MIDAS Gen

V.741 Enhancements

❑ Analysis & Design Part

- Concrete / Steel pushover analysis & safety verification as per Eurocode 8-3: 2004
- Masonry pushover analysis & global assessment as per OPCM3431
- Lateral-Torsional Buckling Analysis
- Improvement on Italian UNI code concrete material DB
- and much more…

❑ Pre/Post-processing part

- Addition of Linear Constraints function
- Automatically finding the major axis for response spectrum analysis
- Improvement on importing dxf file
- Addition of CEB-FIP 78 model code
- Web-based online manual including context-sensitive help
- and much more…

MIDAS Gen Integrated Design System for Building and General Structures

❑ Analysis & Design Part

1. Pushover analysis improvement
2. Important notice to existing users regarding pushover analysis
3. Concrete/Steel pushover analysis & safety verification as per Eurocode 8-3:2004
4. Masonry pushover analysis & global assessment as per OPCM3431
5. Concrete design as per Eurocode 2:2004
6. Steel design as per Eurocode 3:2005
7. Improvement on Italian UNI code concrete material DB
8. Lateral-Torsional Buckling Analysis
9. Limit Strength for Tension only/Compression only Truss
10. Nonlinear Point Springs
11. Tens./Comp.-only, Hook & Gap elements in Material nonlinear analysis
12. Concrete design as per ACI318-05
13. Doubly reinforced beam design

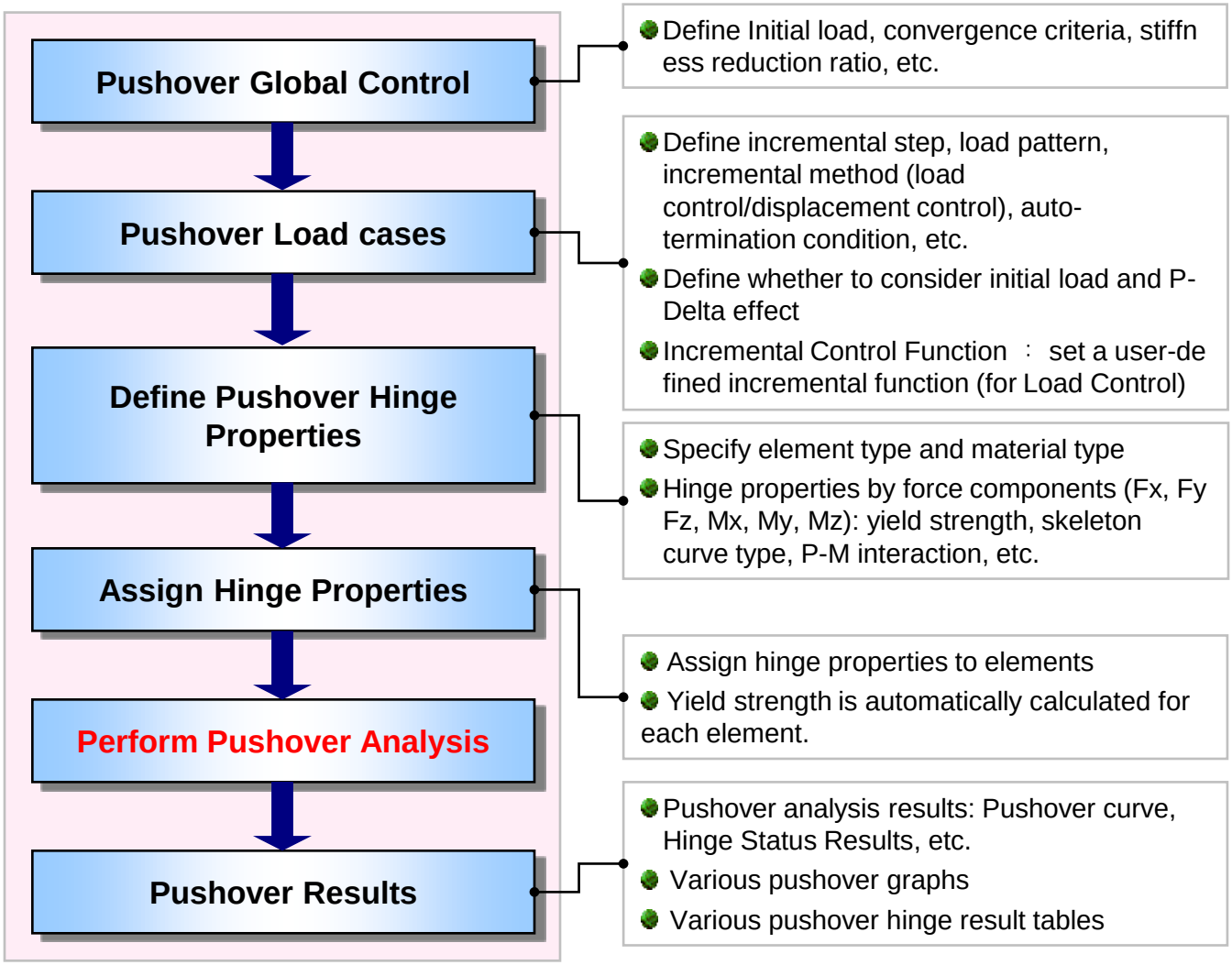
1. Pushover analysis improvement

Analysis & Design

(1) Pushover Analysis Procedure

Upgrade Contents

• Pushover analysis is fully revised and updated from pre-/post-processing to solver.



1. Pushover analysis improvement

Analysis & Design

(2) Enhanced Usability

■ Pushover Global Control: defined in a single dialog

- Initial load
- Default value of stiffness reduction ratio (bi-linear/tri-linear hinge curve)
- Nonlinear Analysis Option (Maximum Iteration, Convergence Criteria)
- Scale Factor for Ultimate Rotation and Secondary Seismic Elements as per Eurocode 8-3

■ Pushover Hinge Properties

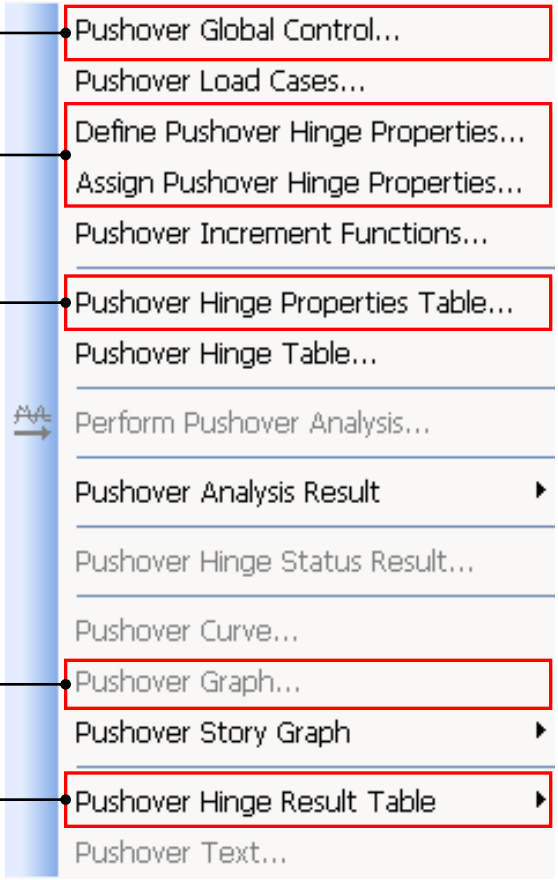
- User-oriented interface
- Define hinge properties by elements (six components can be defined in a single dialog.)
- Hinge properties about y-axis and z-axis are separately defined.
- Show yield strength in real value as well as the ratio of the yield surface.
- Assign hinge properties by Drag & Drop
- Check hinge properties using Pushover Hinge Properties table

■ Pushover graph

- Force-Deformation graph, displacement graph by steps, etc.

■ Pushover Hinge result table

- Hinge status, Plastic deformation, etc.



1. Pushover analysis improvement

Analysis & Design

(3) Improved analysis process for Nonlinear Element and Hinge Properties

■ Nonlinear Element

- **Moment-Rotation (M-θ) type hinge** can be used in Load control pushover analysis**.**
- **Out-of-plane nonlinearity** for wall elements of the plate type is reflected.
- Distributed hinge is added. (**Moment-curvature relation**) : Plasticity of the entire element considered. Enter integration points (1~20) (* Only plasticity at both ends was considered for the present Multi-linear type element)
- Defining hinge properties for nonlinear **general link** completely revised.
- Moment-Rotation (M-θ) type hinge and Moment-Curvature (M-ϕ) type hinge can be used in combination.

■ Pushover Hinge Properties

- **PMM TYPE** (Change in axial forces considered)
  - -RC Tri-linear: Crack surface (1st yield surface) can be defined.
  - -Steel Tri-linear: 1st and 2nd yield surfaces can be separately defined.
  - -Maximum yield moment about ± My, ± Mz can be individually defined.
- Skeleton curve considering slip is newly added for **truss element and general link**.
- The user can directly define the initial stiffness of nonlinear hinges.
- The user can directly define yield deformations.

1. Pushover analysis improvement

Analysis & Design

(4) Improved Analysis Control & Speed

■ Simple Analysis Control

- Improvement on load control method: 100% of applied load is accurately reflected in analysis.
- Addition of Load Incremental Method

  - Auto-stepping control: The first step is loaded up to 90% of the elastic limit of the structure. Further steps are automatically divided into the ratio of $\{(n+1)-i\}/\sum_{i=1}^{n-1} i$

  - Equal step (1/nstep): Equally divided steps.

  - User defined Increment-control function

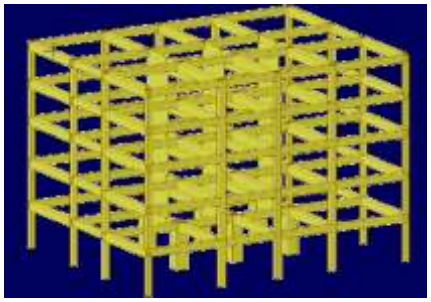
- Auto-terminating condition is added.

  - Current Stiffness Ratio: If the analysis results do not converge, analysis will be terminated.

  - Auto-terminating condition by story drift ratio is added (Displacement Control).

■ Analysis Speed

- Analysis speed is improved by adopting INCORE Solver. Analysis time is reduced to **40－50%** compared to the old version.



[Comparing analysis time]

	old version	Ver.7.4.1	Ver.7.4.1 / old version
Skyline Solver	47.570 [sec]	20.790 [sec]	43.70 [%]
Mult-Frontal Solver	46.780 [sec]	20.490 [sec]	43.80 [%]

- Number of Nodes： 135
- Number of elements：beam （234）, wall （12）
- Nonlinear hinges are assigned to all the elements.
- Incremental method: Displacement Control (50 steps)

1. Pushover analysis improvement

Analysis & Design

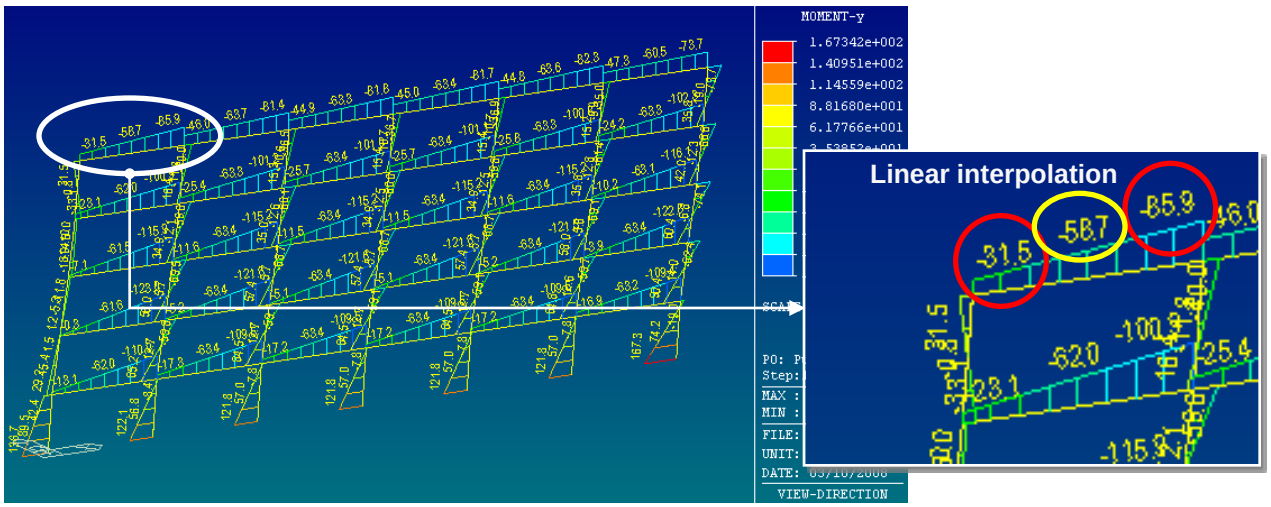
(5) Improvement on displaying member forces due to pushover analysis

Design > *Pushover Analysis* > *Perform Pushover Analysis*
Results > *Forces* > *Beam Diagrams*

■Old Version

Linear Interpolation of the member forces at each end was used for forces at intermediate points.

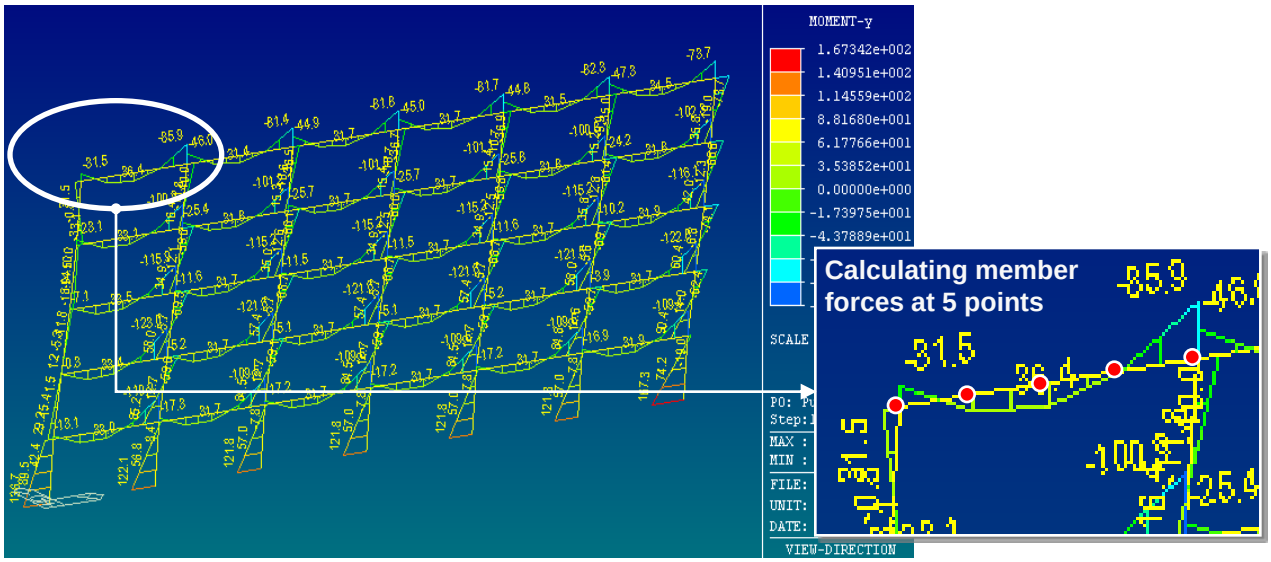
→ Inaccurate member forces at intermediate points if distributed loads were present unless separate calculations were made.



