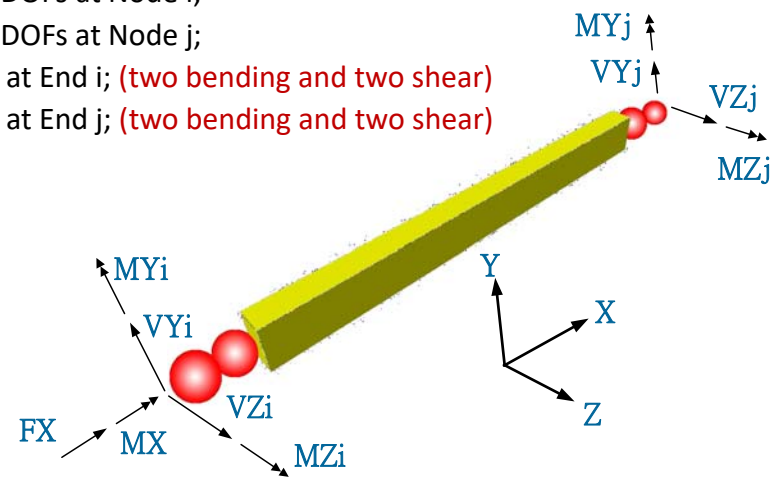
BeamColumn Element

- The zero-length plastic hinge (lumped plasticity)

(1) 6 global DOFs at Node i;
(2) 6 global DOFs at Node j;
(3) 4 hinges at End i; (two bending and two shear)
(4) 4 hinges at End j; (two bending and two shear)



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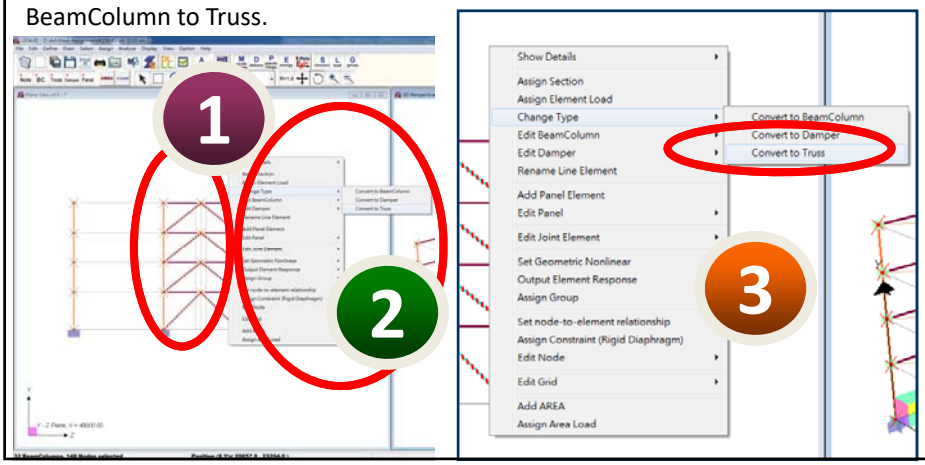
Specify the lumped masses and constraints.

Change the Type of Element

1.Select the Braces of BRBF and EBF.

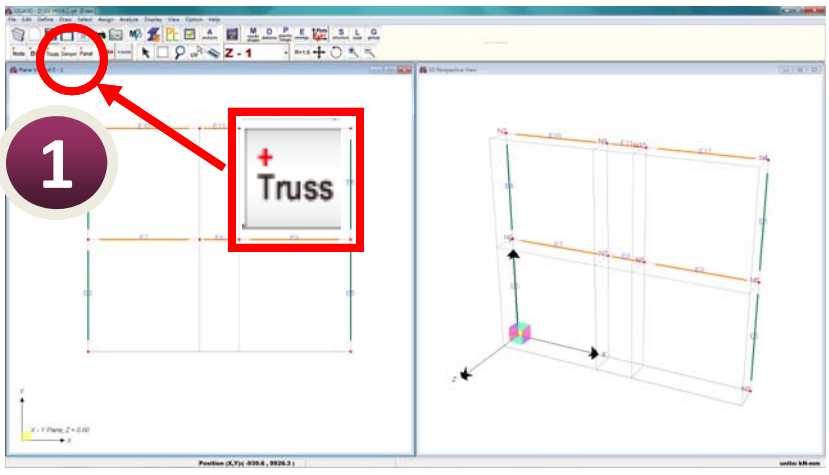
2.Click right mouse button to activate the ***pop-up menu***.

3.Select and Click ***Change Type>Convert to Truss*** to change the type from BeamColumn to Truss.



Activate Draw Mode for Drawing Truss Element

1.Click the button to start to draw a Truss element.



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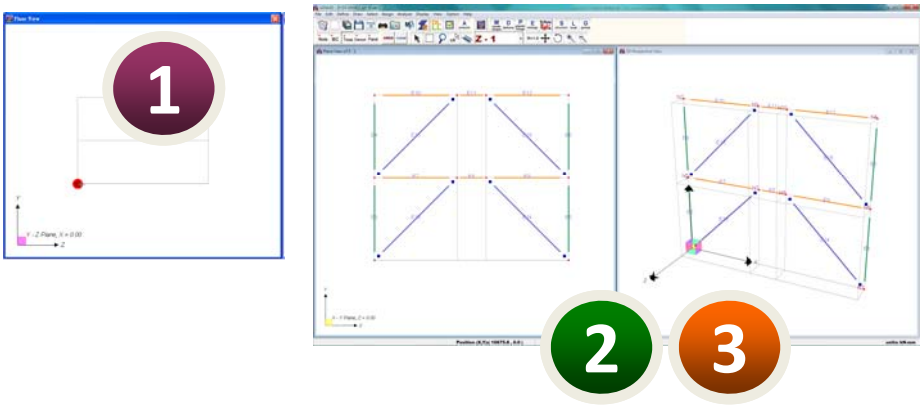
Draw a Truss Element

1.When the mouse position is close to the grid intersection, red point means ***snap to grid function*** is available.

2.Click the left mouse button and drag mouse to define a Truss element.

3.Repeat step 2, construct the braces.



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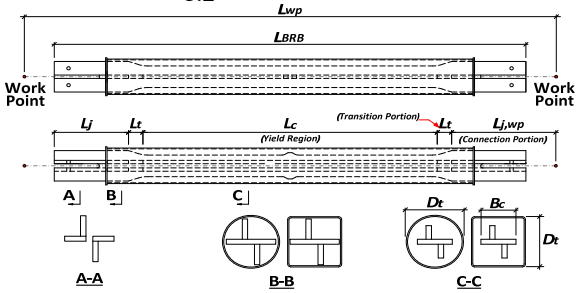
BRB Model

Command: Truss, Material (Hardening)

$$K_{eff} = \frac{1}{\frac{1}{K_c}+\frac{1}{K_t}+\frac{1}{1.2K_j}} = \frac{EA_cA_tA_j}{L_cA_tA_j + 2L_tA_cA_j + \frac{2L_{j,wp}A_cA_t}{1.2}} = Q\frac{EA_c}{L_{wp}}$$

$$P_{y\_core} = A_cF_y$$



K_{eff} & Py are both decided.
L (length) is fixed, how to define E, A, Fy in PISA3D?

Method A:
Fix E ; modify A & Fy as
$A_{eff} = K_{eff} \times L \div E$ *(Section)*
$Fy_{eff} = Py \div A_{eff}$ *(Material)*

Method B:
Fix A ; modify E as
$E_{eff} = K_{eff} \times L \div A$ *(Material)*
$Fy = Py \div A$

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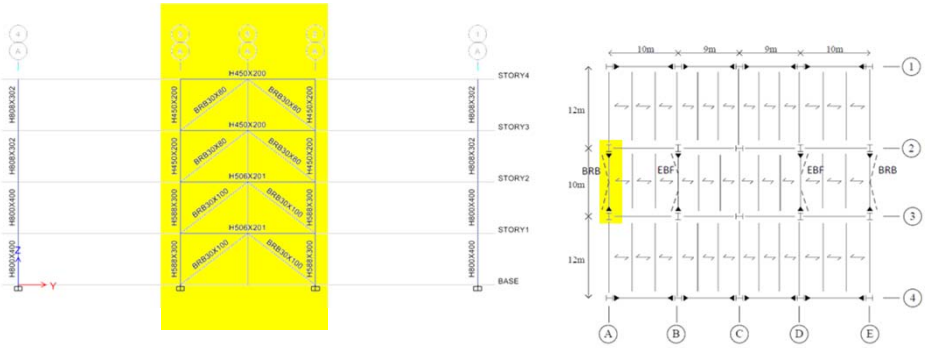
Details of the BRBs in BRBF



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Check/remove the settings of the rigid end offset.

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Specify the lumped masses and constraints.

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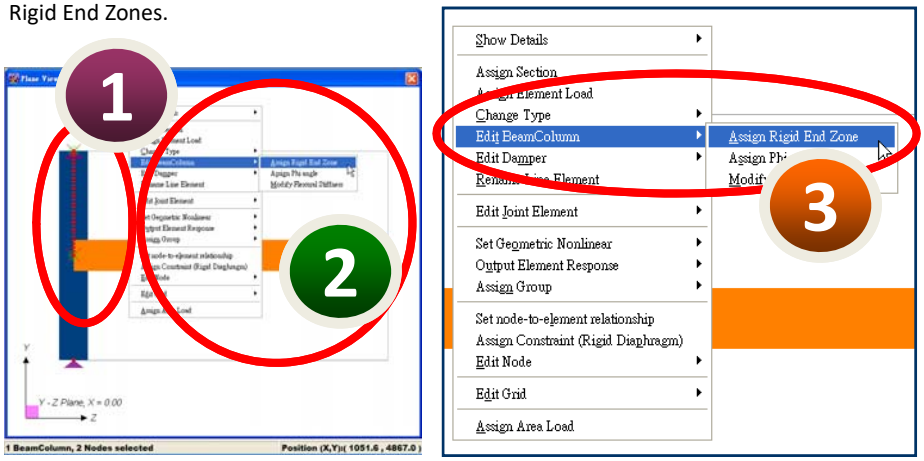
Erase the Rigid End Offset

1.Select All of Beams and Columns.

2.Click right mouse button to activate the ***pop-up menu***.

3.Select and Click ***Edit BeamColumn>Assign Rigid End Zone*** to activate the form of Assign Rigid End Zones.



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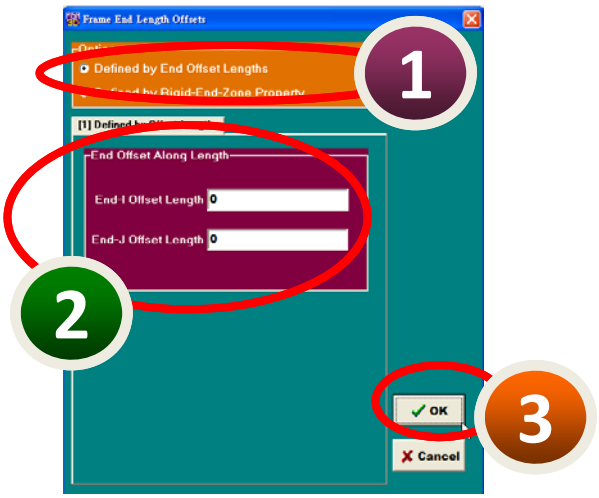
Erase the Rigid End Offset

1.Select the option of ***Defined by End Offset Lengths***.

2.Input the End Offset Lengths according to ***BeamColumn Local axis***.

3.Click the ***OK*** button.



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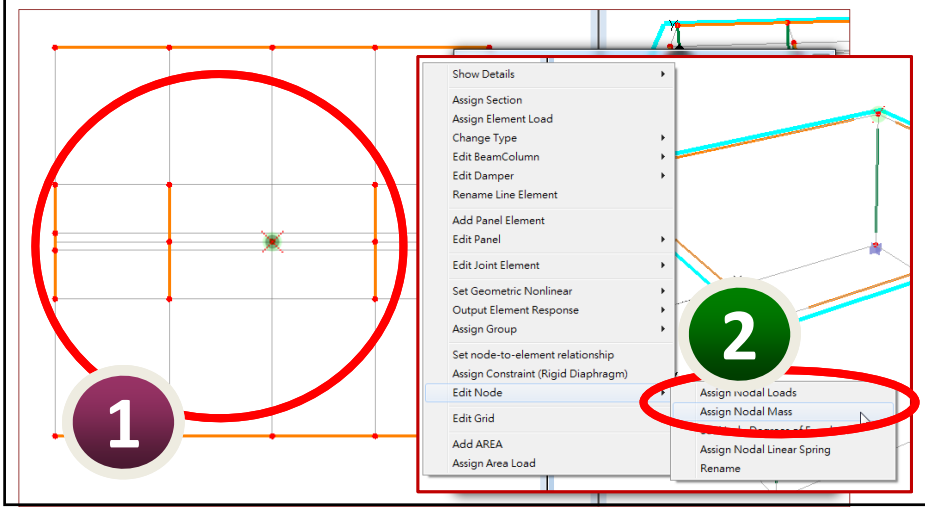
Assign Nodal Masses

1.Select the **master node**, then click right mouse button to show the popup menu.

2.Select and Click the ***Edit Node>Assign Nodal Masses***.



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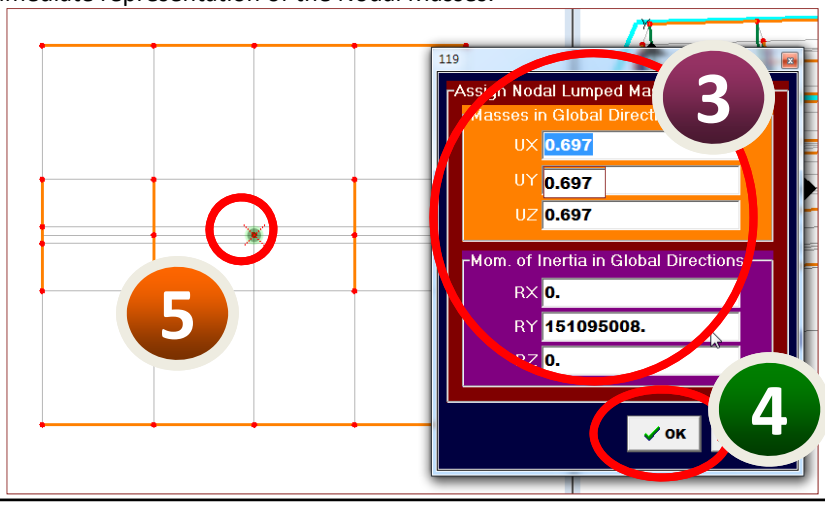
Assign Nodal Masses

3.Input the nodal masses.
4.Click the ***OK*** button.
5.Immediate representation of the Nodal Masses.



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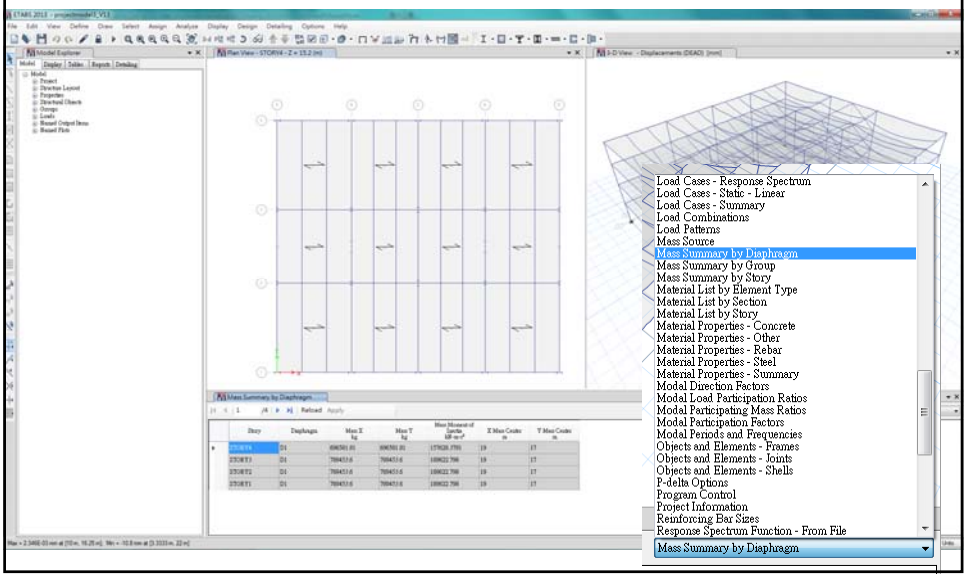
Nodal Masses calculated by ETABS



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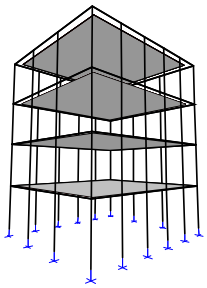
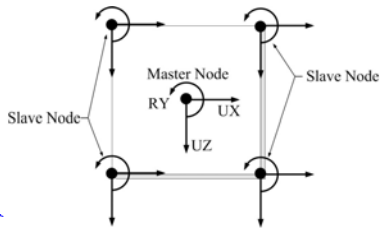
Setting of Nodal Degrees of Freedom (DOFs)

Diaphragm setting





(See manual: D02, D05)

Command: Constraint, DOF

A) The Master Node is a virtual one:

//DOF Node UX? UY? UZ? RX? RY? RZ?

DOF N20 0 -1 0 -1 0 -1

B) The Master Node is an existing one:

DOF N20 0 0 0 0 0 0

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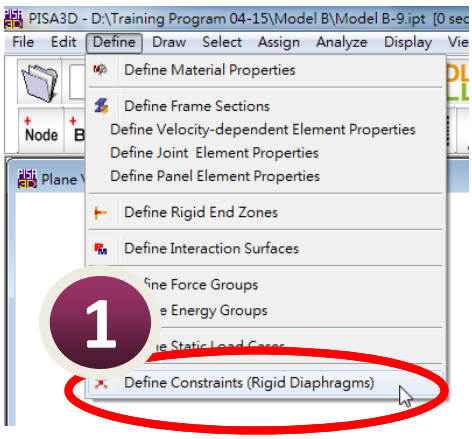
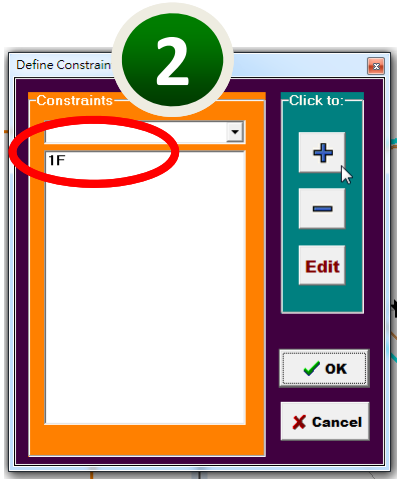
Define the Constraint

1.Select and Click the ***Define>Define Constraints (Rigid Diaphragm)*** from the main menu.

2.Add a new ***constraint*** **1F**.





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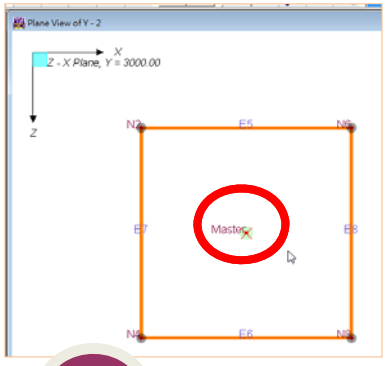
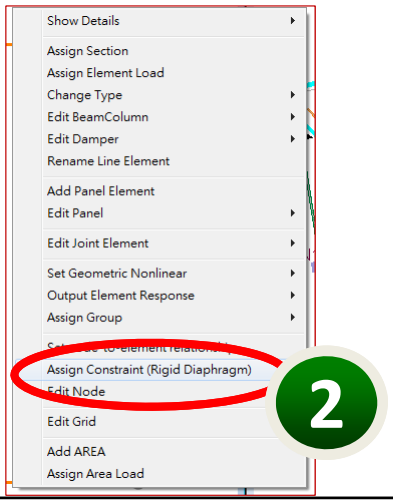
Assign the Constraint

1.Select Node **Master**, then click right mouse button to show the popup menu.

2.Select and Click the ***Assign Constraints (Rigid Diaphragm)***.





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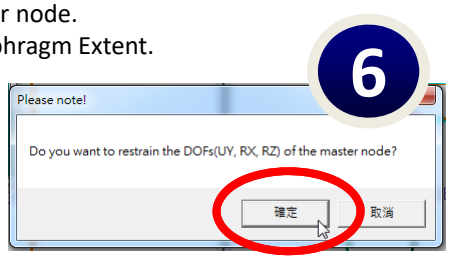
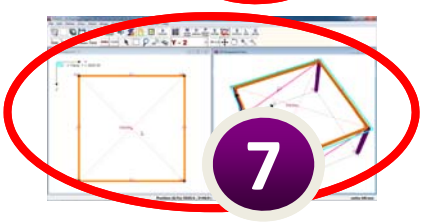
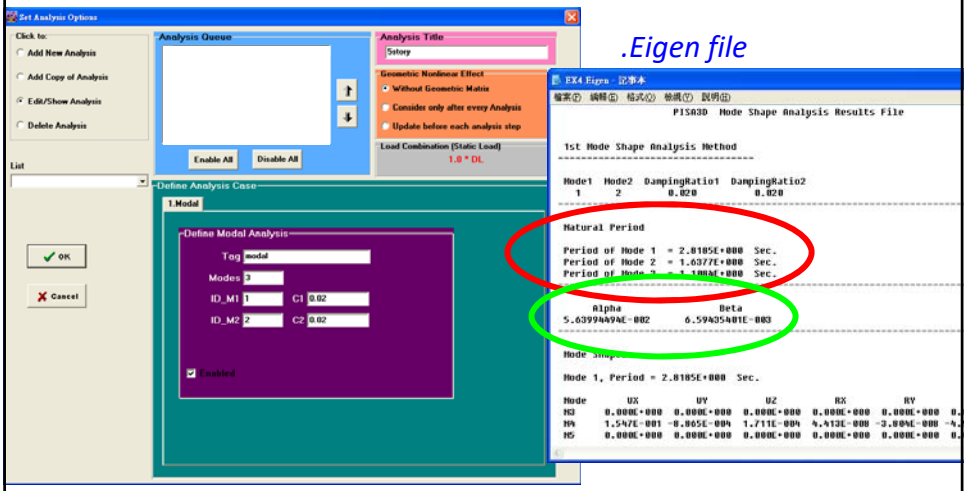
Assign the Constraint

3.Specify the Node ***Master*** as Master Node.
4.Assign the Constraint ***1F***.
5. Click the ***OK*** button.
6.Click to modify the DOFs of the master node.
7.Immediate representation of the Diaphragm Extent.