■ New Version (Ver.7.4.1)

Display member forces at every quarter point (i, 1/4, 2/4, 3/4, j)

→ True member forces are displayed reflecting distributed loads.

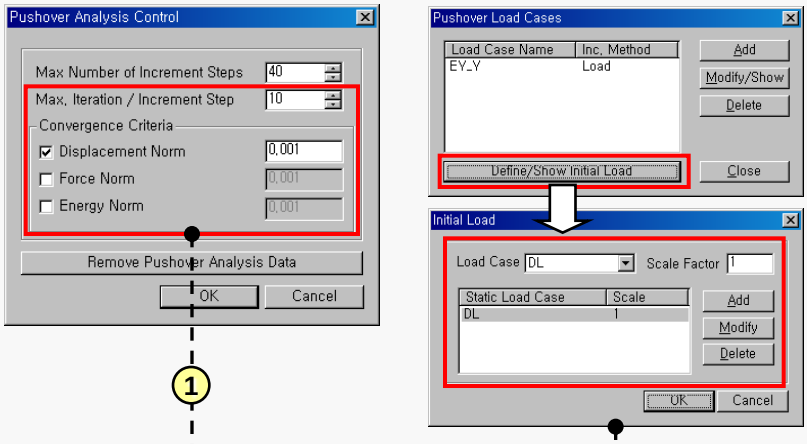


* For detailed information, refer to **Pushover user's guide** at http://eng.midasuser.com.

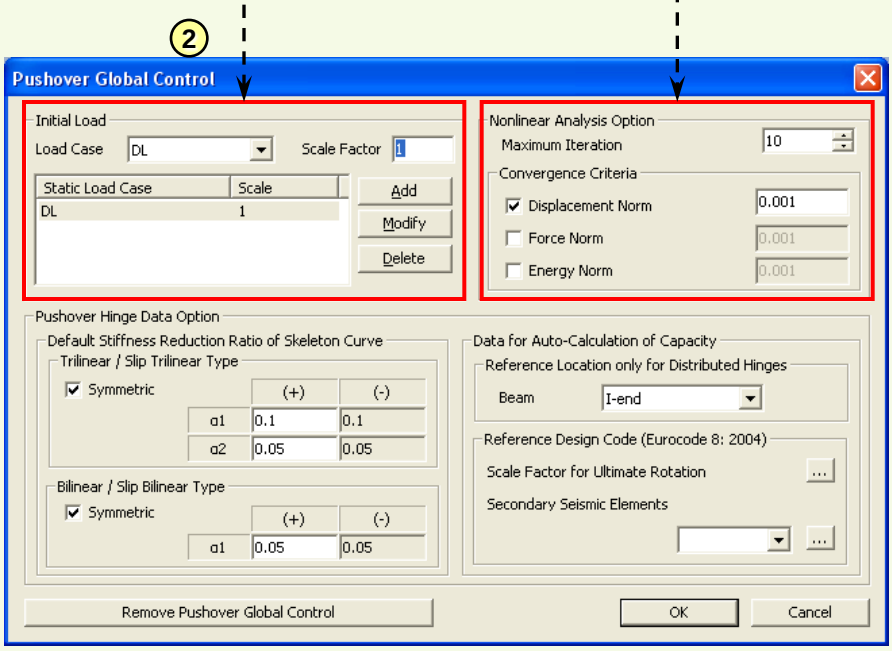
2. Important Notice to Existing Users

(1) Data conversion – Analysis control data

■ Old Version

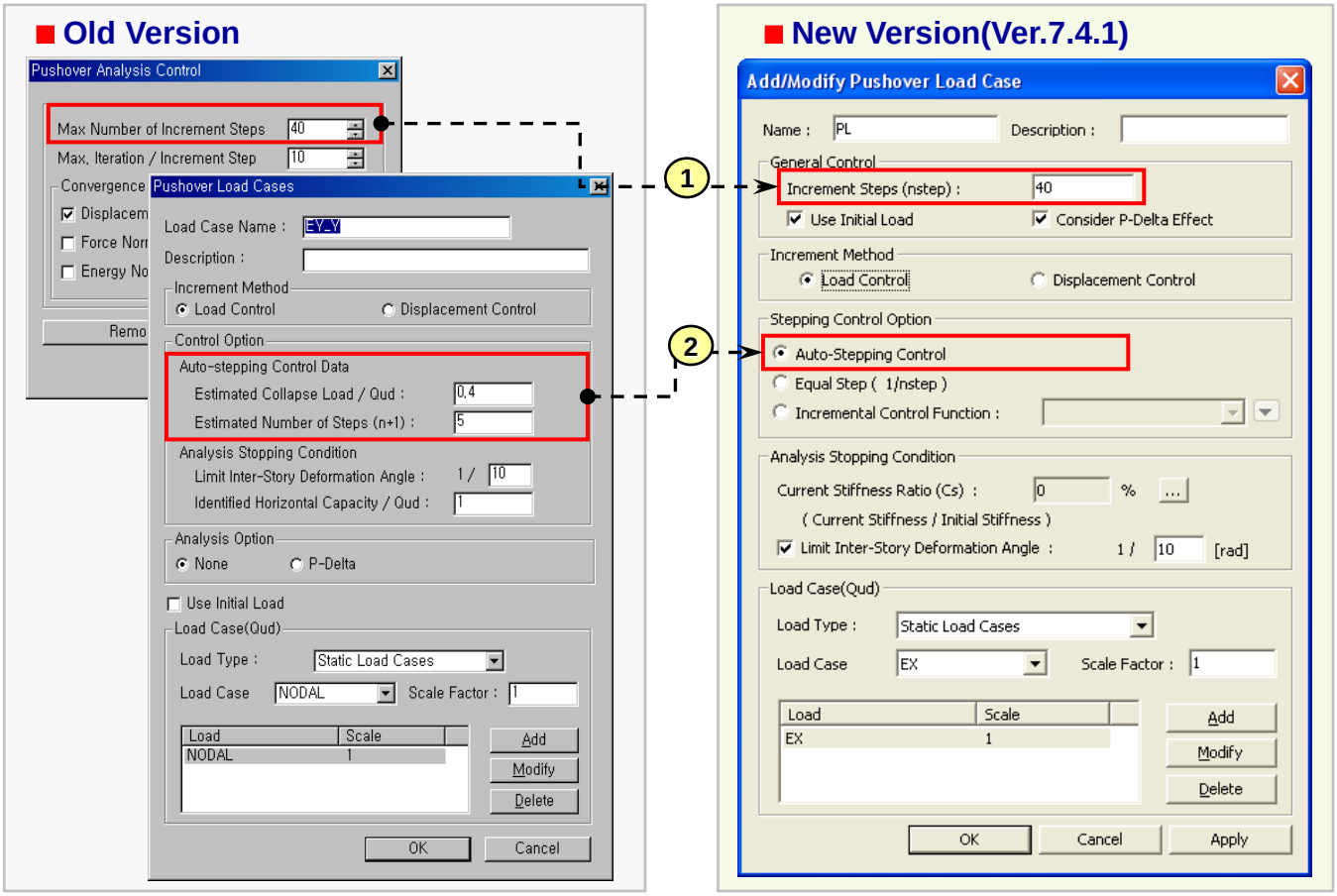


■ New Version(Ver.7.4.1)



- **Convergence Criteria → Moved to the *Pushover Global Control* dialog.** (1)
- **Initial Load → Moved to the *Pushover Global Control* dialog.** (2)

(2) Data conversion – Pushover Load Case

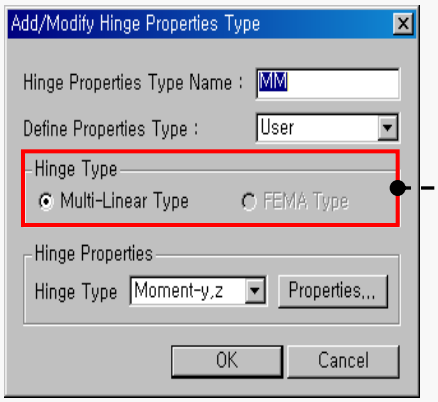


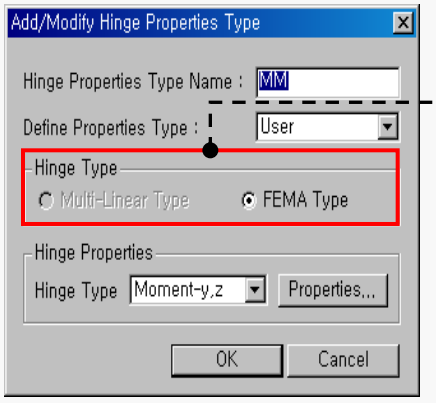
- **Number of Incremental Steps** → Moved to the *Pushover Load Case* dialog. (1)
  (Number of Increment Steps can be set by load cases separately.)
- **Auto-stepping Control** → Control method is totally revised. (2)

(3) Data conversion – Hinge properties type

■ Old Version

– Define hinge properties by components

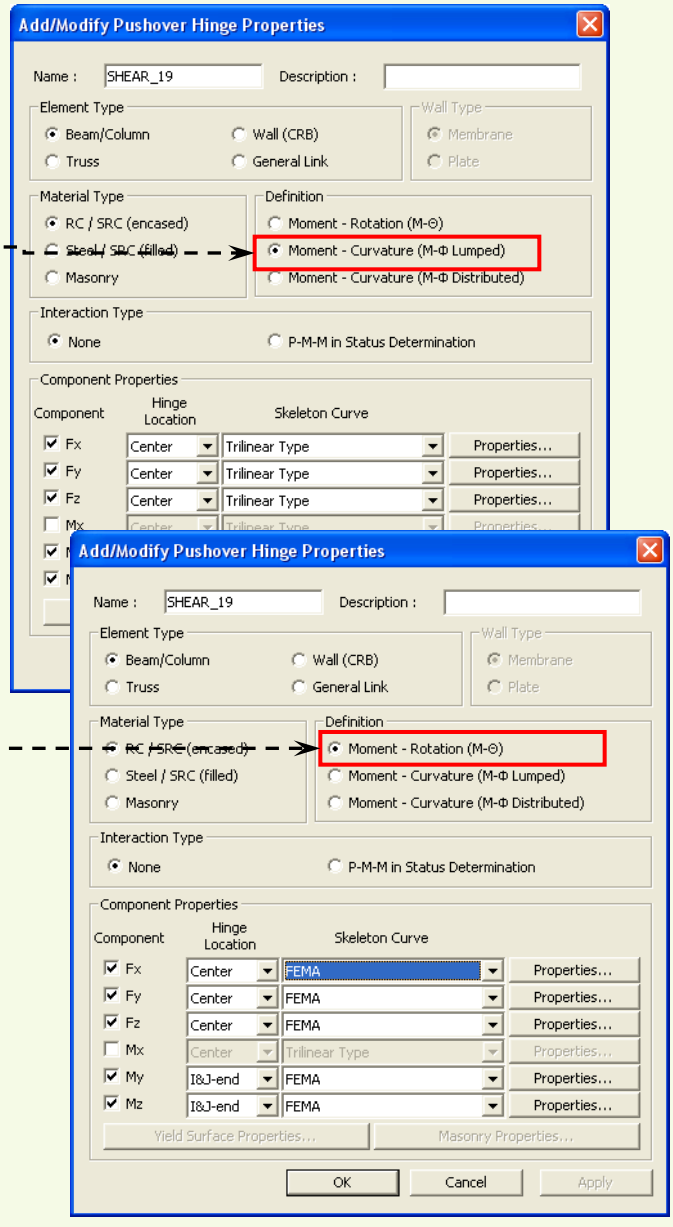




- Old Version Multi-linear → New Version Moment-Curvature (Lumped) (1)
- Old Version FEMA → New Version Moment-Rotation (2)

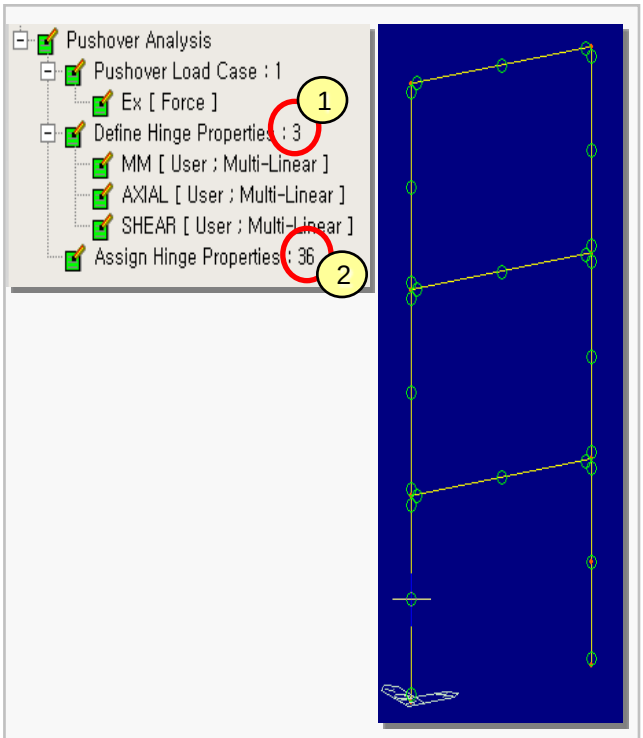
■ New Version (Ver.7.4.1)

– Define hinge properties by elements



(4) Data conversion – Hinge properties assignment

■ Old Version



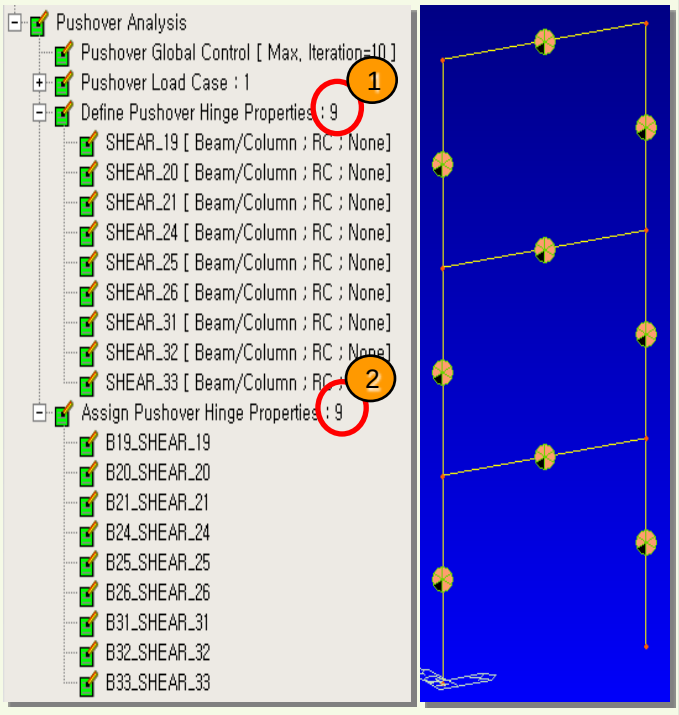
● Hinge properties defined by components (1)

* 3 components of hinge properties have been defined.

Hinge properties by component are assigned to the elements. (2)

* 36 component hinge properties have been assigned to the elements.

■ New Version(Ver.7.4.1)



● Hinge properties defined by elements 1 (1)

* 9 hinge properties by elements have been defined.

Hinge properties by elements are assigned to the elements. (2)

* Hinge properties have been assigned to 9 elements.

- Nonlinear hinge properties were defined by force components in the old version, however in the new version, they are defined by elements. For example, in order to assign axial and flexural hinge properties to one element in the old version, the user defined two different hinge properties. However, in the new version, only one hinge property defining the axial and flexural properties is needed.
- In the new version, when the user opens a model file created in the old version, the component hinge properties will be individually assigned to the corresponding elements (one component hinge property per element). So, the converted file size of the model may become larger than that of the old version. This is not the general way to define hinge properties in the new version, but it is intended to avoid errors in converting files. Refer to Assign Hinge Properties to learn how to assign hinge properties in the new version.

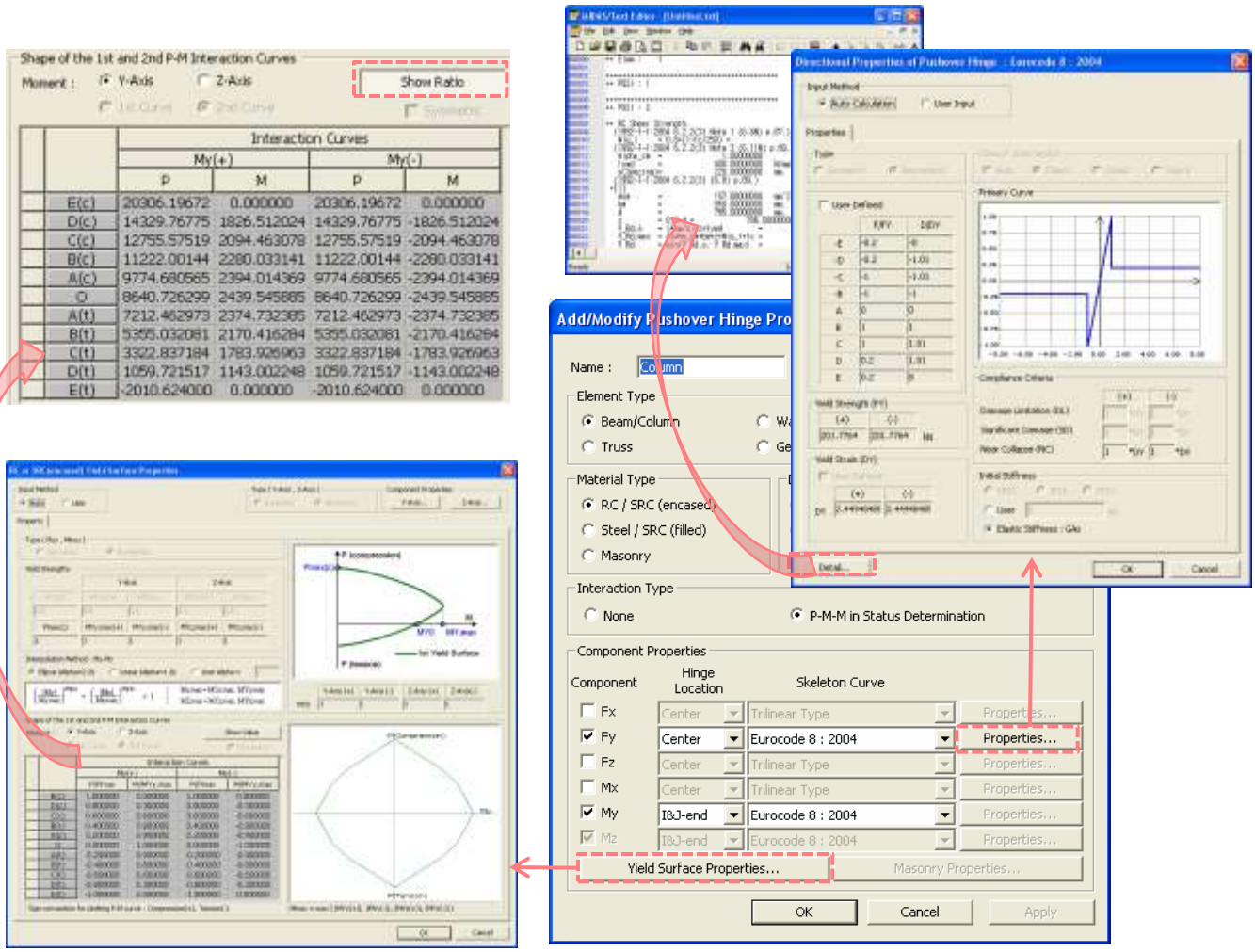
3. Concrete/Steel Pushover analysis as per Eurocode8:2004 — Analysis & Design

(1) Pushover Hinge Properties

Design > ***Pushover Analysis*** > ***Pushover Global Control***
Design > ***Pushover Analysis*** > ***Pushover Load Cases***
Design > ***Pushover Analysis*** > ***Define Pushover Hinge Properties***
Design > ***Pushover Analysis*** > ***Assign Pushover Hinge Properties***

Upgrade Contents

a. Pushover hinge type as per Eurocode 8:2004 is newly added.
b. 6 components (Fx, Fy, Fz, Mx, My & Mz) can be defined in Pushover Hinge Properties dialog box.
c. When PMM hinge is defined, yield moments considering P-M interaction can be checked by clicking on [Show Ratio] button.
d. Deformation capacity is calculated based on Eurocode 8-3:2004, and the user can check the calculated values in a detailed report.



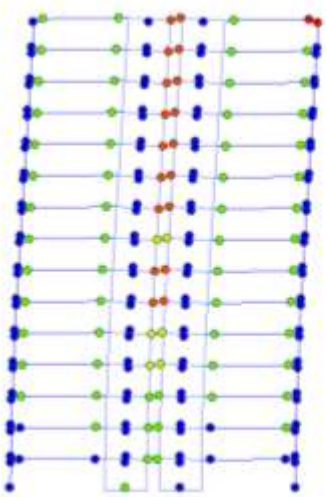
3. Concrete/Steel Pushover analysis as per Eurocode 8:2004 Analysis & Design

(2) Pushover analysis results & Target displacement

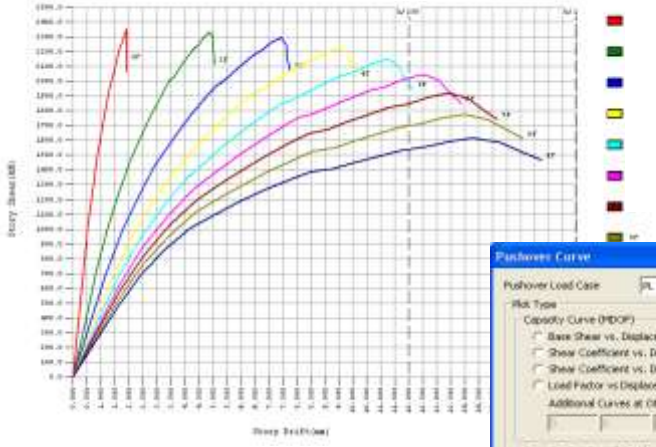
Design > ***Pushover Analysis*** > ***Pushover Hinge Status Results***
Design > ***Pushover Analysis*** > ***Pushover Curve***
Design > ***Pushover Analysis*** > ***Pushover Story Graph > Story Shear Graph***

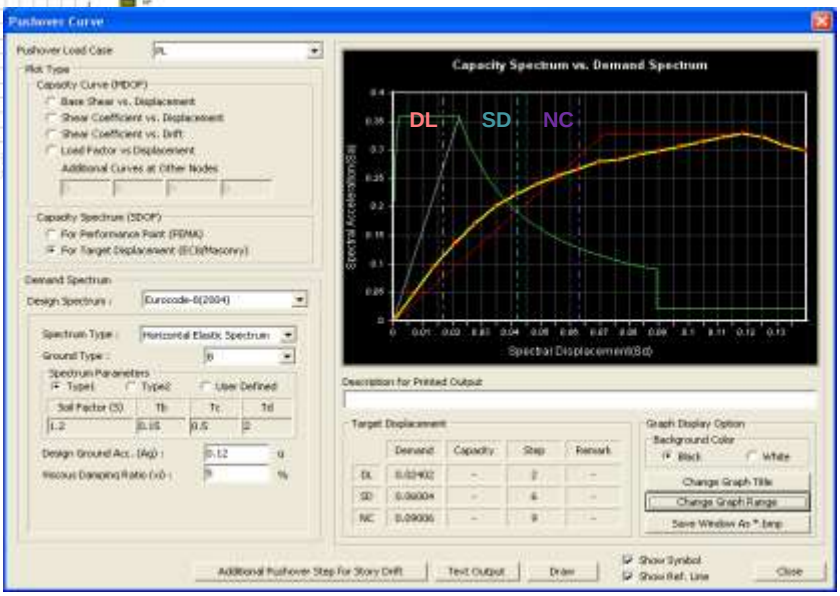
Upgrade Contents

a. Target displacements (demands & steps corresponding to the limit states of DL, SD & NC) for the design spectrum are displayed in the Pushover Curve dialog box.
b. Hinge status (Ductility, Deformation, Force, Status of yielding) for each pushover step resulting from the Pushover analysis is displayed in Contours.



Story Shear vs Story Drift

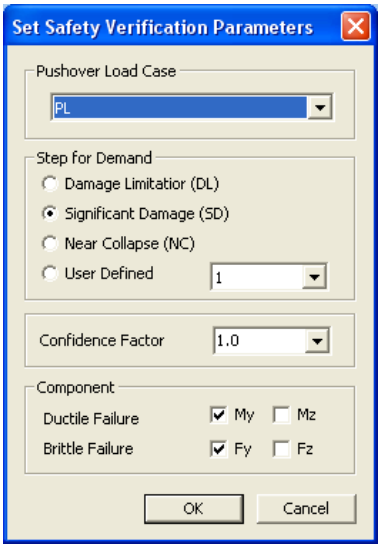




3. Concrete/Steel Pushover analysis as per Eurocode 8:2004 Analysis & Design

(3) Safety Verification

Design > ***Pushover Analysis*** > ***Safety Verification Table***



Upgrade Contents

- In the safety verification table, the capacity of both ductile and brittle components are compared to the demand.

	Elem	Location	Seismic Element	Load	Verify Ductile Mechanism My			Verify Brittle Mechanism Fz		
					Demand	Capacity	Remark	Demand	Capacity	Remark
	Step for Demand = NC (Step 6), Confidence factor = 1.00									
	Press right mouse button and click 'Set Safety Parameters' menu to change step or loadcase									
▶	1	Center	Primary	PL	-	-	-	22.3282	588.9450	OK
	1	I-end	Primary	PL	0.0026	0.0248	OK	-	-	-
	1	J-end	Primary	PL	0.0021	0.0249	OK	-	-	-
	2	Center	Primary	PL	-	-	-	115.0150	645.6150	OK
	2	I-end	Primary	PL	0.0033	0.0242	OK	-	-	-
	2	J-end	Primary	PL	0.0006	0.0243	OK	-	-	-
	3	I-end	Primary	PL	0.0026	0.0600	OK	-	-	-
	3	J-end	Primary	PL	0.0080	0.0600	OK	-	-	-
	4	I-end	Primary	PL	0.0027	0.0600	OK	-	-	-
	4	J-end	Primary	PL	0.0079	0.0600	OK	-	-	-
	7	I-end	Primary	PL	0.0075	0.0250	OK	-	-	-
	7	J-end	Primary	PL	0.0076	0.0250	OK	-	-	-
	12	Center	Primary	PL	-	-	-	21.9998	563.6480	OK
	12	I-end	Primary	PL	0.0012	0.0251	OK	-	-	-
	12	J-end	Primary	PL	0.0018	0.0251	OK	-	-	-
	13	Center	Primary	PL	-	-	-	139.7730	619.1270	OK
	13	I-end	Primary	PL	0.0032	0.0245	OK	-	-	-
	13	J-end	Primary	PL	0.0000	0.0246	OK	-	-	-
	14	I-end	Primary	PL	0.0006	0.0600	OK	-	-	-
	14	J-end	Primary	PL	0.0100	0.0600	OK	-	-	-

* For detailed information, refer to '**Pushover Analysis as per Eurocode8:2004'** tutorial at http://eng.midasuser.com.