Modal Analysis

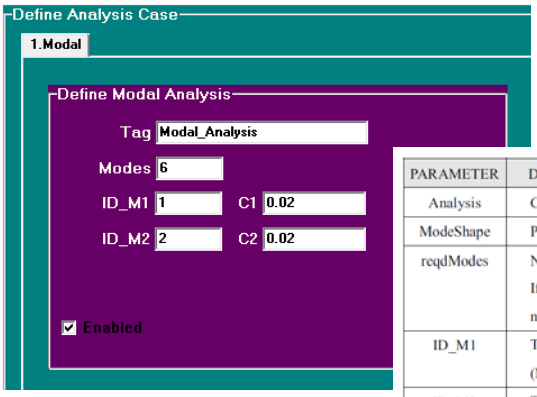


.Eigen file

■*Check mode shapes & periods*
Input required modes, damping ratios

(See manual: B04, Modal Analysis)

Modal Analysis



PARAMETER	DESCRIPTION
Analysis	Control Word.
ModeShape	Perform modal analysis.
reqdModes	Number of modes required to be calculated, must > 0 If "reqdModes" is greater than the number of free DOFs, only the number of free DOFs would be calculated.
ID_M1	The ID number of the 1st mode specified to get α and β. (Must > 0 and <= reqdModes).
ID_M2	The ID number of the 2nd mode specified to get α and β. (Must > 0 and <= reqdModes).
C1	The damping ratio of the 1st mode specified to get α and β.
C2	The damping ratio of the 2nd mode specified to get α and β.

(See manual: B04, Modal Analysis)

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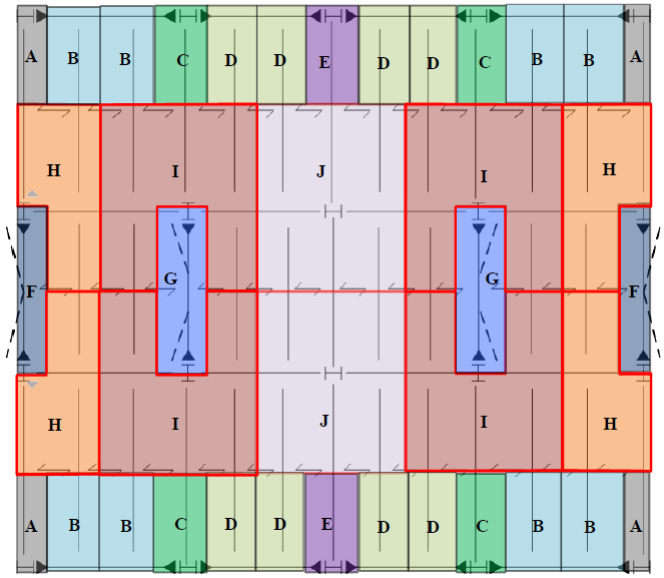
Tributary Area



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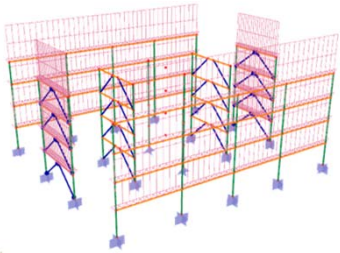
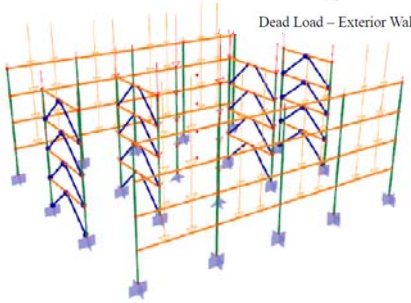
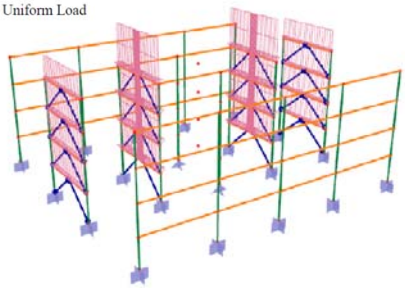
Loads



Dead Load – Exterior Walls Uniform Load



Dead Load – Point Load

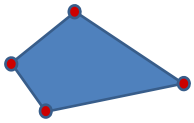


Dead Load – Uniform Load

The Area

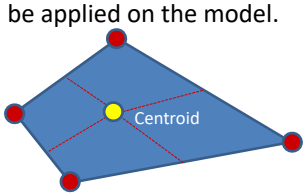
Definition

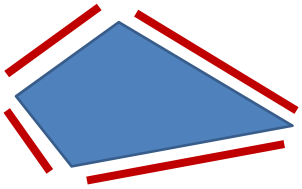
The area is restricted to be defined by a convex quadrilateral.



Intention

The area is an object defined only for assigning the uniform surface load.
The uniform surface load can be distributed by Nodal Loads/Element Loads , then be applied on the model.





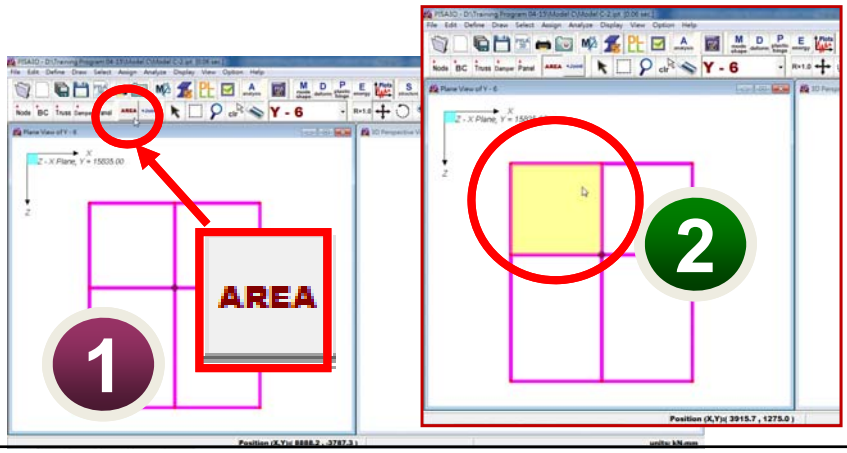
Create

Create Area at Click. Create Area using four nodes.

Activate Draw Mode for Creating Areas at Click

1.Click the button to start to Create Areas at Click.

2.Click left mouse button in the region to create the area.



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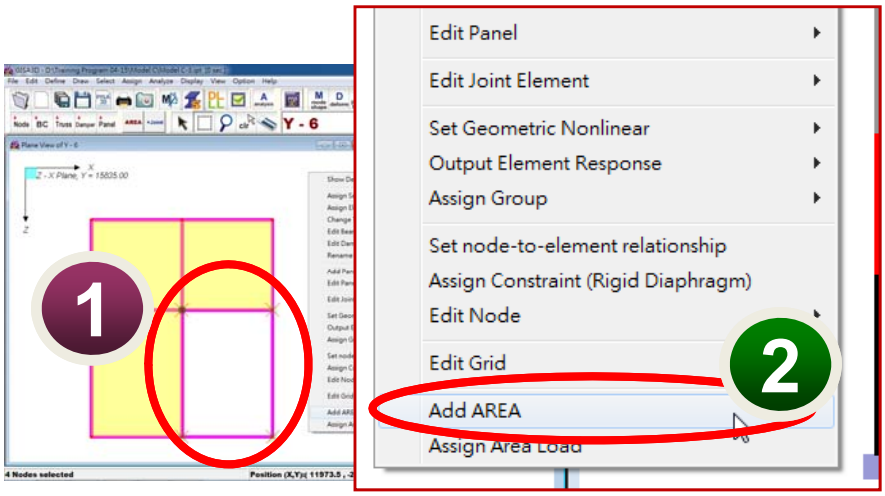
Create a Area using 4 nodes

1.Select the **4 nodes**, then click right mouse button to show the popup menu.

2.Select and Click the ***Add AREA***.



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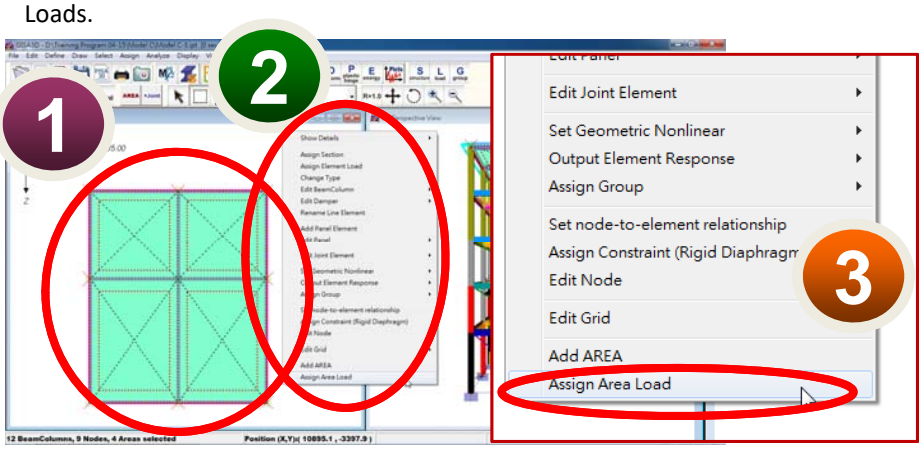
Assign Area Loads

1.Select ***Areas***.

2.Click right mouse button to activate the ***pop-up menu***.

3.Select and Click ***Assign Area Load*** to activate the form of Assign Uniform Surface Loads.



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Specify Area Loads using the Static Load Case

1.Select ***Load Case*** **DL**.

2.Make sure the selected option is ***Replace Existing Loads***.