4. Masonry Pushover analysis as per OPCM3431

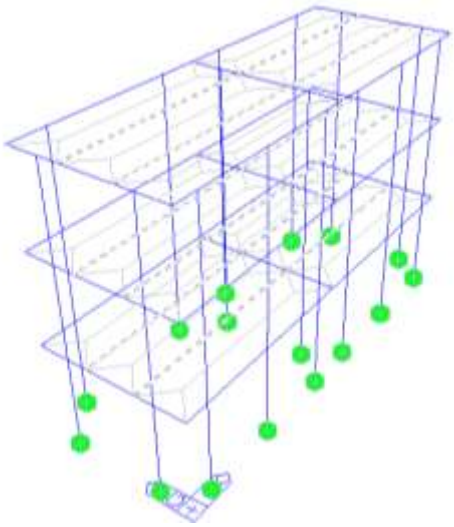
Analysis & Design

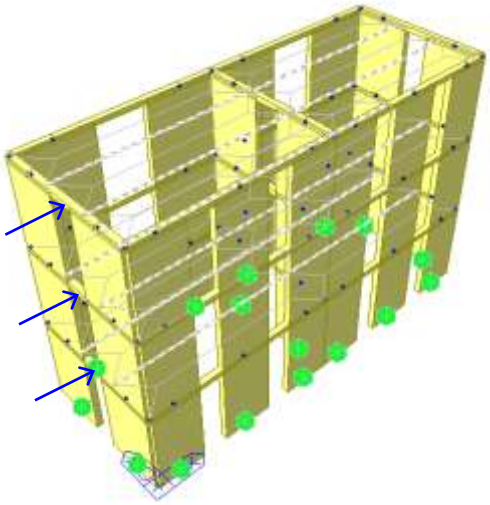
(1)Pushover hinge properties of a masonry structure

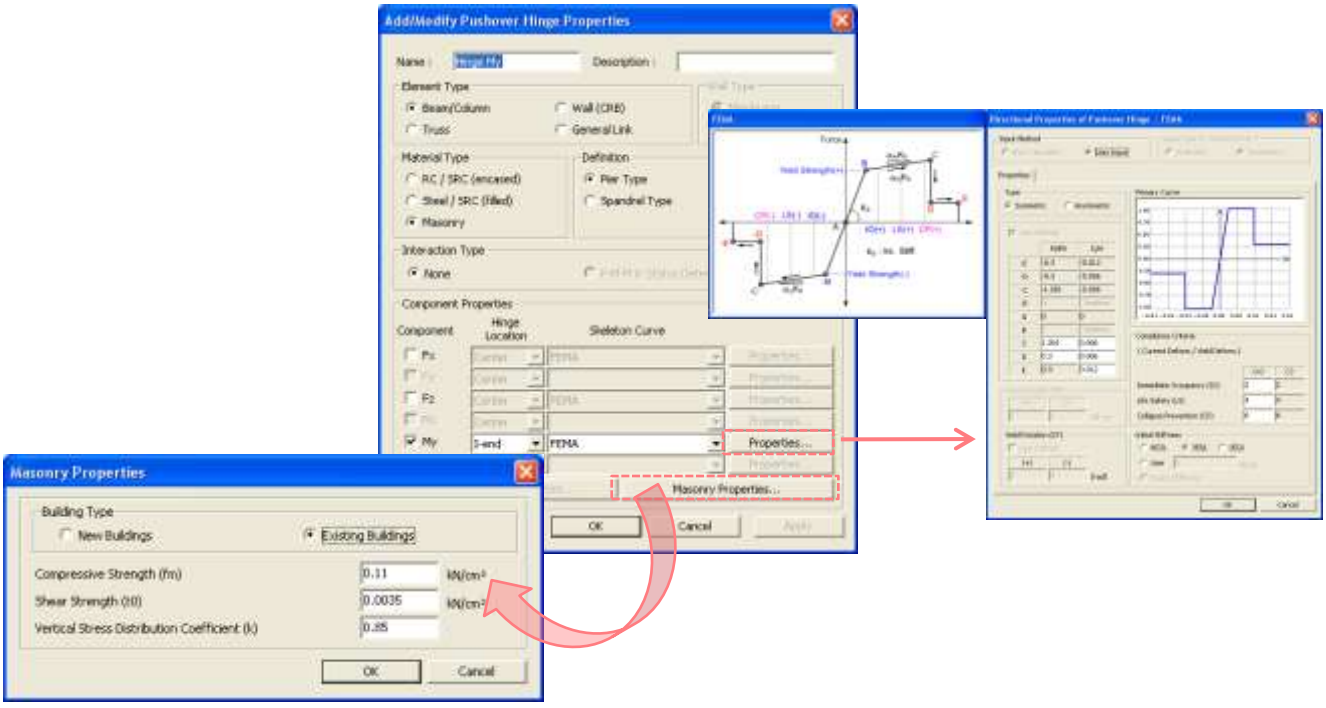
Design > ***Pushover Analysis*** > ***Define Pushover Hinge Properties***

Upgrade Contents

- Pushover analysis for **masonry structures** is newly implemented.
- Different hinge properties for **new buildings** and **existing buildings** are provided.
- Different hinge properties for **masonry piers** and **masonry spandrels** are provided.







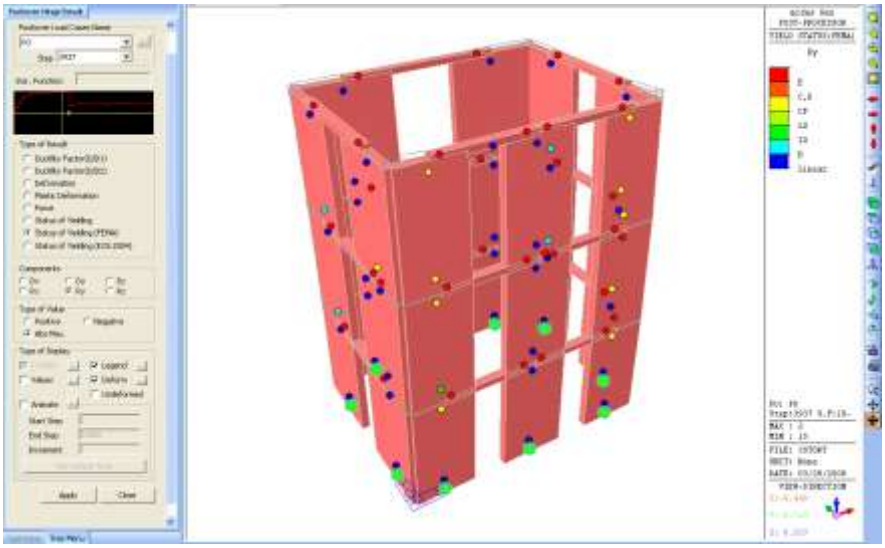
4. Masonry Pushover analysis as per OPCM3431

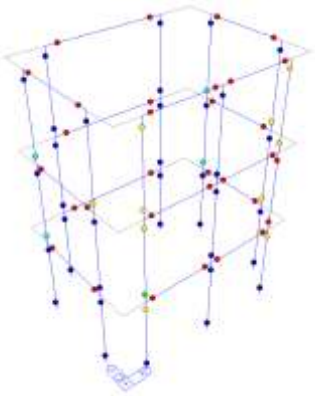
(2) Pushover analysis results & Global assessment

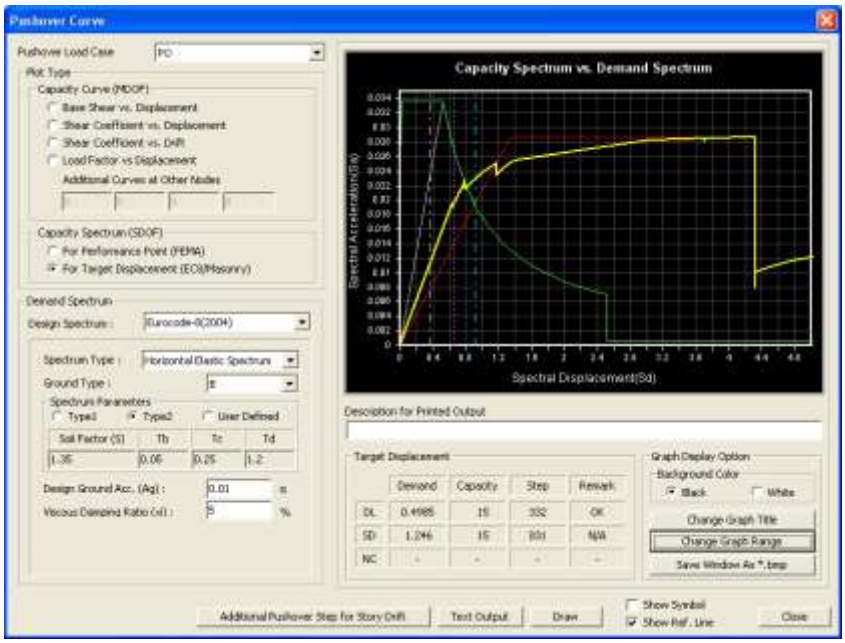
Design > ***Pushover Analysis*** > ***Pushover Hinge Status Results***
Design > ***Pushover Analysis*** > ***Pushover Curve***

Upgrade Contents

- Assessment results for limit states of DL & SD between the capacity and the demand are displayed in terms of global response in Pushover Curve.
- Hinge status (Ductility, Deformation, Force, Status of yielding) for each pushover step resulting from the Pushover analysis is displayed in Contours.







4. Masonry Pushover analysis as per OPCM3431

(3) Resistance of masonry pier & spandrel

		Pier type	Spandrel type
Axial resistance	Member in compression	$fx = f_m \cdot (L \cdot T) = f_m \cdot A_{pier}$	$fx = f_{hd} \cdot (h \cdot t) = f_{hd} \cdot A_{sbeam}$
	Member in tension	$fx = 0$	$fx = 0$
Shear resistance	Existing building	$V_t = L \cdot T \cdot \frac{1.5 \cdot \tau_0}{\beta} \sqrt{1 + \frac{p}{1.5\tau_0}}$	$V_t = h \cdot t \cdot f_{vk0}$
	New building	$V_t = L' \cdot T \cdot \tau_0$	
Flexural resistance	Member in compression	$M_u = \frac{L^2 \cdot T \cdot p}{2}\left(1 - \frac{p}{\kappa \cdot f_m}\right) = \frac{P \cdot L}{2}\left(1 - \frac{p}{\kappa \cdot f_m}\right)$	$M_u = \frac{H_p \cdot h}{2}\left(1 - \frac{H_p}{0.85 \cdot f_{hd} \cdot h \cdot t}\right)$
	Member in tension	$M_u = 0$	

Where,

f_m : Compressive strength (***User Defined Value***)

L : Pier Length

T : Pier Thickness

L' : Depth of Neutral Axis Calculated at Each Load Step

$$L' \begin{cases} = 3 \cdot \left(\frac{1}{2} - \frac{e}{L}\right) \cdot L & ; e \geq L/6 \\ = L & ; e < L/6 \end{cases}$$

H : Pier Height

τ_0 : Shear Strength (***User Defined Value***)

P : Axial Force

M : Moment

$$\beta \begin{cases} = 1.5 \; ; 1.5 \leq H/L \\ = H/L \; ; \; 1.0 < H/L < 1.5 \\ = 1.0 \; ; \; H/L \leq 1.0 \end{cases}$$

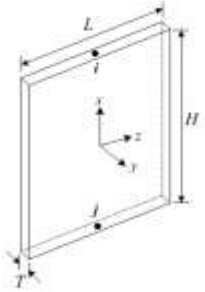
p : Vertical Stress

κ : Vertical Stress Distribution Coefficient
(Default: κ =0.85, ***User Defined Value***)

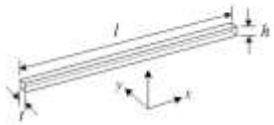
f_{hd} : Horizontal Compressive strength (***User Defined Value***)

f_{vk0} : Shear Strength in absence of Vertical Loads (***User Defined Value***)

$$H_p \begin{cases} i) \; 0.4 \cdot f_{hd} \cdot h \cdot t \\ ii) \; H_p \; : \textbf{\textit{User Defined Value}} \\ minimum\ value\ between\ i)\ and\ ii) \end{cases}$$



(a) Masonry pier



(b) Masonry spandrel

5. Concrete Design as per Eurocode 2:2004

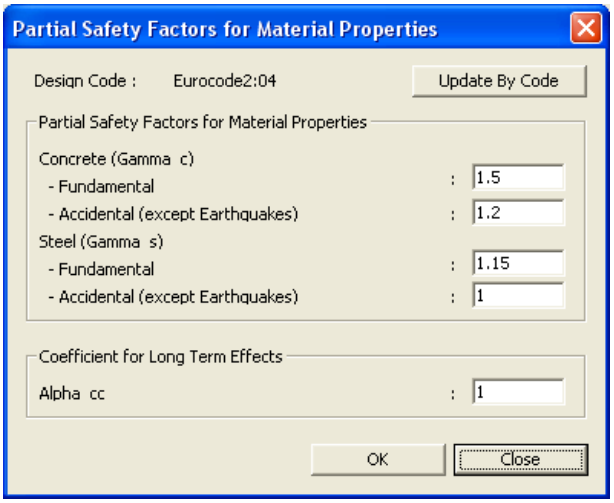
(1) ULS & SLS Design

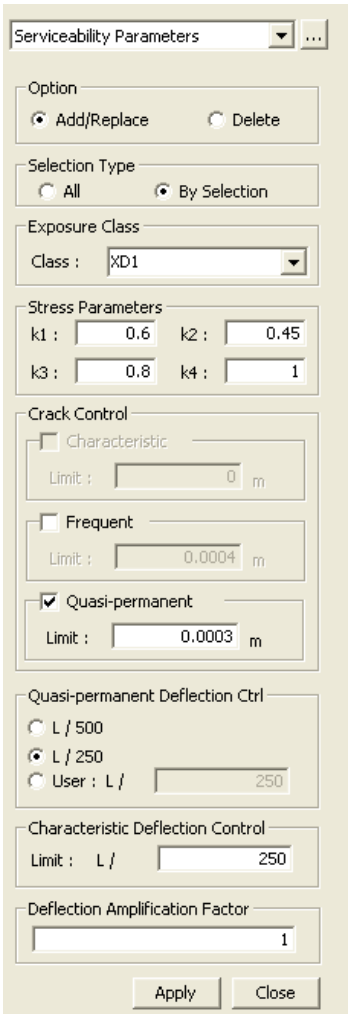
Design > ***Concrete Design Parameters*** > ***Design Code***
Design > ***Concrete Design Parameters*** > ***Serviceability Parameters***
Design > ***Concrete Design Parameters*** > ***Partial Safety Factors for Material Properties***

Upgrade Contents

RC design as per Eurocode 2:2004 is newly implemented.