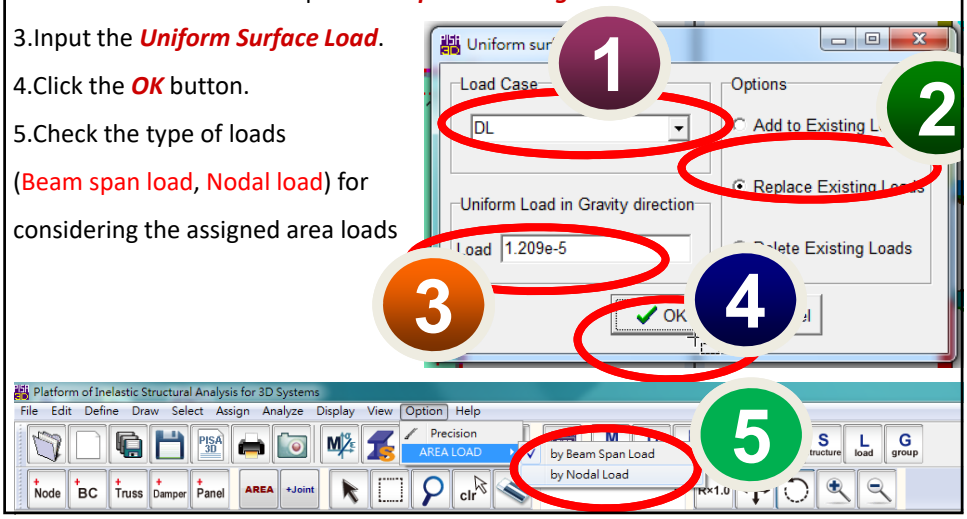
3.Input the ***Uniform Surface Load***.

4.Click the ***OK*** button.

5.Check the type of loads

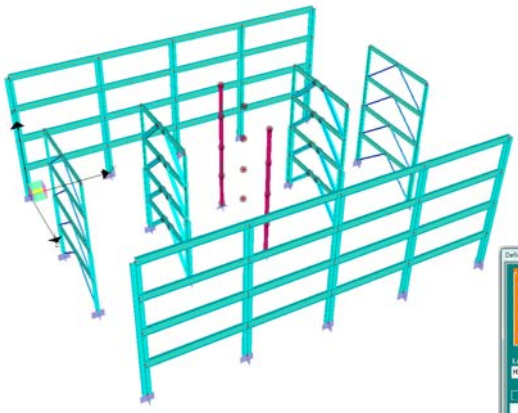
(Beam span load, Nodal load) for

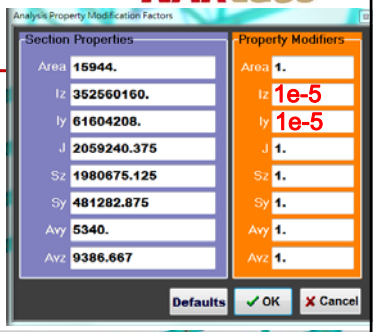
considering the assigned area loads

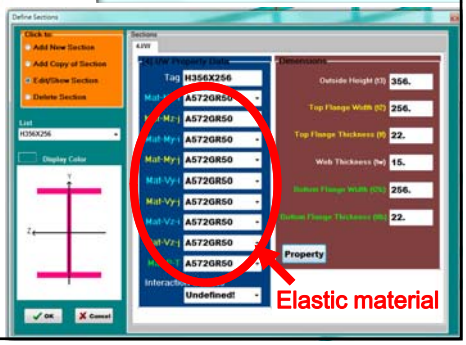


NARLabs

Leaning Columns



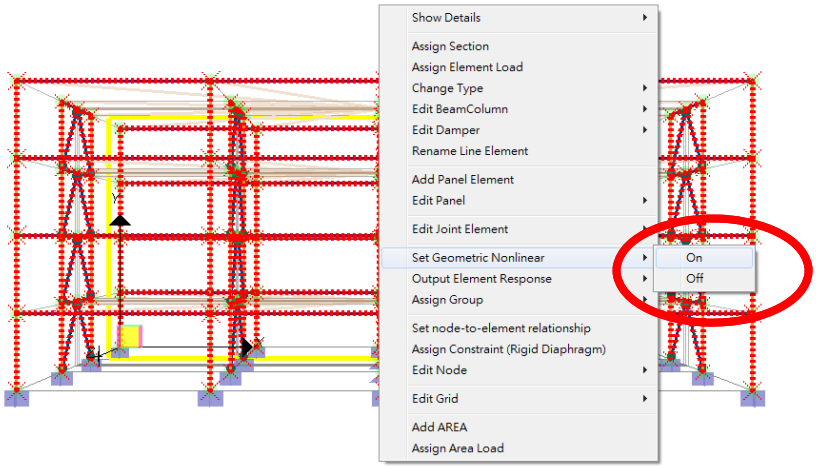




NARLabs

Include P-Delta effect

1.Select All of Beams Braces and Columns.
2.Click right mouse button to activate the ***pop-up menu***.
3.Select and Click ***Set Geometric Nonlinear>On*** to include P-Delta effect.

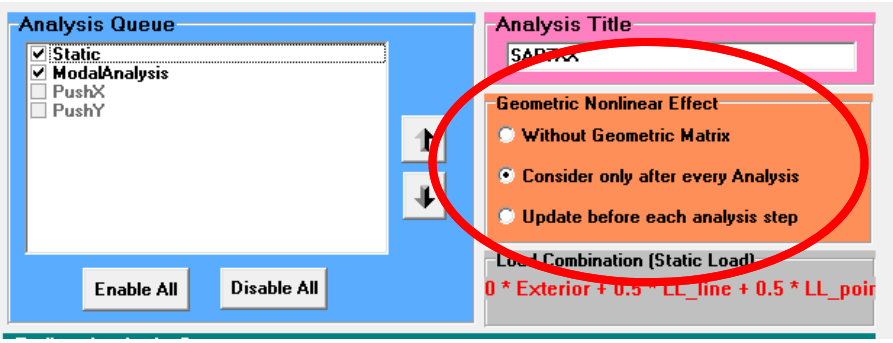


NARLabs

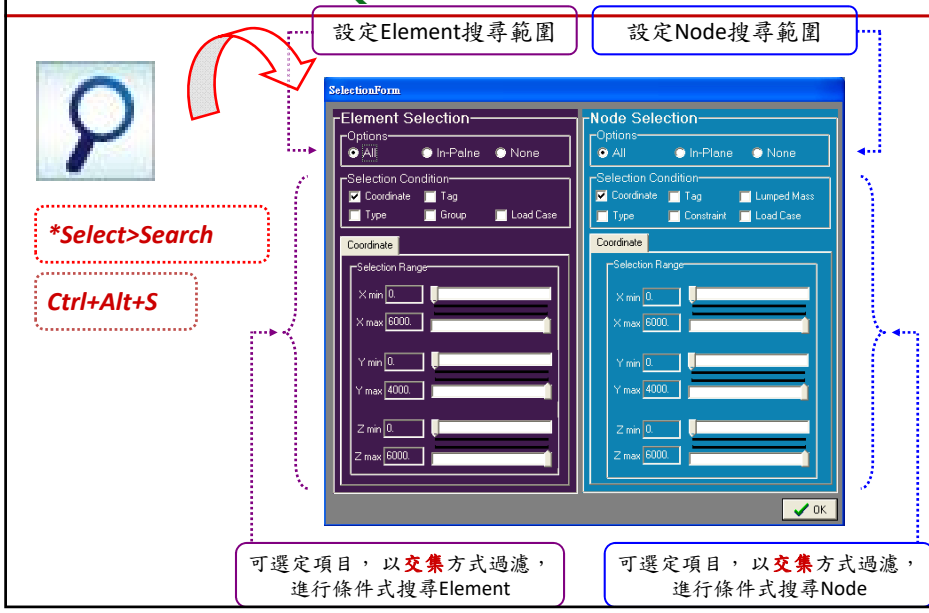
Include P-Delta effect

1.Set the Geometric Matrix Effect in the form of Analysis Setting.

2.Make sure that the gravity loads has been included before modal analysis.



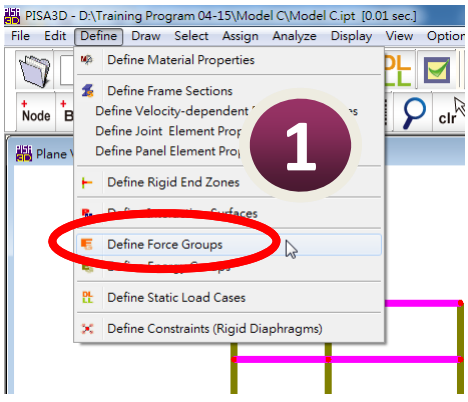
Quick Search

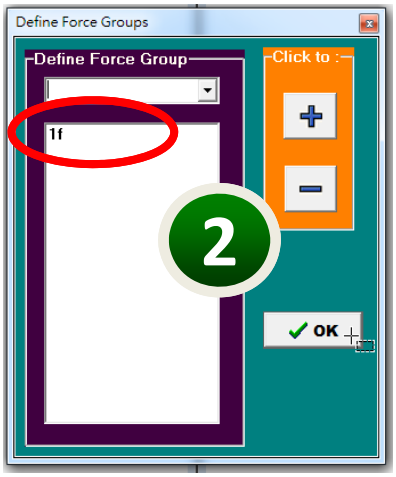


Define the Force Group

1.Select and Click the ***Define>Define Force Group*** from the main menu.

2.Add the new ***Force Group*** **1f**.

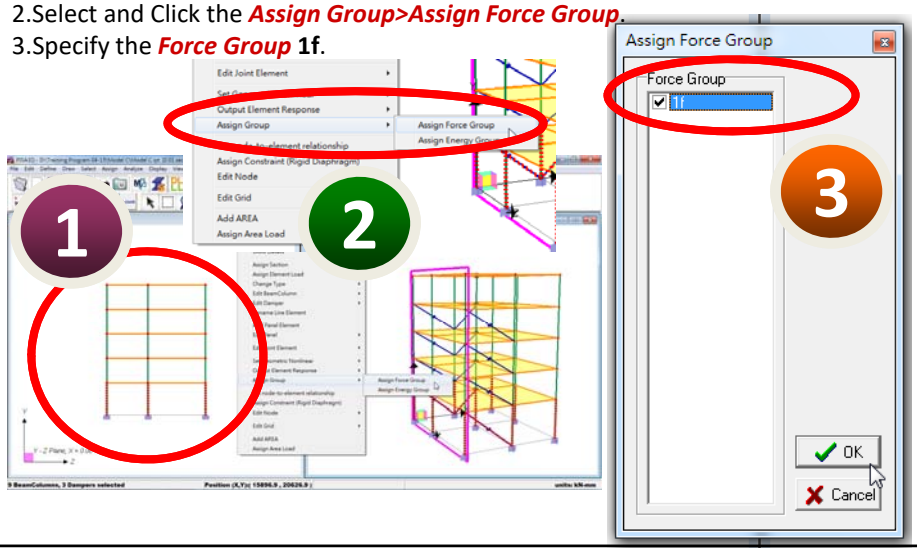




NARLabs

Assign the Force Group

1.Select elements, then click right mouse button to show the popup menu.
2.Select and Click the ***Assign Group>Assign Force Group***.
3.Specify the ***Force Group*** **1f**.