- Ultimate Limit States Design (Beam, Column, Wall) - ***New for Ver.7.4.1***
- Serviceability Limit States Design (Stress limit, Crack width, Deflection)



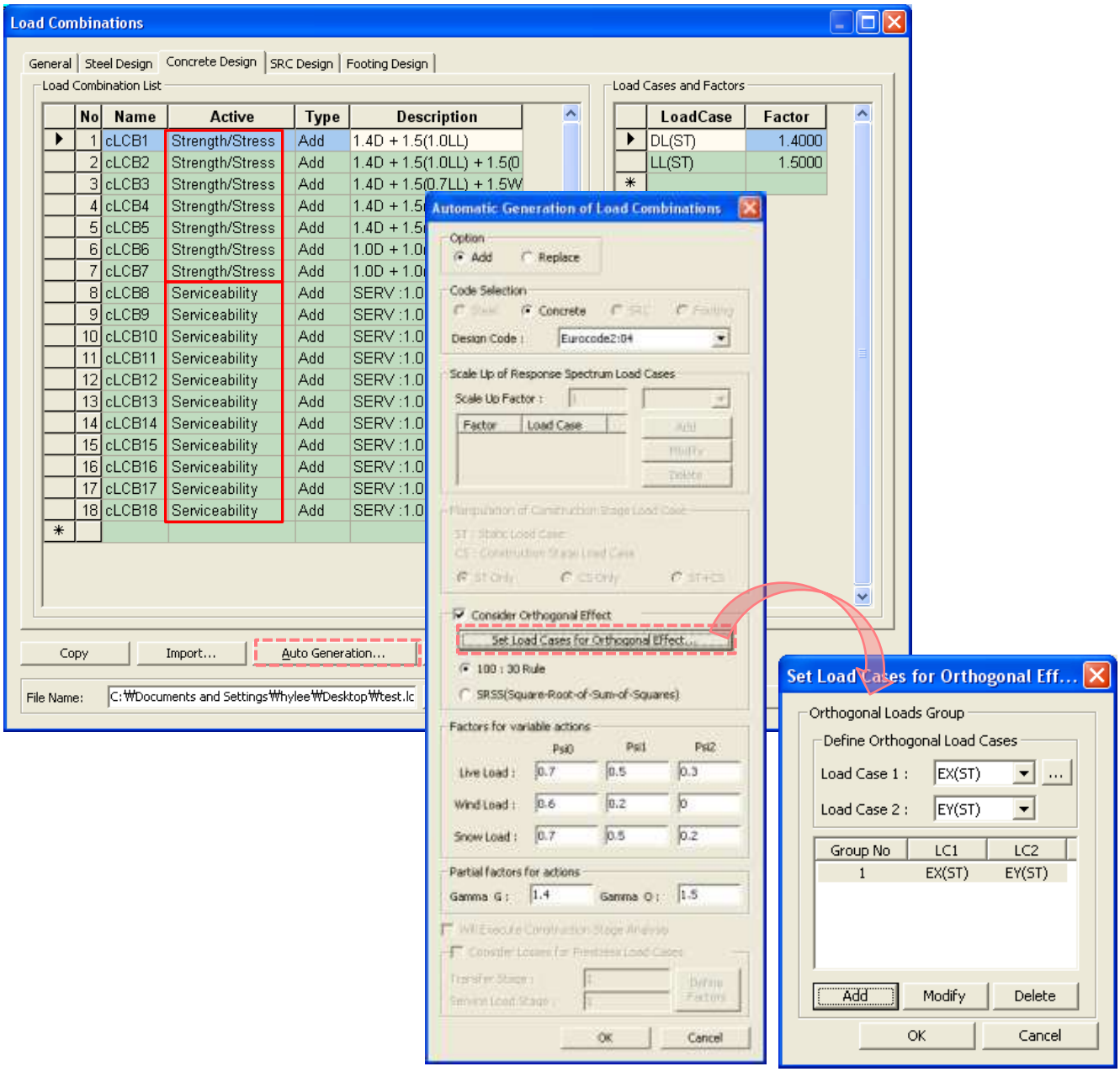


(2) Auto-Generation of Load Combination as per Eurocode 2:2004

Results > ***Combinations***

Upgrade Contents

- Auto generation of load combinations based on Eurocode 2:2004 is newly implemented.
- Orthogonal Effect of Earthquake load can be considered.



5. Concrete Design as per Eurocode 2:2004

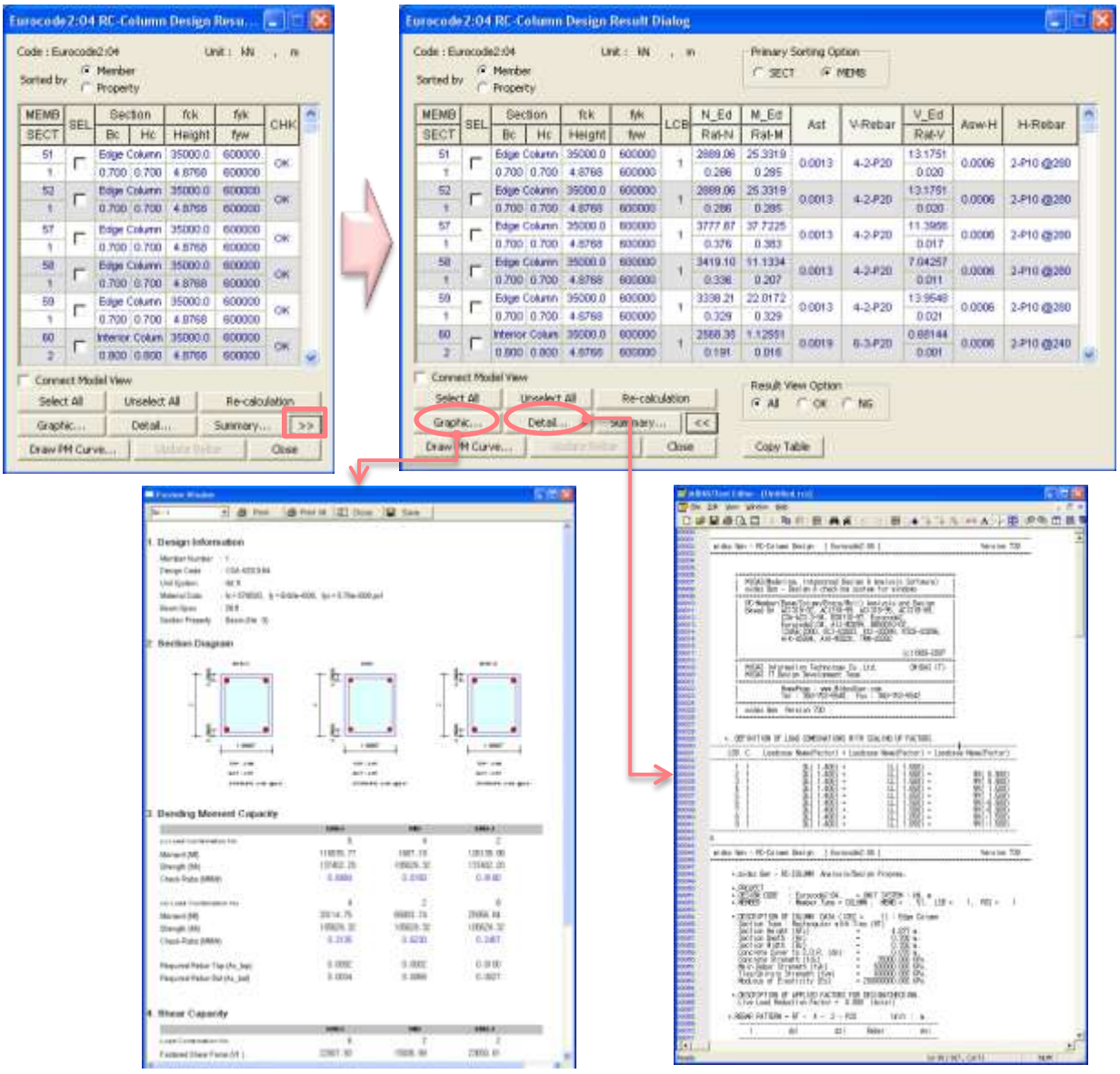
Analysis & Design

(3) Design Report

Design > ***Concrete Code Design*** > ***Beam Design***
Design > ***Concrete Code Design*** > ***Column Design***
Design > ***Concrete Code Design*** > ***Wall Design***

Upgrade Contents

- Design results are displayed in both graphical and detailed report format.



* For detailed information, refer to '**Concrete Design as per Eurocode2:2004'** tutorial at http://eng.midasuser.com.

6. Steel Design as per Eurocode 3:2005

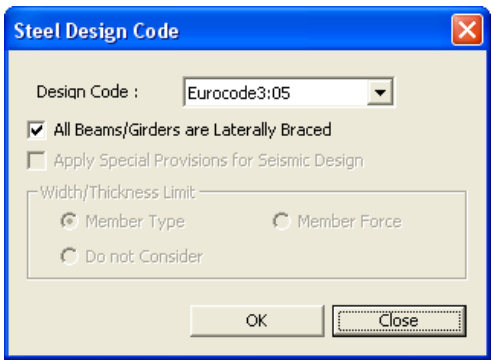
(1) ULS & SLS Design

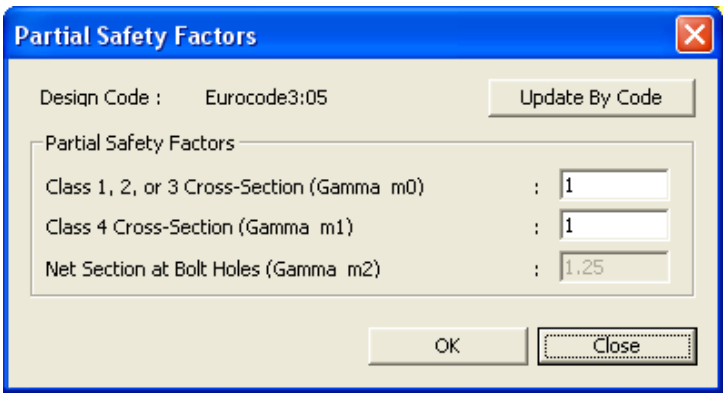
Design > ***Steel Design Parameters*** > ***Design Code***
Design > ***Steel Design Parameters*** > ***Serviceability Parameters***
Design > ***Steel Design Parameters*** > ***Partial Safety Factors***

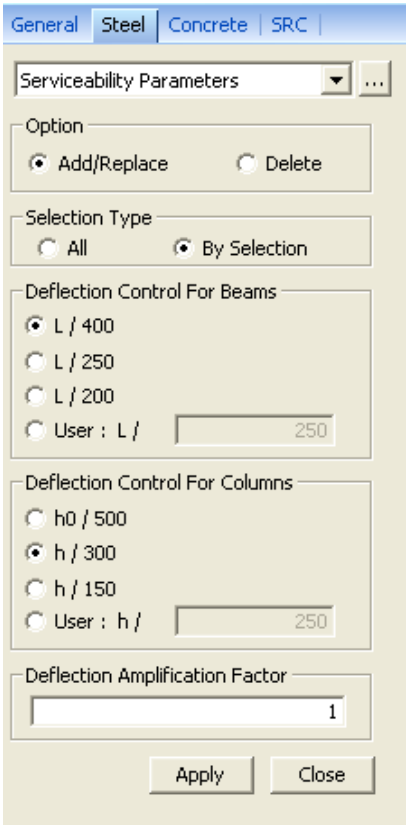
Upgrade Contents

Steel design as per Eurocode 3:2005 is newly implemented.

- Ultimate Limit State Design (Beam, Column, Brace) ***- New for Ver.7.4.1***
- Serviceability Limit States Design (Deflection)







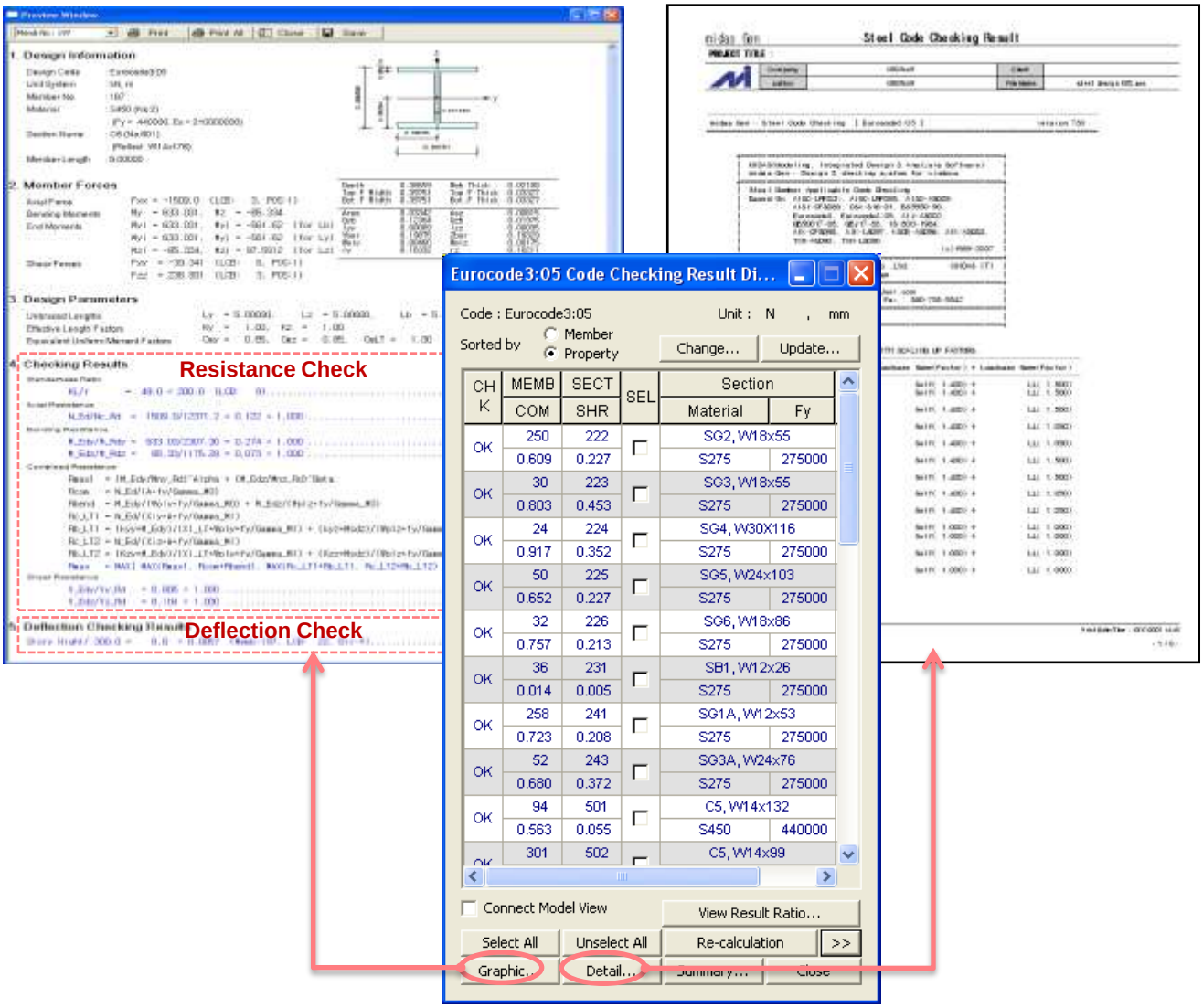
6. Steel Design as per Eurocode 3:2005

(2) Design Report

Design > ***Concrete Code Design*** > ***Beam Design***
Design > ***Concrete Code Design*** > ***Column Design***
Design > ***Concrete Code Design*** > ***Wall Design***

Upgrade Contents

- Design results are displayed in both graphical and detailed report formats.



Eurocode implementation status in midas Gen

Related Codes

- ❑ Eurocode 0:2002
- ❑ Eurocode 2:2004
- ❑ Eurocode 3:2005
- ❑ Eurocode 8:2004
- ❑ OPCM3431
- ❑ UNI
- ❑ BS
- ❑ DIN

		Specification
Material DB	Concrete Material DB	Eurocode 2:2004
	Steel Material DB	Eurocode 3:2005
Section DB	Steel Section DB	UNI, BS, DIN
Load	Static Wind load	Eurocode 1:2005
	Static Seismic Load	Eurocode 8:2004
	Response Spectrum Function	Eurocode 8:2004
Pushover Analysis	Masonry Pushover	OPCM3431
	RC Pushover	Eurocode 8:2004
	Steel Pushover	Eurocode 8:2004
Design	Load Combination	Eurocode 0:2002
	ULS Concrete Frame Design	Eurocode 2:2004
	ULS Steel Frame Design	Eurocode 3:2005
	SLS Concrete Frame Design	Eurocode 2:2004
	SLS Steel Frame Design	Eurocode 3:2005

7. Improvement on Italian UNI code concrete material DB

Analysis & Design

Upgrade Contents

- In the concrete material DB as per Italian UNI code, Rck10, Rck15 & Rck20 have been added.
- In the old version, cubic strength was used for design strength in Eurocode design. In ver.7.4.1, it is corrected to cylindrical strength.

Effects & Usage

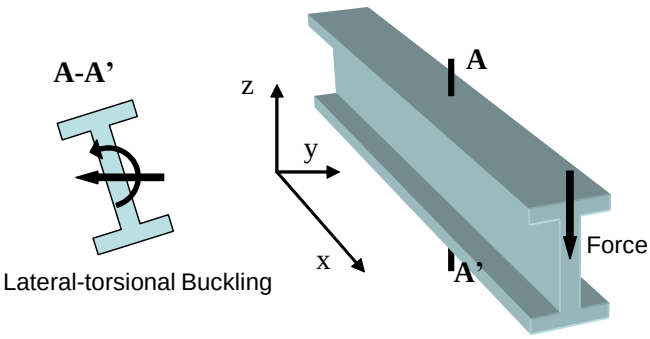
•When the user opens a model file which is created in the old version, design strength will not be updated. However when the user opens the 'Material Data' dialog or 'Modify Concrete Materials' dialog and changes the material properties of UNI code, the design strength of all the UNI code assigned elements in the model file will be updated correct design strength.

UNI code concrete DB	Design Strength (MPa)		Modulus of Elasticity (MPa)	
	old version	ver.7.4.1	old version	ver.7.4.1
Rck 10	-	8	-	2.5331E+4
Rck 15	-	12	-	2.7085E+4
Rck 20	-	16	-	2.8607E+4
Rck 25	25	20	2.8500E+4	2.9961E+4
Rck 30	30	25	3.1220E+4	3.1475E+4
Rck 35	35	28	3.3721E+4	3.2308E+4
Rck 40	40	32	3.6049E+4	3.3345E+4
Rck 45	45	35	3.8236E+4	3.4077E+4
Rck 50	50	40	4.0305E+4	3.5220E+4

8. Lateral-Torsional Buckling Analysis

Analysis & Design

Model > ***Buckling Analysis Control***



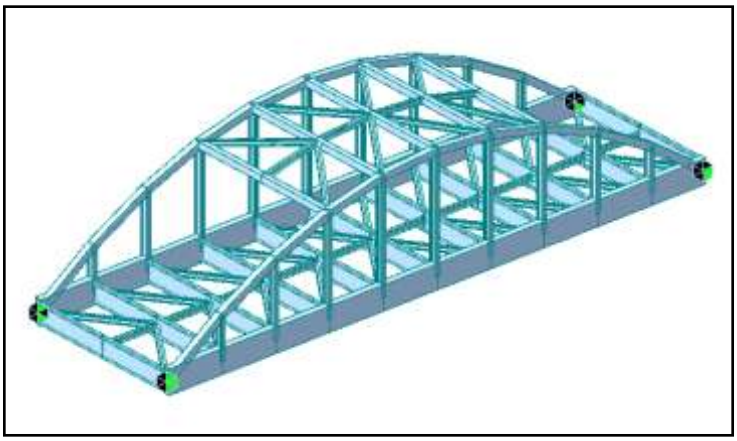
Upgrade Contents

• Addition of lateral-torsional buckling consideration in analysis.

Effects & Usage

• The buckling mode around the weak axis is considered for a member which has to resist both bending and shear. This results in more accurate critical load factors.

Test Model



Buckling Result Comparison

Mode	No Lateral Torsion	Lateral Torsion Inc.
1	56.49929	**33.26758**
2	57.61738	57.6344
3	69.3207	58.63127
4	70.54121	70.61125
5	119.1424	71.42605
6	119.7788	71.79503
7	145.7739	72.97477
8	146.4525	100.135
9	216.0261	106.5486
10	228.6329	119.2809

9. Limit Strength for Tension only/Compression only Truss

Analysis & Design

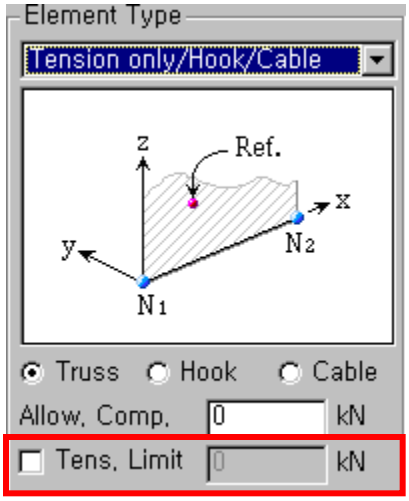
Model > ***Elements*** > ***Create Elements***

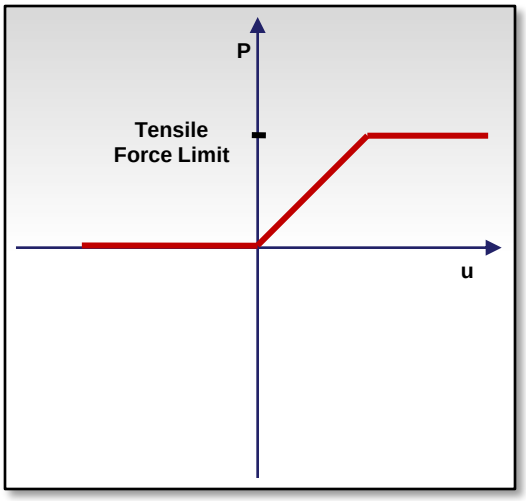
Upgrade Contents

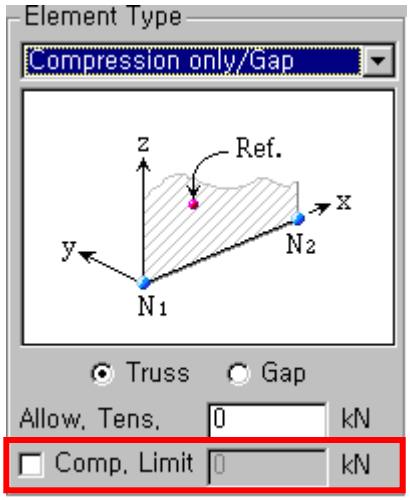
• Addition of Limit Strength for Tension only/Compression only Trusses.

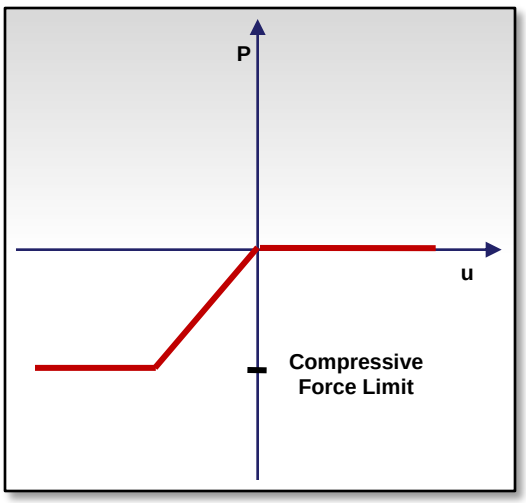
Effects & Usage

•An additional method of representing material nonlinearity. Both Tension only / Compression only limits are provided.









10. Nonlinear Point Springs

Analysis & Design

Model > ***Boundary*** > ***Point Spring Support***

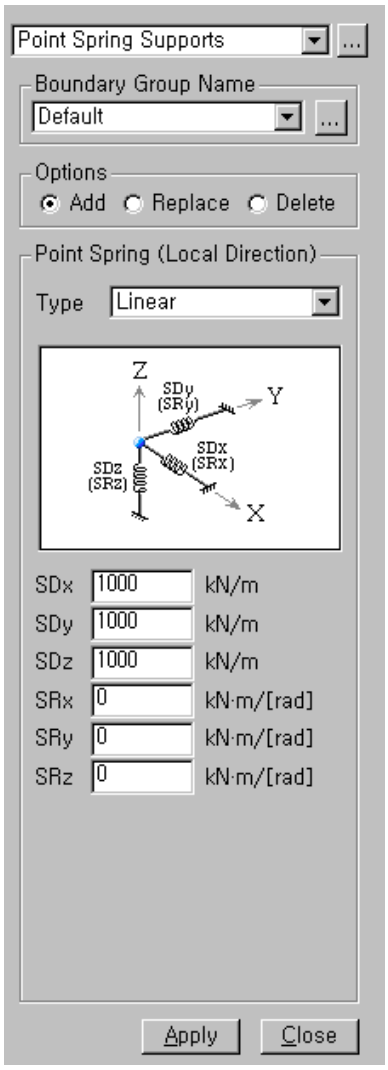
Upgrade Contents

• Compression-only/Tension-only and Multi-Linear Type point springs have been added.

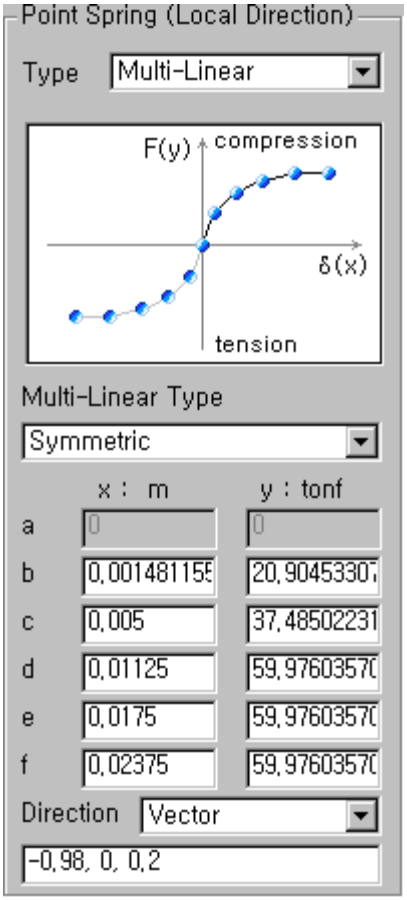
Effects & Usage

• Linear, Multi-Linear and Compression-only springs can be used for modeling the soil structure interaction e.g. integral bridge.

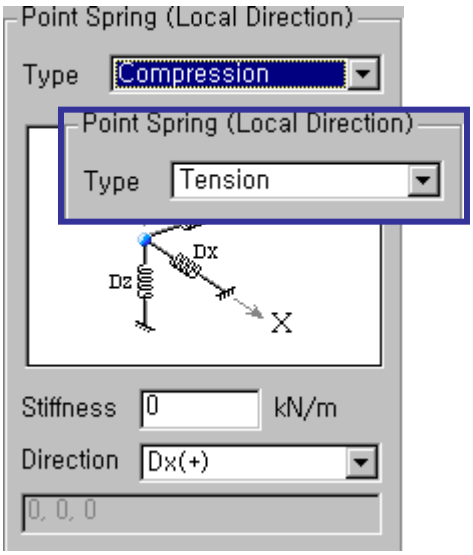
• By using Multi-Linear (Bi-Linear) springs, the effects of temperature, braking and acceleration in rail structure interaction can be determined.



Point Spring Support



Multi-Linear Point Spring Support



Compression-only/Tension-only Point Spring Support

11. Tens./Comp.-only, Hook & Gap element in Material nonlinear analysis

Upgrade Contents

- In the old version, Tension-only, Compression-only, Hook and Gap elements were changed to truss elements in nonlinear analysis. In ver.7.4.1, those elements can be now used in material nonlinear analysis reflecting their true nonlinear properties.

❑ **Elements, which can be used in material nonlinear analysis and/or geometry nonlinear analysis**

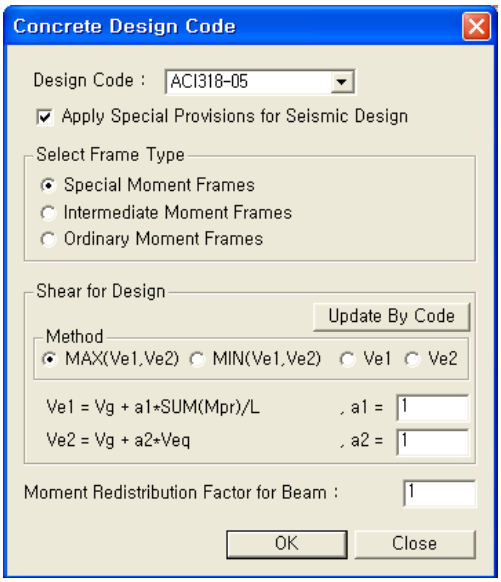
Element	Material Nonlinear
Truss	yes
Tension only	yes
Hook	yes
Cable	yes†
Compression only	yes
Gap	yes
Beam	yes†
Plate – Thick	yes
Plate – Thin	Yes*
Plane Stress	yes
Plane Strain	yes
Axisymmetry	yes
Solid	yes

† : Corresponding elements are considered as linear elements in analysis.
* : Corresponding thin plate elements are considered as thick plate elements.