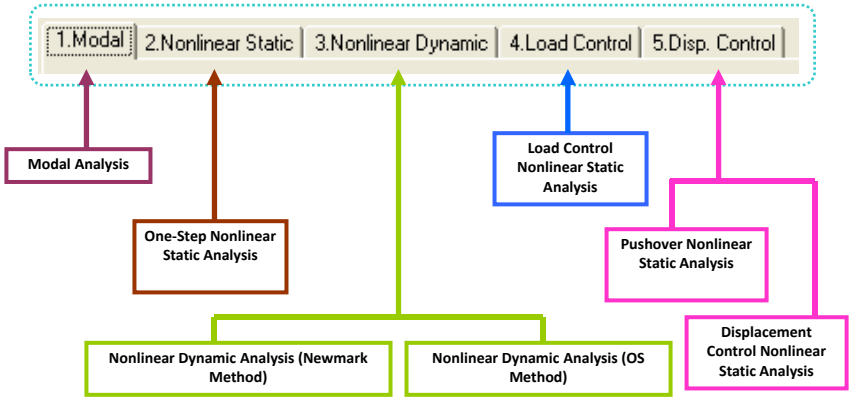
NARLabs

Analysis Setting

Analyze->Analysis Setting

A analysis

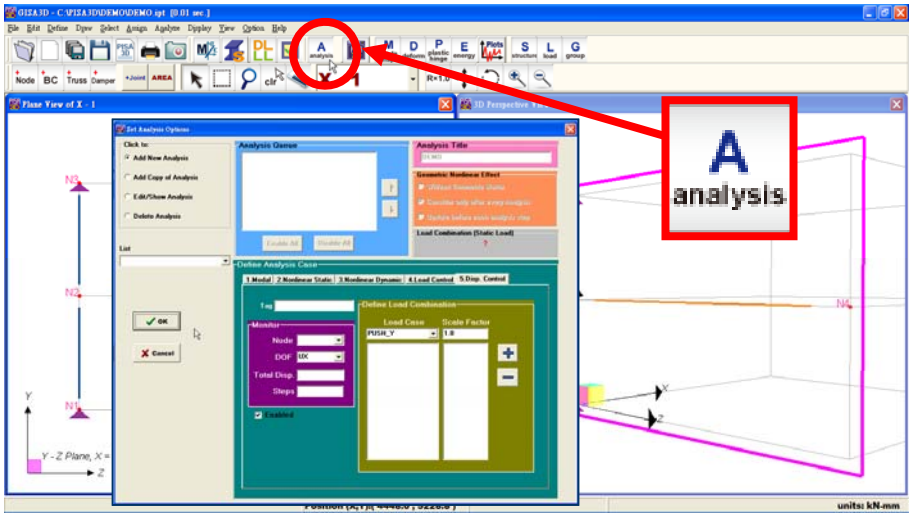
(See PISA3D Manual: PART B.)



NARLabs

Define the Analysis Cases for Analyzing the Model

1.Click the button to activate the form of ***Set Analysis Options***.



NARLabs

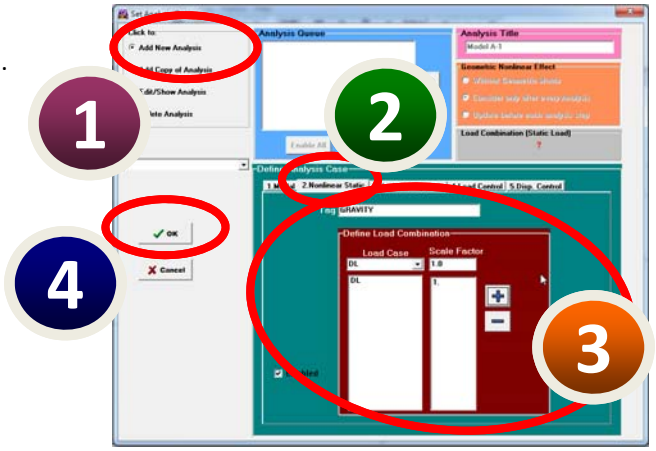
Define the Nonlinear Static Analysis for Gravity Analysis

1.Make sure the selected option is ***Add New Analysis***.

2.Select the ***Nonlinear Static*** page.

3.Input the Tag, the parameters and specify gravity loads using the ***static load case*** **DL**.

4.Click the ***OK*** button.



NARLabs

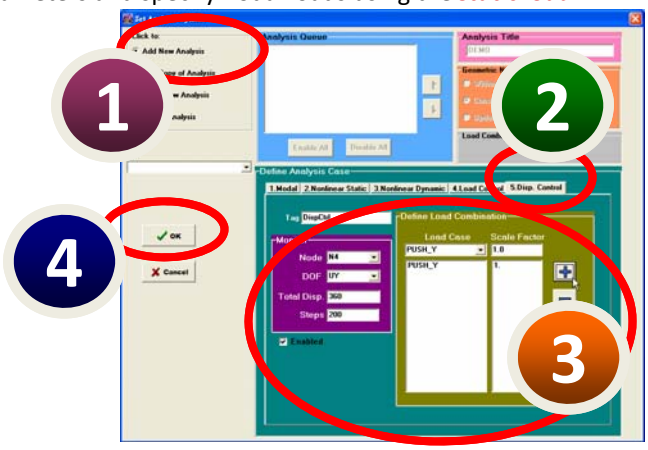
Define the Displacement Control Nonlinear Static Analysis

1.Make sure the selected option is ***Add New Analysis***.

2.Select the ***Disp. Control*** page.

3.Input the Tag, the parameters and specify nodal loads using the ***static load case***.

4.Click the ***OK*** button.

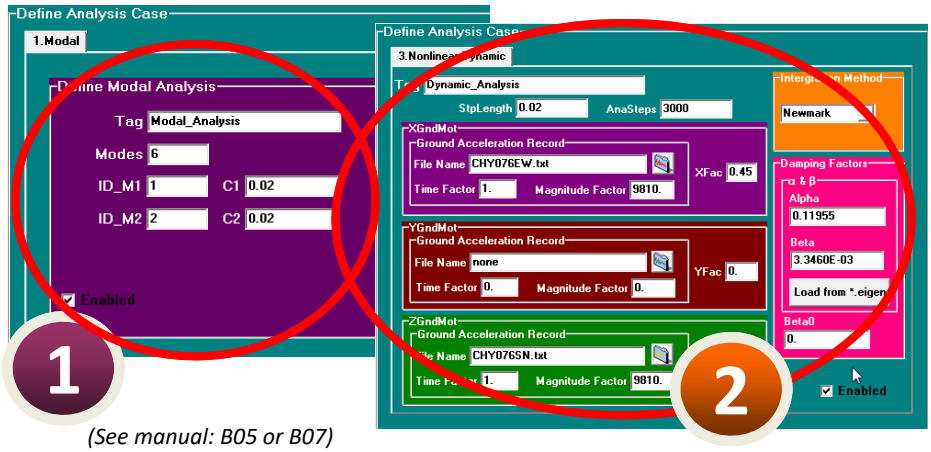


NARLabs

Define the Nonlinear Dynamic Analysis Cases

1. Perform the modal analysis to analyze your model.

2. The Damping Factors (α, β) can be determined from the modal analysis, then add and perform the nonlinear dynamic analysis. $[C]=\alpha[M]+\beta[K_t]$ or $[C]=\alpha[M]+\beta_0[K_0]$



(See manual: B05 or B07)

NARLabs

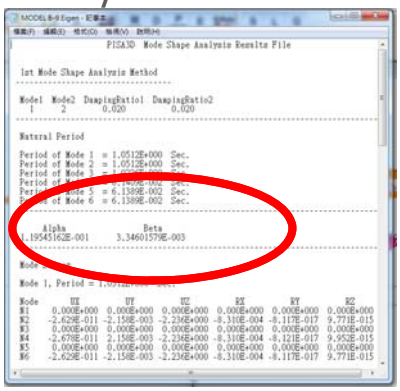
Define the Nonlinear Dynamic Analysis Cases

Damping Factors (α, β) can be determined in two ways:

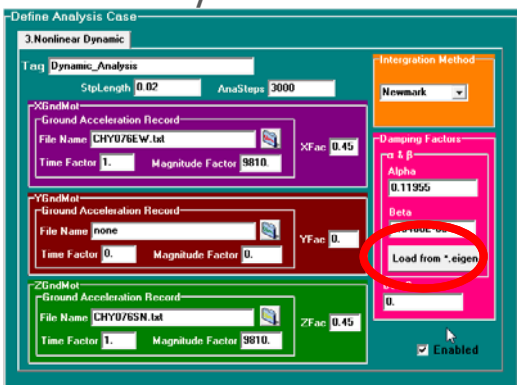
[Option A] Get from EIGEN file.

[Option B] Click the Load from *.eigen Button.

Option A



Option B

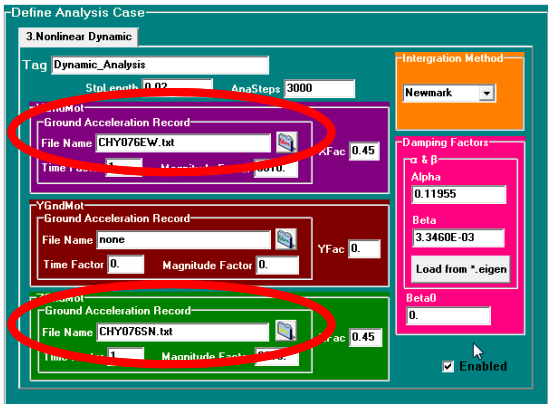


NARLabs

Define the Nonlinear Dynamic Analysis Cases

1.The file path of Ground Acc. Record can be defined using both of the absolute path and the relative path.

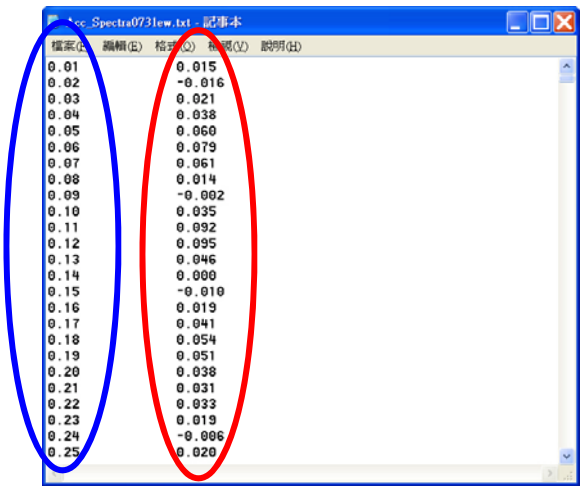
2.The default directory of the relative path is identical to the location of your PISA3D input file (*. ipt).



NARLabs

Nonlinear Dynamic Analysis

Ground Acceleration Records



Time

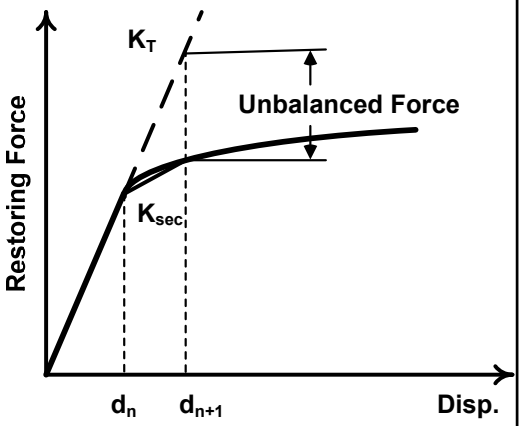
Acceleration

NARLabs

Nonlinear Dynamic Analysis

Non-iterative Newmark Scheme

- Newmark scheme for transient response analysis.
- Constant average acceleration method
- In each time step, the updated element stiffness at the beginning of each time step is used to calculate the responses.
- The approach is non-iterative and any unbalanced forces resulting from the element stiffness change in any time step are incorporated into the external loads in the next time step.