12. Concrete Code Design as per ACI 318-05

Analysis & Design

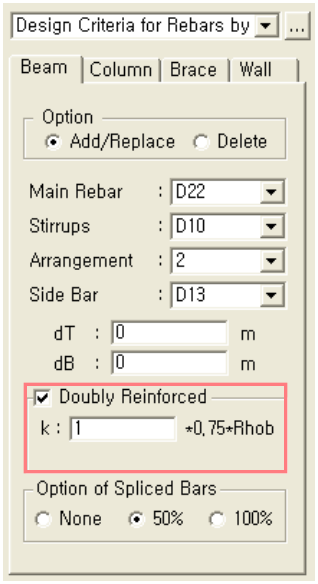
Design > *Concrete Design Parameters* > *Design Code*

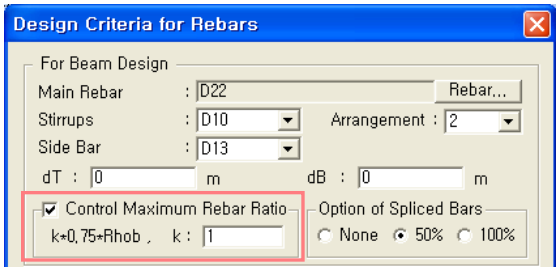


13. Doubly Reinforced Beam Design

Design > *Concrete Design Parameters* > *Design Criteria for Rebar by member*

Design > *Concrete Design Parameters* > *Design Criteria for Rebar, Design Criteria for Rebar by member*





Related Codes

- ACI318-05, TWN-USD 92

Upgrade Contents

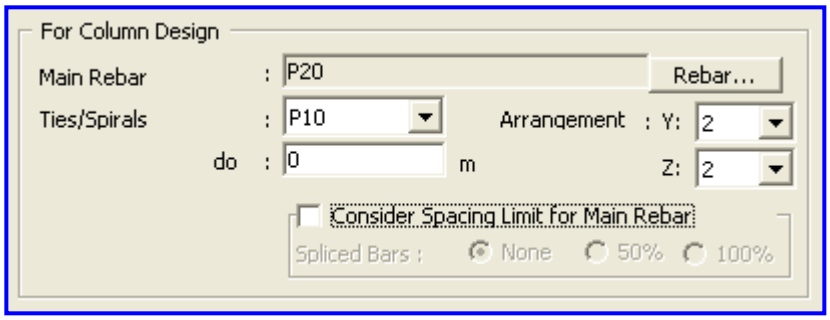
- Check on in order to design doubly reinforced beams.
- Maximum tensile rebar limit can be specified by entering the ratio(k) as a factor of the reinforcement limit ($0.75\rho_b$).

14. Control of minimum rebar spacing for beam/column design

Design > ***Concrete Design Parameter*** > ***Design Criteria for Rebars***
Design > ***Concrete Code Design*** > ***Beam Design / Column Design***

Upgrade Contents

- The program did not provide required rebar areas for the column design, which sometimes caused inconvenience when the user tried to manipulate reinforcement.
- For this, minimum rebar spacing limit can be ignored in Gen V741. Older versions always applied the spacing requirement in the design code. Checking off "Consider Spacing Limit for Main Rebar" allows the user to find the required rebar area beyond the code required spacing.



15. Scale factor for shear strength of concrete

Design > ***Concrete Design Parameter*** > ***Design Code***
Design > ***Concrete Code Design*** > ***Beam Design***

Upgrade Contents

- TWN-USD 92 Clause 15.4.4.2 indicates that "transverse reinforcement shall be proportioned to resist shear assuming Vc=0 when both of the following conditions occur….." In Gen V741, even though such conditions occur, the user can include a part of shear strength of concrete as well as shear reinforcement. This function is intended to reflect the engineering practice in Taiwan.

❑ Pre/Post-processing part

1. Addition of Linear Constraints function
2. Automatically finding the major axis for response spectrum analysis
3. Improvements on speed of calculation of Masses
4. Improvements on speed of calculation of Floor Load
5. Plate offset
6. Improvement on importing dxf file
7. Display general link element deformations of Time History Analysis result
8. Addition of CEB-FIP 78 model code
9. Section shape display for irregular section imported from SPC
10. Displaying wall member forces by Wall ID
11. Automatic file recovery
12. Web-based online manual including context-sensitive help
13. Default unit system is changed from kips-ft to kN-m.

1. Addition of Linear Constraints function

Pre/Post-processing

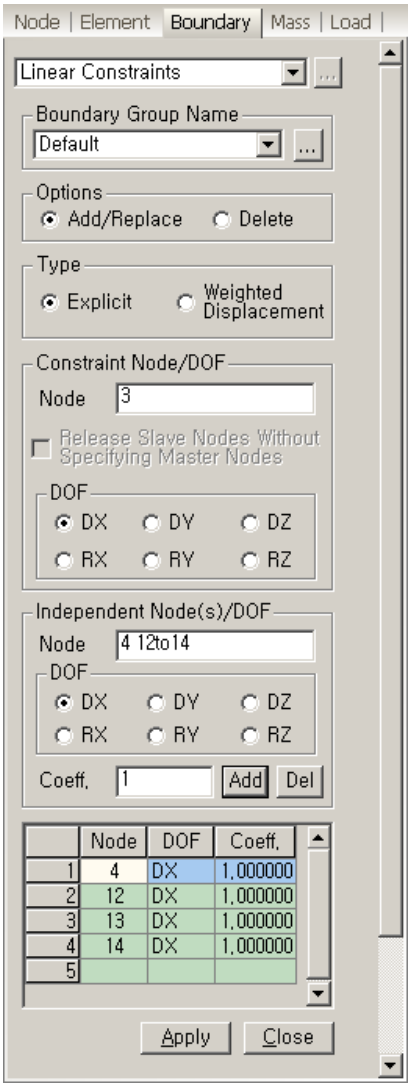
Model > ***Boundaries*** > ***Linear Constraints***

Upgrade Contents

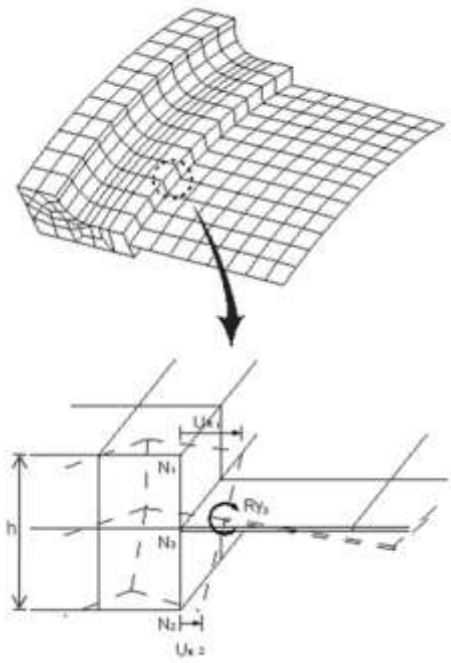
•A Linear Constraints function is newly implemented to constrain a specific node to subordinate to the movements of certain nodes.

Effects & Usage

•Rigid Link can be applied in terms of global axis only. Using Linear Constraints, it enables to constrain displacement/rotation between nodes in terms of any axis as well as global axis.



Explicit Type



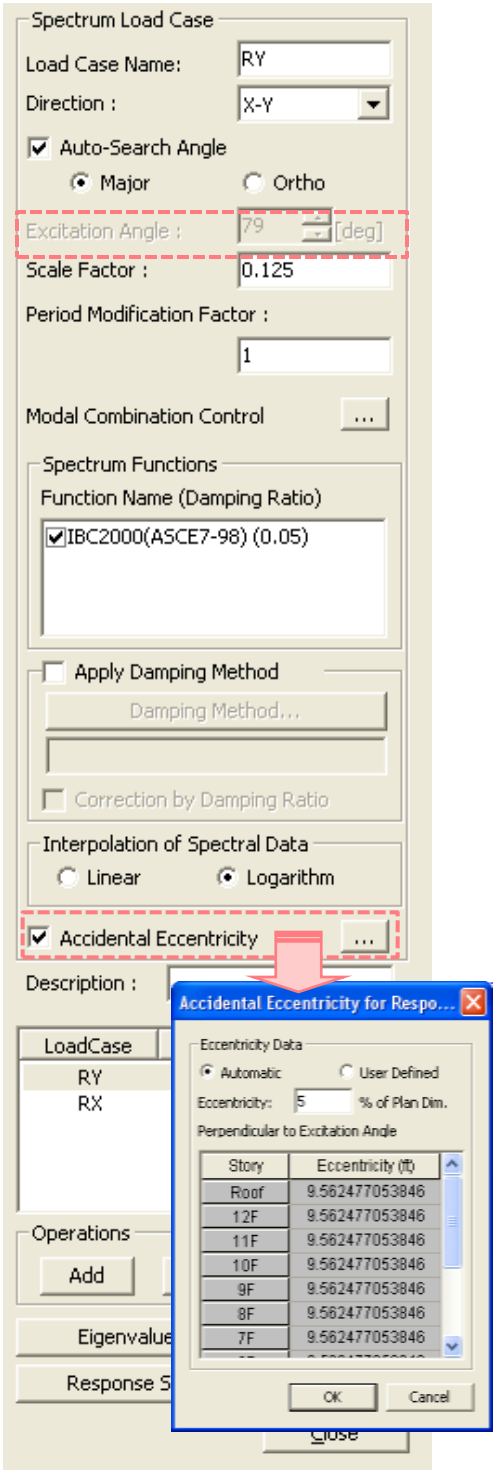
The figure above shows an application example in which a connection is made between a 3-D structure consisted of solid elements and a thin plate consisted of plate elements. Since solid elements do not have stiffness against rotational DOF, they cannot restrain the rotational behavior of the connected plate. If the rotational DOF of the connected part is restrained using Eq. (1) below, the plate elements would generally behave perpendicularly to the connection

$$R_{Y,3} = \frac{1}{h}U_{X,1} - \frac{1}{h}U_{X,2} \qquad \text{Eq. (1)}$$

2. Automatically finding the major axis of a building

Pre/Post-processing

Loads > *Response Spectrum Analysis Data* > *Response Spectrum Load Cases*



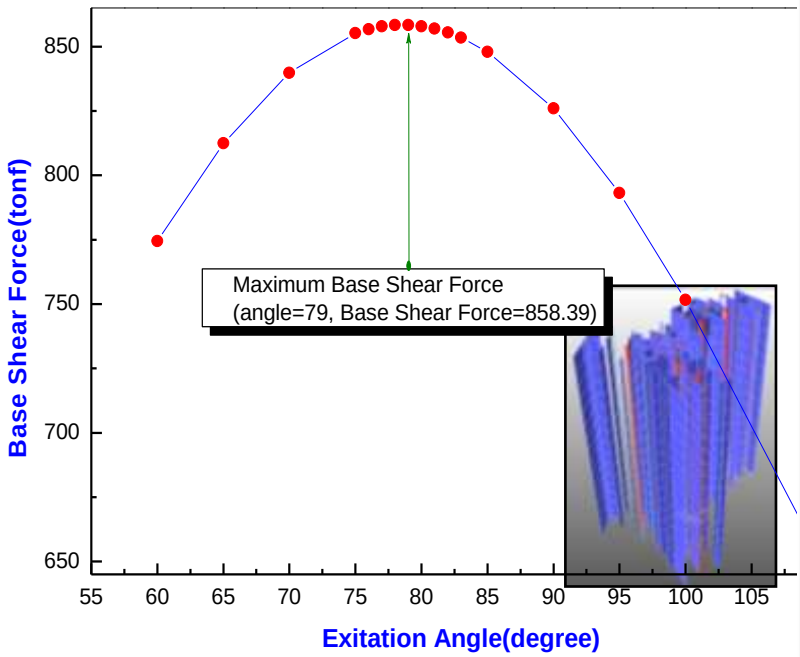
Accidental eccentricity is automatically up dated based on the major axis.

Upgrade Contents

- Excitation angle of response spectrum is automatically taken as the major-axis direction of a building.

Load Case	Angle	Base Shear Force
RX-60(RS)	60	774.4752
RX-65(RS)	65	812.4327
RX-70(RS)	70	839.7885
RX-75(RS)	75	855.1793
RX-76(RS)	76	856.7492
RX-77(RS)	77	857.8082
RX-78(RS)	78	858.3552
RX-U(RS)	**79**	**858.3899**
RX-80(RS)	80	857.9131
RX-81(RS)	81	856.9266
RX-82(RS)	82	855.4334
RX-83(RS)	83	853.4374
RX-85(RS)	85	847.958
RX-90(RS)	90	825.9408
RX-95(RS)	95	793.1512
RX-100(RS)	100	751.5546
RX-110(RS)	110	653.2589

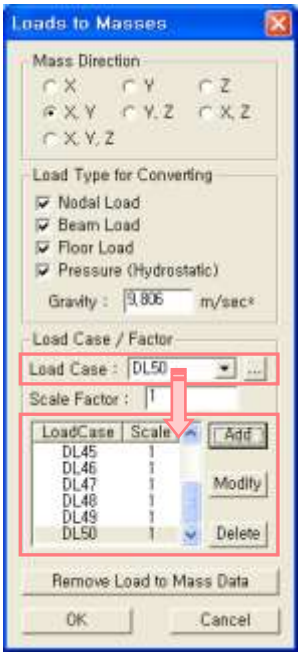
Major axis



3. Improvements on calculation of Masses

Pre/Post-processing

Model > ***Masses*** > ***Load to Masses***



Related Functions

- ❑ Load > Load Tables > Nodal Body Forces table
- ❑ Model > Masses > Floor Diaphragm Masses
- ❑ Model > Masses > Nodal Masses Table
- ❑ Results > Result Tables > Story > Weight Irregularity Check Table

Upgrade Contents

- The maximum number of load cases which are available in Load to Masses function has been increased to '50' in order to convert various load cases into masses .
- Increase in speed of calculating mass data.

4. Improvements on calculation of Floor Load Data

Load > ***Define Floor Load Type***
Load > ***Assign Floor Load Type***

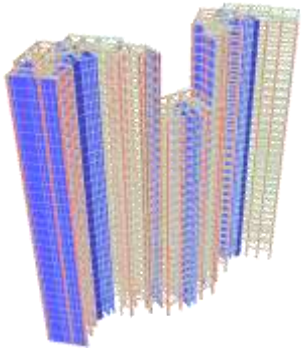
Upgrade Contents

- Increase in speed of calculating Floor Load data

❑ **Example**

Model information	Status	Ver.7.2.1	Ver.7.4.1	Improvement
- Elements: 31859 - Story: 30 - Floor loads are assigned to all the floors.	When calculating floor loads before performing analysis	160 sec.	66 sec.	2.4 times

* Computer information: Intel(R) Pentium(R) 4 CPU 2.80GHz, 1GB RAM

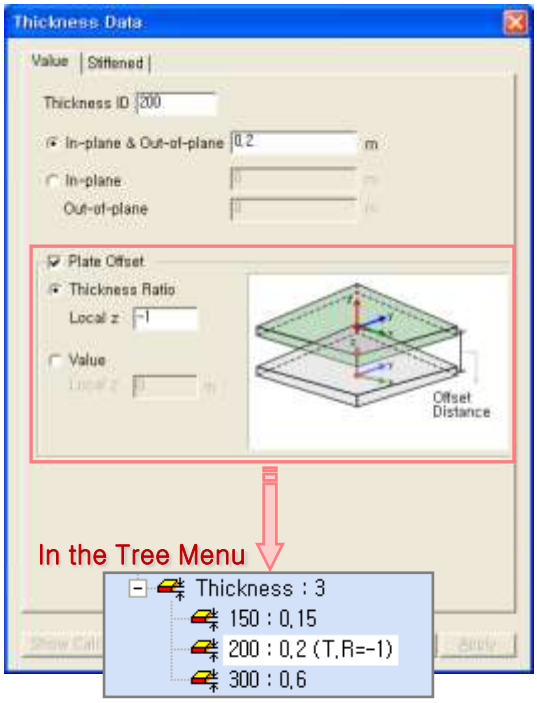


* Test model

5. Plate Offset

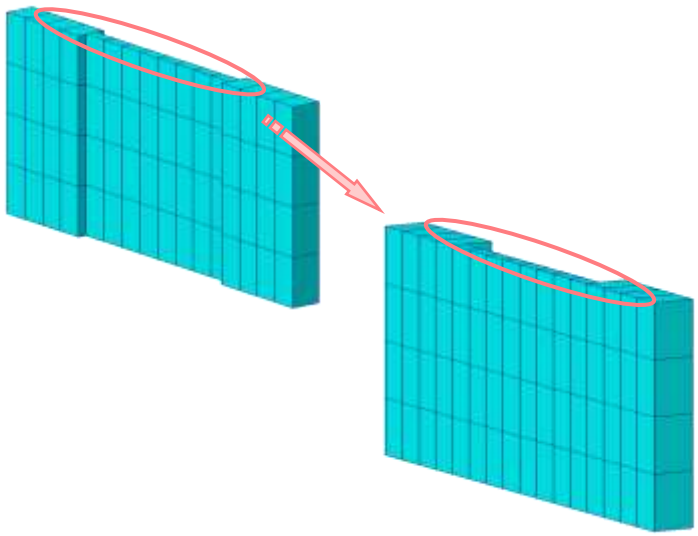
Pre/Post-processing

Model > ***Properties*** > ***Thickness***



Upgrade Contents

- Plate offset is newly added.
- Offset is applicable in the element's local-z direction.