Check the Unbalanced Energy

【.Energy file】

ADST_1.Energy - 記事本

檔案(F) 編輯(E) 格式(O) 檢視(V) 說明(H)

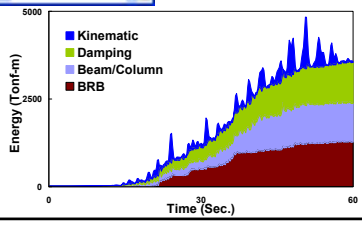
PISA3D Energy Distribution File

Analysis Time/Step	Unbalanced Energy_Ratio	Input Energy	Kinetic Energy	Damping Energy	Strain Energy	Element Group-BC	Element Group-LINK
0.100	0.00%	3.237E+001	3.458E+000	6.459E+000	2.245E+001	2.176E+001	6.141E-001
0.200	-0.00%	1.856E+002	7.191E+001	1.630E+001	9.738E+001	8.779E+001	3.697E+000
0.300	0.00%	2.260E+002	9.238E+001	4.583E+001	8.775E+001	4.578E+001	8.067E-001
0.400	0.00%	2.152E+002	7.704E+001	5.065E+001	8.753E+001	4.581E+001	6.143E-001
0.500	0.00%	2.391E+002	1.437E+002	6.659E+001	2.884E+001	2.268E+001	9.477E-001
0.600	0.00%	2.473E+002	1.240E+002	7.873E+001	4.460E+001	4.107E+001	9.285E-002
0.700	0.00%	2.364E+002	1.124E+002	9.205E+001	3.201E+001	2.101E+001	9.491E-001
0.800	0.00%	2.822E+002	5.714E+001	1.030E+002	1.220E+002	1.019E+002	4.171E+000
0.900	0.00%	4.618E+002	6.164E+001	1.132E+002	2.870E+002	2.358E+002	1.091E+001
1.000	0.00%	5.804E+002	1.385E+002	1.278E+002	3.142E+002	1.892E+002	1.128E+001
1.100	0.00%	5.642E+002	1.253E+002	1.497E+002	2.892E+002	1.324E+002	5.250E+000
1.200	0.00%	8.339E+002	2.991E+002	1.903E+002	3.445E+002	2.630E+002	1.223E+001
1.300	0.00%	1.120E+003	6.396E+002	2.051E+002	2.753E+002	2.406E+002	8.186E+000
1.400	0.00%	1.149E+003	7.764E+002	2.755E+002	9.716E+001	8.054E+001	1.779E-001
1.500	0.00%	1.315E+003	6.668E+002	3.283E+002	3.198E+002	3.137E+002	2.425E+000
1.600	0.00%	1.400E+003	8.057E+002	3.632E+002	2.310E+002	1.667E+002	4.276E+000
1.700	-0.00%	1.510E+003	6.114E+002	4.099E+002	4.889E+002	3.164E+002	1.120E+001
1.800	-0.00%	1.434E+003	1.587E+002	4.325E+002	8.432E+002	6.233E+002	1.638E+001

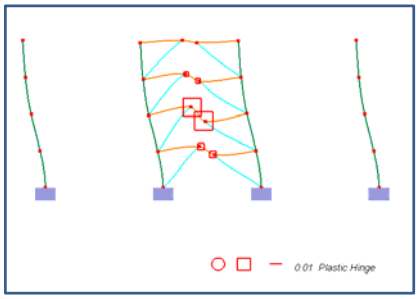
Element Group

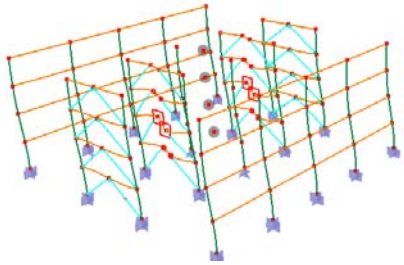
< 10~20% is better !

Energy Distribution



Display the Plastic Hinge Distributions with the Structural Deformation





About the representation of hinges in BeamColumn elements, circle and square indicate the nonlinear behavior occurred with flexural and shear yielding respectively. The red line show on middle point of truss element indicates the axial yielding.

Additionally, the size of the shapes and line mentioned means the magnitudes of the nonlinear behavior, plastic hinge rotation, axial strain level. And the sizes are all normalized with respect to the given or default circle, square and line.

User can find the default standard shapes (0.01 for axial strain and 0.01 radians for rotation) on the bottom of the 2D view windows, and visually make a comparison between the standard one and the hinges showed in the model.

Output Setting

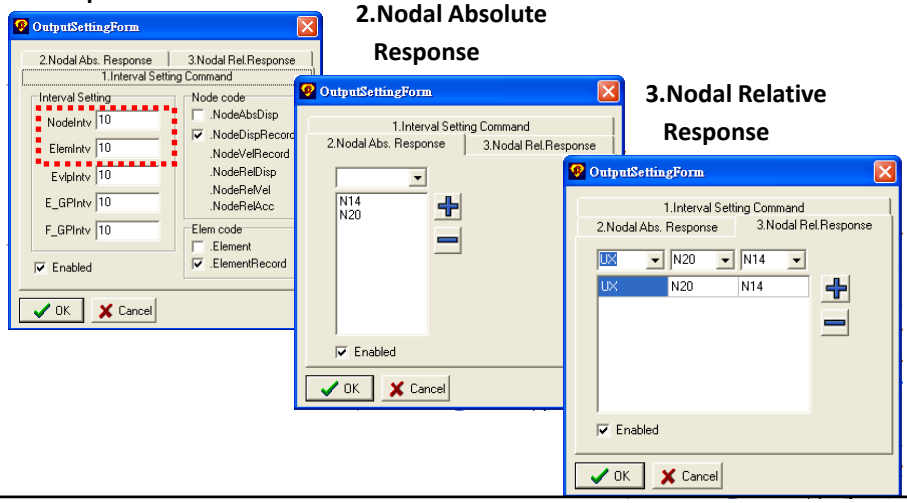
*Analyze->Output Setting

(See PISA3D Manual: I01, I02, I03)

1.Output Interval

2.Nodal Absolute Response

3.Nodal Relative Response



Contents of Output Files (1)

1. Echo
   包含分析模型的資料與分析過程的訊息，可供使用者檢核模型正確性，錯誤訊息亦會輸出於此檔。

2. Element
   在每個指定要輸出的時間點上，輸出使用者指定要輸出的所有元素反應。

3. ElemRecord
   印出上述.Element檔案的所有內容，但是會將每個元素的反應依時間順序排列在一起，方便作圖。此檔只有在分析完成後才會產生。

4. ElemEnvelope
   在每個指定要輸出的時間點上，輸出使用者指定要輸出的所有元素，到此時間點為止的最大反應。

5. SectionX, SectionY, SectionZ
   輸出X/Y/Z向的元素群組斷面力。

6. Energy
   印出系統應變能、阻尼能、動能、外力輸入能量、元素群組應變能量，與不平衡能量。

NARLabs

Contents of Output Files (2)

7. NodeAbsDisp
   在每個指定要輸出的時間點上，輸出使用者指定要輸出的所有節點的位移反應。

8. NodeDisRecord
   印出上述.NodeAbsDisp檔案的所有內容，但是會將每個節點的反應依時間順序排列在一起，方便作圖。此檔只有在分析完成後才會產生。

9. NodeVelRecord, NodeAccRecord
   如同.NodeDisRecord，但記載的是速度與相對加速度的反應

10. NodeRelDisp, NodeRelVel, NodeRelAcc
    根據使用者的指定，輸出節點間的相對位移、速度與加速度反應，例如可用來觀測層間變位。

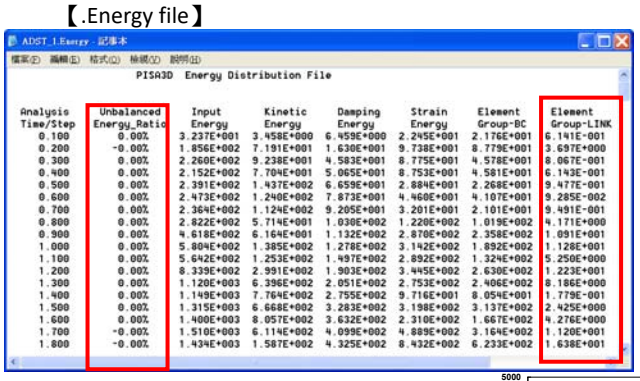
11. NodeEnvelope
    在每個指定要輸出的時間點上，輸出使用者指定要輸出的所有節點，到此時間點為止的最大反應。

12. Eigen
    振態分析結果的輸出檔，記載自然週期、振態，與比例阻尼的α、β值。

NARLabs

Contents of Output Files (3)

【.Energy file】



PISA3D Energy Distribution File

Analysis Time/Step	Unbalanced Energy_Ratio	Input Energy	Kinetic Energy	Damping Energy	Strain Energy	Element Group-BC	Element Group-LINK
0.100	0.00%	3.237E+001	3.458E+000	6.459E+000	2.245E+001	2.176E+001	6.141E-001
0.200	-0.00%	1.856E+002	7.191E+001	1.630E+001	9.738E+001	8.779E+001	3.697E+000
0.300	0.00%	2.260E+002	9.238E+001	4.583E+001	8.775E+001	4.578E+001	8.067E-001
0.400	0.00%	2.152E+002	7.704E+001	5.065E+001	8.753E+001	4.581E+001	6.143E-001
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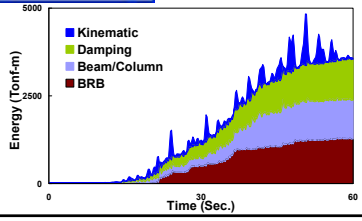
0.600	0.00%	2.473E+002	1.240E+002	7.873E+001	4.460E+001	4.107E+001	9.285E-002
0.700	0.00%	2.364E+002	1.124E+002	9.205E+001	3.201E+001	2.101E+001	9.491E-001
0.800	0.00%	2.822E+002	5.714E+001	1.030E+002	1.220E+002	1.019E+002	4.171E+000
0.900	0.00%	4.618E+002	6.164E+001	1.132E+002	2.870E+002	2.358E+002	1.091E+001
1.000	0.00%	5.804E+002	1.385E+002	1.278E+002	3.142E+002	1.852E+002	1.128E+001
1.100	0.00%	5.642E+002	1.253E+002	1.497E+002	2.892E+002	1.324E+002	5.250E+000
1.200	0.00%	8.339E+002	2.991E+002	1.903E+002	3.445E+002	2.630E+002	1.223E+001
1.300	0.00%	1.120E+003	6.396E+002	2.051E+002	2.753E+002	2.406E+002	8.186E+000
1.400	0.00%	1.149E+003	7.764E+002	2.755E+002	9.716E+001	8.054E+001	1.779E-001
1.500	0.00%	1.315E+003	6.668E+002	3.283E+002	3.198E+002	3.137E+002	2.425E+000
1.600	0.00%	1.400E+003	8.057E+002	3.632E+002	2.310E+002	1.667E+002	4.276E+000
1.700	-0.00%	1.510E+003	6.114E+002	4.099E+002	4.889E+002	3.164E+002	1.120E+001
1.800	-0.00%	1.434E+003	1.587E+002	4.325E+002	8.432E+002	6.233E+002	1.638E+001

Element Group

< 10~20% is better !



Energy Distribution

NARLabs

Contents of Output Files (4)

【.Element file】

ADST_1.Element - 記事本

檔案(F) 編輯(E) 格式(O) 檢視(V) 說明(H)

```
 Elem.  Yield      Axial          Total          Now_Plas.      Accum._Plastic Extension      Total       Hysteresi
 Tag    Code       Force          Extension      Extension      Positive       Negative       StrainEngy  StrainEng
 E25       1   -1.234E+003    -2.444E+001    -3.744E+000     5.807E+002    -5.845E+002    1.362E+006  1.585E+00

 Joint Element
 Elem.  Yield   Internal       Total          Now_Plas.      Accum._Plastic Rotation       Total       Hysteresis
 Tag    Code    Moment         Rotation       Rotation       Positive       Negative       StrainEngy  StrainEngy
 J2        0    1.159E+006     4.841E-003     3.428E-003     1.057E-002    -7.139E-003     2.221E+004  2.245E+004
 J3        0    1.025E+006     4.671E-003     3.441E-003     1.534E-002    -1.190E-002     3.336E+004  3.452E+004
 J10       0    1.159E+006     4.839E-003     3.425E-003     1.056E-002    -7.139E-003     2.221E+004  2.244E+004
 J11       0    1.025E+006     4.672E-003     3.441E-003     1.534E-002    -1.190E-002     3.336E+004  3.451E+004


 Element Response at Time:  30.0000

 BeamColumn Element
 Elem.  -- -- Plas Hinge Yied Code -- --   BendingMom.    BendingMom.    BendingMom.    BendingMom.    ShearForce
 Tag    MzI MzJ MyI MyJ UyI UyJ UzI UzJ    Z_I_Now        Z_J_Now        Y_I_Now        Y_J_Now        Y_I_Now
 E13    0   1   0   0   0   0   0   0      -6.887E+005     1.238E+006    -1.404E+000     1.712E+000     7.851E+002

 Truss Element
 Elem.  Yield      Axial          Total          Now_Plas.      Accum._Plastic Extension      Total       Hysteresi
 Tag    Code       Force          Extension      Extension      Positive       Negative       StrainEngy  StrainEng
 E25       1   -1.265E+003    -3.039E+001    -9.174E+000     5.807E+002    -5.899E+002    1.370E+006  1.593E+00

 Joint Element
 Elem.  Yield   Internal       Total          Now_Plas.      Accum._Plastic Rotation       Total       Hysteresis
 Tag    Code    Moment         Rotation       Rotation       Positive       Negative       StrainEngy  StrainEngy
 J2        0    1.020E+006     4.652E-003     3.428E-003     1.057E-002    -7.139E-003     2.200E+004  2.245E+004
 J3        0    6.930E+005     4.216E-003     3.441E-003     1.534E-002    -1.190E-002     3.297E+004  3.452E+004
 J10       0    1.020E+006     4.649E-003     3.425E-003     1.056E-002    -7.139E-003     2.200E+004  2.244E+004
 J11       0    6.925E+005     4.216E-003     3.441E-003     1.534E-002    -1.190E-002     3.297E+004  3.451E+004
```

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Contents of Output Files (5)

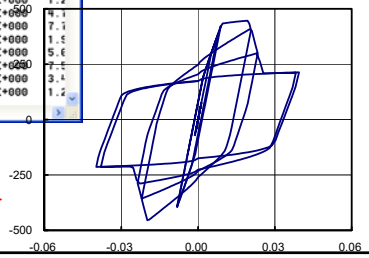
【.ElementRecord file】

ADST_1.ElemRecord - 記事本

檔案(F) 編輯(E) 格式(O) 檢視(V) 說明(H)

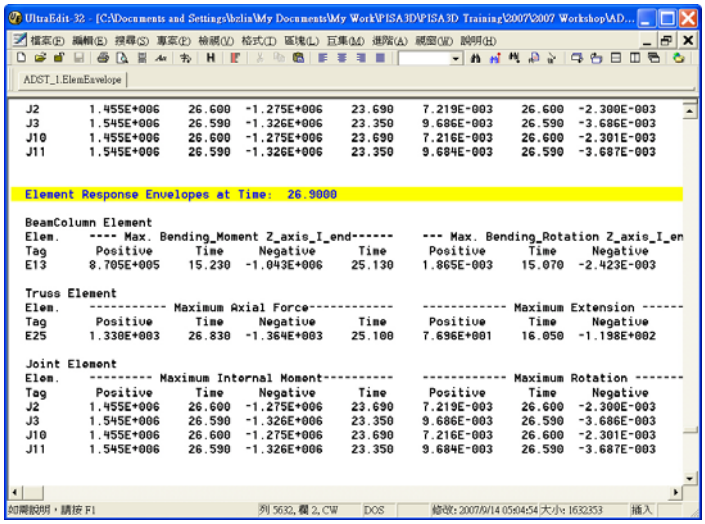
```
   29.400    0   0   0   0   0   0   0   0     1.340E+005   -3.997E+003   -1.650E+000    2.01
   29.500    0   0   0   0   0   0   0   0     1.027E+004    3.109E+005   -1.585E+000    1.93
   29.600    0   0   0   0   0   0   0   0    -1.679E+005    3.557E+005   -1.531E+000    1.86
   29.700    0   0   0   0   0   0   0   0    -3.892E+005    5.149E+005   -1.523E+000    1.85
   29.800    0   1   0   0   0   0   0   0    -5.202E+005    9.699E+005   -1.500E+000    1.82
   29.900    0   1   0   0   0   0   0   0    -6.352E+005    1.155E+006   -1.450E+000    1.76
   30.000    0   1   0   0   0   0   0   0    -6.887E+005    1.238E+006   -1.404E+000    1.71


 E25 : Truss Element
 Analysis   Yield    Axial          Total          Now_Plas.      Accum._Plastic Extension      T
 Time/Step  Code     Force          Extension      Extension      Positive       Negative       Str
    0.100      0    1.635E+000     2.742E-002     0.000E+000     0.000E+000     0.000E+000     2.2
    0.200      0    1.871E+001     3.137E-001     0.000E+000     0.000E+000     0.000E+000     2.9
    0.300      0    4.947E+001     8.296E-001     0.000E+000     0.000E+000     0.000E+000     2.6
    0.400      0    4.939E+001     8.282E-001     0.000E+000     0.000E+000     0.000E+000     2.6
    0.500      0    1.669E+001     2.800E-001     0.000E+000     0.000E+000     0.000E+000     2.3
    0.600      0   -1.223E+001    -2.051E-001     0.000E+000     0.000E+000     0.000E+000     1.2
    0.700      0   -2.386E+001    -4.001E-001     0.000E+000     0.000E+000     0.000E+000     1.1
    0.800      0   -3.044E+001    -5.104E-001     0.000E+000     0.000E+000     0.000E+000     7.7
    0.900      0   -4.874E+001    -8.175E-001     0.000E+000     0.000E+000     0.000E+000     1.9
    1.000      0   -8.219E+001    -1.378E+000     0.000E+000     0.000E+000     0.000E+000     5.6
    1.100      0   -9.489E+001    -1.591E+000     0.000E+000     0.000E+000     0.000E+000     7.5
    1.200      0   -6.375E+001    -1.069E+000     0.000E+000     0.000E+000     0.000E+000     3.4
    1.300      0   -3.808E+001    -6.385E-001     0.000E+000     0.000E+000     0.000E+000     1.2
```



Contents of Output Files (6)

【.ElemEnvelope file】



UltraEdit-32 - [C:\Documents and Settings\hchia\My Documents\My Work\PISA3D\PISA3D Training\2007\2007 Workshop\AD...

ADST_1.ElemEnvelope

```
 J2        1.455E+006    26.600  -1.275E+006    23.690    7.219E-003    26.600  -2.300E-003
 J3        1.545E+006    26.590  -1.326E+006    23.350    9.686E-003    26.590  -3.686E-003
 J10       1.455E+006    26.600  -1.275E+006    23.690    7.216E-003    26.600  -2.301E-003
 J11       1.545E+006    26.590  -1.326E+006    23.350    9.684E-003    26.590  -3.687E-003


 Element Response Envelopes at Time:  26.9000

 BeamColumn Element
 Elem.     ---- Max. Bending_Moment Z_axis_I_end------     --- Max. Bending_Rotation Z_axis_I_en
 Tag        Positive      Time     Negative      Time      Positive      Time     Negative
 E13       8.705E+005    15.230  -1.043E+006    25.130    1.865E-003    15.070  -2.423E-003

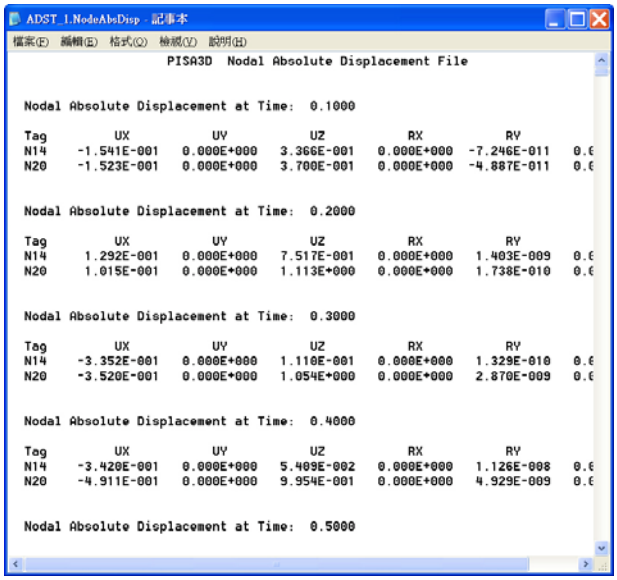
 Truss Element
 Elem.     ---------- Maximum Axial Force------------     ------------ Maximum Extension ------
 Tag        Positive      Time     Negative      Time      Positive      Time     Negative
 E25       1.338E+003    26.830  -1.364E+003    25.100    7.696E+001    16.050  -1.198E+002

 Joint Element
 Elem.     --------- Maximum Internal Moment----------     ------------ Maximum Rotation -------
 Tag        Positive      Time     Negative      Time      Positive      Time     Negative
 J2        1.455E+006    26.600  -1.275E+006    23.690    7.219E-003    26.600  -2.300E-003
 J3        1.545E+006    26.590  -1.326E+006    23.350    9.686E-003    26.590  -3.686E-003
 J10       1.455E+006    26.600  -1.275E+006    23.690    7.216E-003    26.600  -2.301E-003
 J11       1.545E+006    26.590  -1.326E+006    23.350    9.684E-003    26.590  -3.687E-003
```