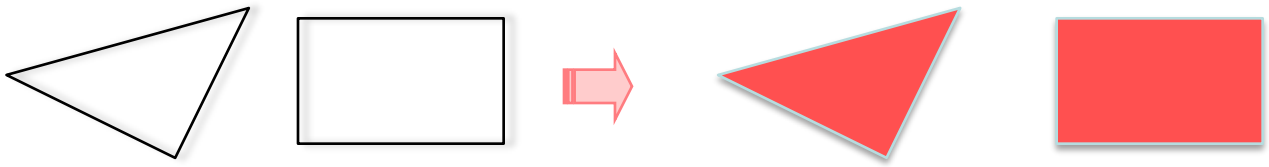


6. Improvement on importing dxf file

File > ***Import*** > ***AutoCAD DXF File***

Upgrade Contents

- Various polyline types such as polygon, triangle, rectangle, etc. can be imported to midas Gen as plate elements in a DXF format.



Triangle polyline in AutoCAD

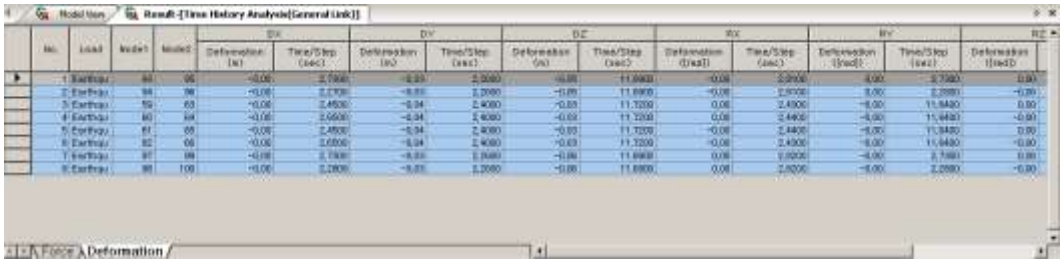
Plate elements in midas Gen

7. Display general link element deformations of Time History Analysis result

Model > ***Results*** > ***Result Tables*** > ***Time History Analysis*** > ***General Link***

Upgrade Contents

• General link element deformations of time history analysis results are tabulated in a Spread Sheet format.



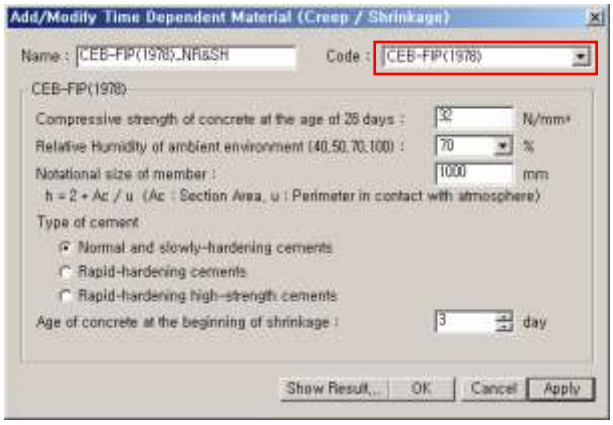
Time History Analysis (General Link) Table

8. Addition of CEB-FIP 78 model code

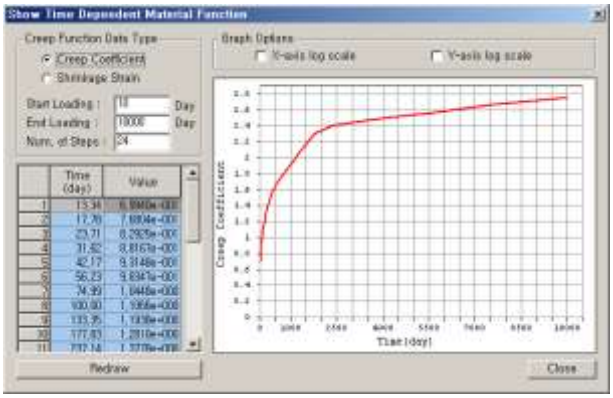
Model > ***Properties*** > ***Time Dependent Material (Creep/Shrinkage)***

Upgrade Contents

•CEB-FIP (1978) model code as well as CEB-FIP (1990) model code can be applied in the construction stage analysis.



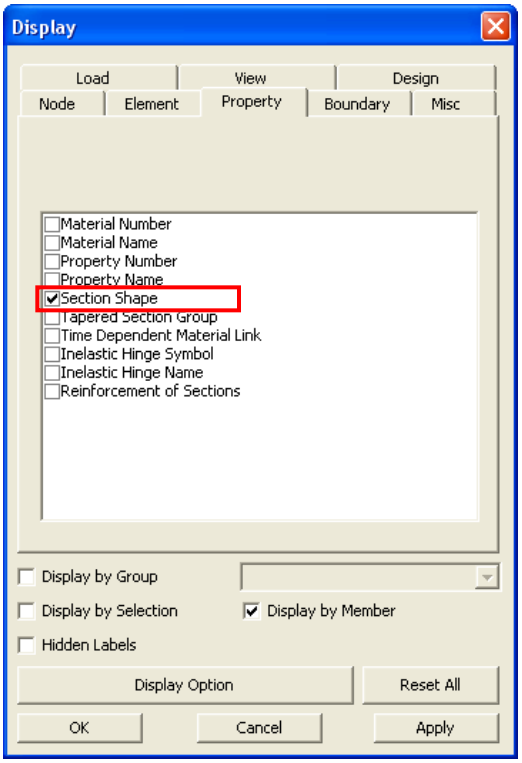
Time Dependent Material (Creep/Shrinkage) Dialog



CEB-FIP Code (1978) Result View

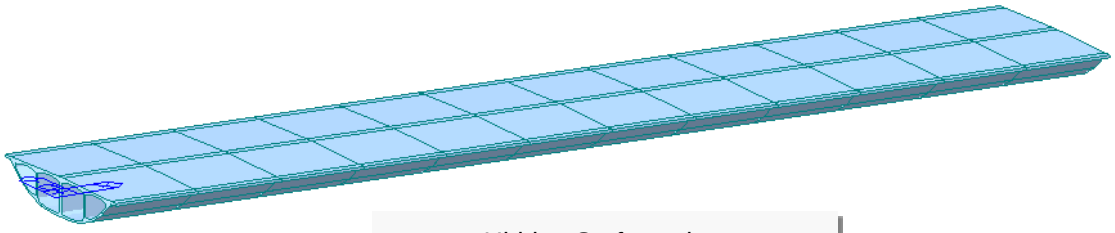
9. Section shape display for irregular section imported from SPC

View > ***Display***

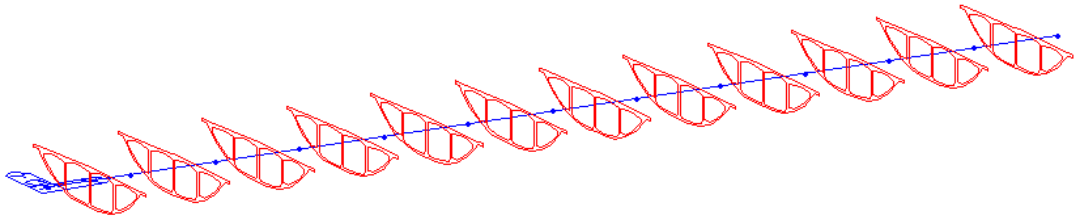


Upgrade Contents

•Section Shape Display function for irregular section imported from SPC is newly implemented.



Hidden Surface view



Frame view with Section Shape display option

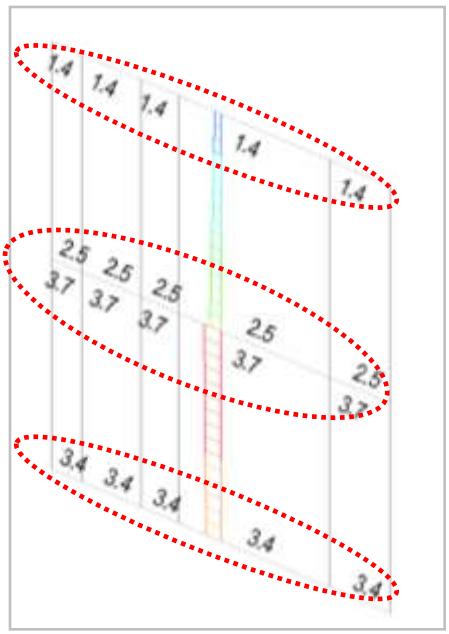
10. Displaying wall member forces by Wall ID

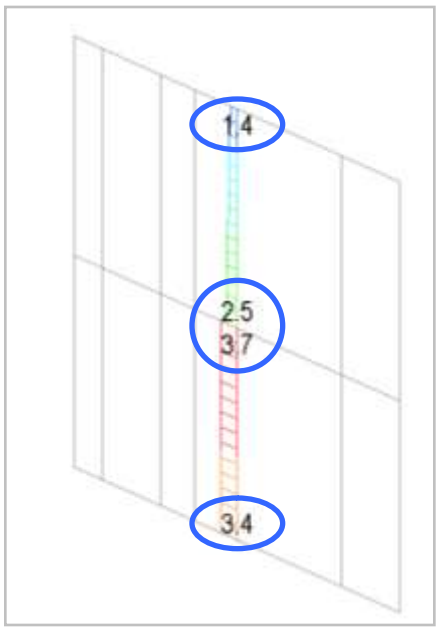
Pre/Post-processing

Results > ***Forces*** > ***Wall Forces/Moments***
Results > ***Forces*** > ***Wall Diagrams***

Upgrade Contents

- Wall member forces are displayed by Wall IDs rather than by wall elements for clarity.





Previous version:
Wall forces by Wall Elements

V741:
Wall forces by Wall IDs

11. Automatic file recovery

Upgrade Contents

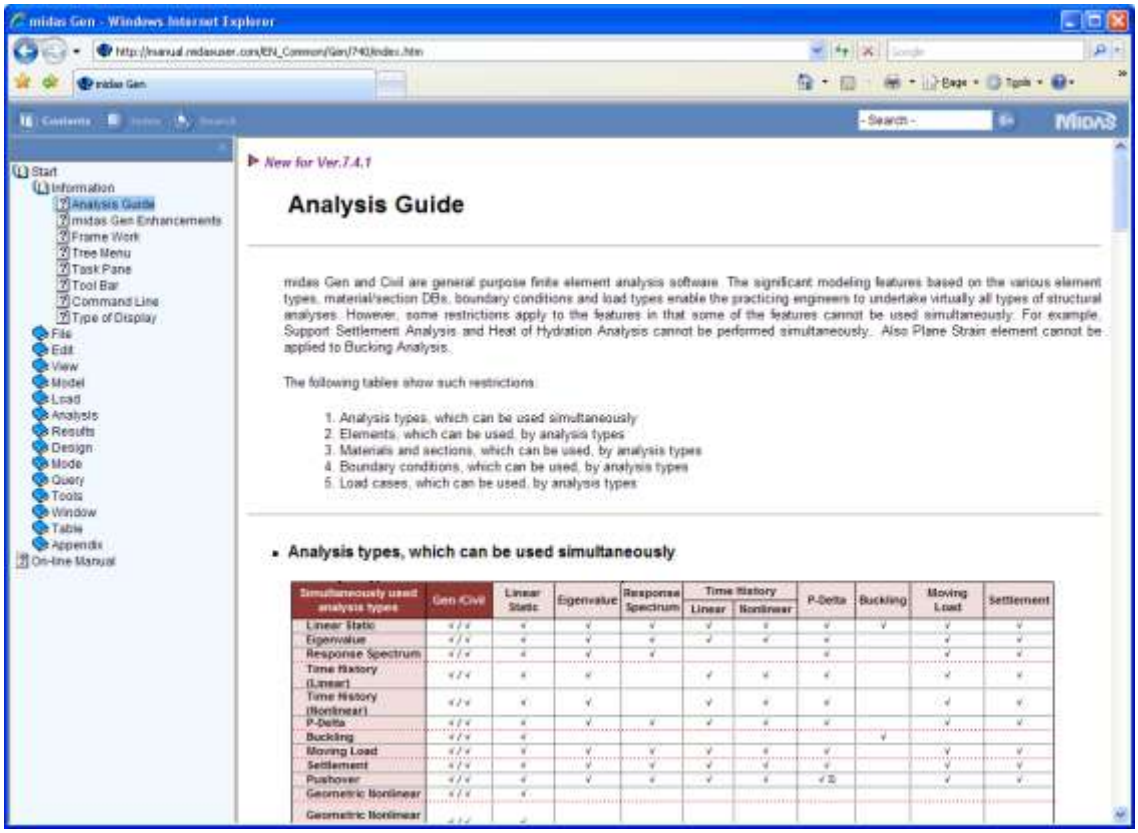
- If midas Gen program encounters a problem and terminates itself in an abnormal way, the working file may be recovered in most times. The saved file name is *file name_restore.mgb*.

12. Web-based online manual including context-sensitive help

Pre/Post-processing

Upgrade Contents

•A web-based online manual is available. Pressing [F1] Key will open the web-based online manual provided that you are connected to the internet.
• Pressing the [F1] key gives the user context-sensitive help for all dialogs.



13. Default unit system is changed from kips-ft to kN-m.

Upgrade Contents

• Default unit system can be changed in the Tools>Unit System menu.