如需說明，請按 F1　列 5632, 欄 2, CW　DOS　修改: 2007/9/14 05:04:54 大小: 1632353　插入

Contents of Output Files (7)

【.NodeAbsDisp file】



ADST_1.NodeAbsDisp - 記事本

檔案(F) 編輯(E) 格式(O) 檢視(V) 說明(H)

```
                PISA3D  Nodal Absolute Displacement File


 Nodal Absolute Displacement at Time:  0.1000

 Tag         UX          UY          UZ          RX          RY
 N14    -1.541E-001   0.000E+000   3.366E-001   0.000E+000  -7.246E-011   0.0
 N20    -1.523E-001   0.000E+000   3.700E-001   0.000E+000  -4.887E-011   0.0


 Nodal Absolute Displacement at Time:  0.2000

 Tag         UX          UY          UZ          RX          RY
 N14     1.292E-001   0.000E+000   7.517E-001   0.000E+000   1.403E-009   0.0
 N20     1.015E-001   0.000E+000   1.113E+000   0.000E+000   1.738E-010   0.0


 Nodal Absolute Displacement at Time:  0.3000

 Tag         UX          UY          UZ          RX          RY
 N14    -3.352E-001   0.000E+000   1.110E-001   0.000E+000   1.329E-010   0.0
 N20    -3.520E-001   0.000E+000   1.054E+000   0.000E+000   2.870E-009   0.0


 Nodal Absolute Displacement at Time:  0.4000

 Tag         UX          UY          UZ          RX          RY
 N14    -3.420E-001   0.000E+000   5.409E-002   0.000E+000   1.126E-008   0.0
 N20    -4.911E-001   0.000E+000   9.954E-001   0.000E+000   4.929E-009   0.0


 Nodal Absolute Displacement at Time:  0.5000
```

Contents of Output Files (8)

【.NodeDisRecord file】

ADST_1.NodeDisRecord - 記事本

檔案(F) 編輯(E) 格式(O) 檢視(V) 說明(H)

```
N14     29.300    4.516E+000    0.000E+000    7.664E+000    0.000E+000    3.342E
N14     29.400   -8.328E+000    0.000E+000    6.349E-001    0.000E+000    4.035E
N14     29.500   -1.046E+001    0.000E+000   -1.219E+001    0.000E+000    1.187E
N14     29.600   -2.046E+001    0.000E+000   -6.958E+000    0.000E+000    1.035E
N14     29.700   -3.679E+001    0.000E+000   -2.019E+000    0.000E+000    1.018E
N14     29.800   -4.727E+001    0.000E+000   -1.801E+001    0.000E+000    1.608E
N14     29.900   -5.880E+001    0.000E+000   -4.425E+001    0.000E+000    1.915E
N14     30.000   -6.079E+001    0.000E+000   -6.183E+001    0.000E+000    1.870E

 Tag   Time/Step       UX            UY            UZ            RX            RY
N20        0.100   -1.523E-001    0.000E+000    3.700E-001    0.000E+000   -4.887E
N20        0.200    1.015E-001    0.000E+000    1.113E+000    0.000E+000    1.738E
N20        0.300   -3.520E-001    0.000E+000    1.054E+000    0.000E+000    2.870E
N20        0.400   -4.911E-001    0.000E+000    9.954E-001    0.000E+000    4.929E
N20        0.500   -5.780E-001    0.000E+000    6.630E-001    0.000E+000    2.330E
N20        0.600   -3.723E-001    0.000E+000   -4.512E-002    0.000E+000    7.420E
N20        0.700   -6.367E-001    0.000E+000   -7.598E-001    0.000E+000    1.398E
N20        0.800   -6.620E-001    0.000E+000   -1.328E+000    0.000E+000    1.871E
N20        0.900   -6.991E-001    0.000E+000   -2.141E+000    0.000E+000    1.988E
N20        1.000   -4.888E-001    0.000E+000   -2.618E+000    0.000E+000    1.697E
N20        1.100   -4.576E-001    0.000E+000   -2.295E+000    0.000E+000    1.184E
N20        1.200   -1.127E+000    0.000E+000   -2.432E+000    0.000E+000    6.295E
N20        1.300   -1.600E+000    0.000E+000   -1.797E+000    0.000E+000    2.544E
N20        1.400   -9.430E-001    0.000E+000   -5.538E-001    0.000E+000    4.732E
N20        1.500    1.768E-001    0.000E+000    7.490E-001    0.000E+000    1.428E
N20        1.600    1.434E+000    0.000E+000    1.723E+000    0.000E+000    2.371E
N20        1.700    3.030E+000    0.000E+000    2.770E+000    0.000E+000    2.071E
N20        1.800    4.242E+000    0.000E+000    3.183E+000    0.000E+000   -5.679E
N20        1.900    4.440E+000    0.000E+000    2.419E+000    0.000E+000   -5.750E
N20        2.000    3.836E+000    0.000E+000    7.770E-001    0.000E+000   -1.196E
N20        2.100    3.302E+000    0.000E+000   -4.415E-001    0.000E+000   -1.639E
N20        2.200    3.361E+000    0.000E+000   -1.155E+000    0.000E+000   -1.676E
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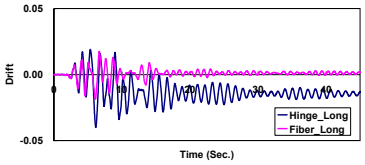


Contents of Output Files (9)

【.NodeEnvelope file】

ADST_1.NodeEnvelope - 記事本

檔案(F) 編輯(E) 格式(O) 檢視(V) 說明(H)

```
Time:  22.6000

Node  ------------ UX Displacement ------------    ------------ UY Displacement ----
Tag     Positive       Time      Negative      Time      Positive       Time      Negative
N14   1.716E+002    22.400   -3.758E+002    19.600    0.000E+000      0.000    0.000E+000
N20   3.682E+002    22.550   -8.097E+002    19.540    0.000E+000      0.000    0.000E+000

Node  ------------ UX Velocity ----------------    ------------ UY Velocity --------
Tag     Positive       Time      Negative      Time      Positive       Time      Negative
N14   3.958E+002    22.170   -3.888E+002    16.930    0.000E+000      0.000    0.000E+000
N20   6.123E+002    22.180   -6.751E+002    18.830    0.000E+000      0.000    0.000E+000

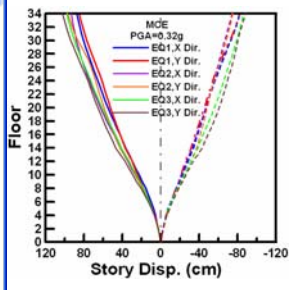
Node  ------------ UX Acceleratoin ------------    ------------ UY Acceleratoin ----
Tag     Positive       Time      Negative      Time      Positive       Time      Negative
N14   3.122E+003    16.440   -3.222E+003    18.380    0.000E+000      0.000    0.000E+000
N20   2.831E+003    15.960   -3.046E+003    22.440    0.000E+000      0.000    0.000E+000


Time:  22.7000

Node  ------------ UX Displacement ------------    ------------ UY Displacement ----
Tag     Positive       Time      Negative      Time      Positive       Time      Negative
N14   1.716E+002    22.400   -3.758E+002    19.600    0.000E+000      0.000    0.000E+000
N20   3.682E+002    22.550   -8.097E+002    19.540    0.000E+000      0.000    0.000E+000

Node  ------------ UX Velocity ----------------    ------------ UY Velocity --------
Tag     Positive       Time      Negative      Time      Positive       Time      Negative
N14   3.958E+002    22.170   -3.888E+002    16.930    0.000E+000      0.000    0.000E+000
N20   6.123E+002    22.180   -6.751E+002    18.830    0.000E+000      0.000    0.000E+000

Node  ------------ UX Acceleratoin ------------    ------------ UY Acceleratoin ----
```



Contents of Output Files (10)

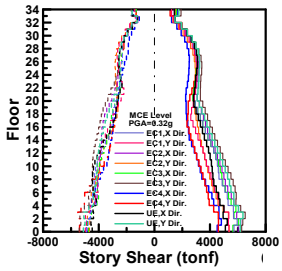
【.SectionX/Y/Z file】

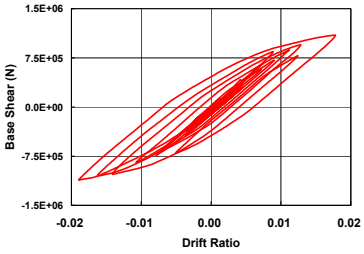
FIBERCONTEST4_SectionX - 記事本

檔案(F) 編輯(E) 格式(O) 檢視(V) 說明(H)

PISA3D X-Direction Group Force File

Time/Step	Group-1F	Group-2F	Group-3F	Group-4F
0	1.017E+001	5.821E-001	7.214E-002	1.445E-002
0.010	2.484E+000	-4.306E-001	7.083E-002	-2.573E-003
0.020	1.704E+002	-3.125E+001	2.319E+000	-4.843E-001
0.030	3.737E+002	-4.611E+001	-2.400E+000	1.491E-001
0.040	3.383E+000	7.925E+001	-2.375E+001	3.105E+000
0.050	-1.039E+003	2.594E+002	-3.674E+001	3.028E+000
0.060	-2.306E+003	4.143E+002	3.061E+000	-6.668E+000
0.070	-3.005E+003	1.867E+002	1.187E+002	-2.396E+001
0.080	-2.649E+003	-4.443E+002	2.689E+002	-3.146E+001
0.090	-1.304E+003	-1.299E+003	3.523E+002	-3.368E+000
0.100	6.849E+002	-2.072E+003	2.579E+002	7.620E+001
0.110	3.173E+003	-2.506E+003	-7.506E+001	1.957E+002
0.120	6.107E+003	-2.412E+003	-6.316E+002	3.117E+002
0.130	9.090E+003	-1.616E+003	-1.323E+003	3.580E+002
0.140	1.144E+004	-8.582E+000	-1.990E+003	2.598E+002
0.150	1.252E+004	2.343E+003	-2.414E+003	-4.443E+001
0.160	1.228E+004	5.103E+003	-2.357E+003	-5.775E+002
0.170	1.131E+004	7.735E+003	-1.634E+003	-1.296E+003
0.180	1.052E+004	9.733E+003	-2.054E+002	-2.074E+003
0.190	1.038E+004	1.086E+004	1.781E+003	-2.711E+003
0.200	1.069E+004	1.125E+004	4.015E+003	-2.970E+003
0.210	1.091E+004	1.121E+004	6.134E+003	-2.642E+003
0.220	1.089E+004	1.098E+004	7.844E+003	-1.610E+003
0.230	1.087E+004	1.067E+004	8.991E+003	1.217E+002
0.240	1.108E+004	1.035E+004	9.568E+003	2.416E+003
0.250	1.152E+004	1.009E+004	9.696E+003	5.032E+003
0.260	1.222E+004	9.910E+003	9.585E+003	7.663E+003
0.270	1.327E+004	9.819E+003	9.470E+003	9.997E+003
0.280	1.429E+004	9.929E+003	9.538E+003	1.177E+004





NARLabs 國家實驗研究院

感謝聆聽　敬請指教

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