MIDAS/Gen V.720 Enhancements

Major Enhancements

Modeling & Analysis Part

- Wind Load Calculation Standard Eurocode 1 (2005) has been added
- Static Seismic Load Calculation Standard Eurocode 8 (2004) has been added
- Masonry Material Models have been added
- Addition of a function to enable the input of Eccentric Beam Loads
- Enhancements of Pushover Analysis function

Results Part

- Display of Moment Combination in Plate Force/Moment Result
- Enhancements of Pushover Analysis Result
- Enhancements of Story Result Tables
- Display Story Shear Force for each Mode

Major Enhancements

Design Part

- **Serviceability Checks as per Eurocode 2 & 3**
- **Assign Rebars by Members**
- **Disregard of Extremely Small Compression/Tension in Nonlinear Members**
- **Enhancements of Concrete Design Result (Rebar, Area and Ratio separately displayed)**
- **Enhancements of Steel Design**
- **Enhancements of Orthogonal Effect in Seismic Load Cases**

Miscellaneous

- **Enhancements of Display function**
- **Graphic Option added in Preferences Menu**
- **Save all Graphic Design Results as a graphic file format**

Contents

(1) Wind Load Calculation Standard Eurocode 1 (2005) has been added

(2) Static Seismic Load Calculation Standard Eurocode 8 (2004) has been added

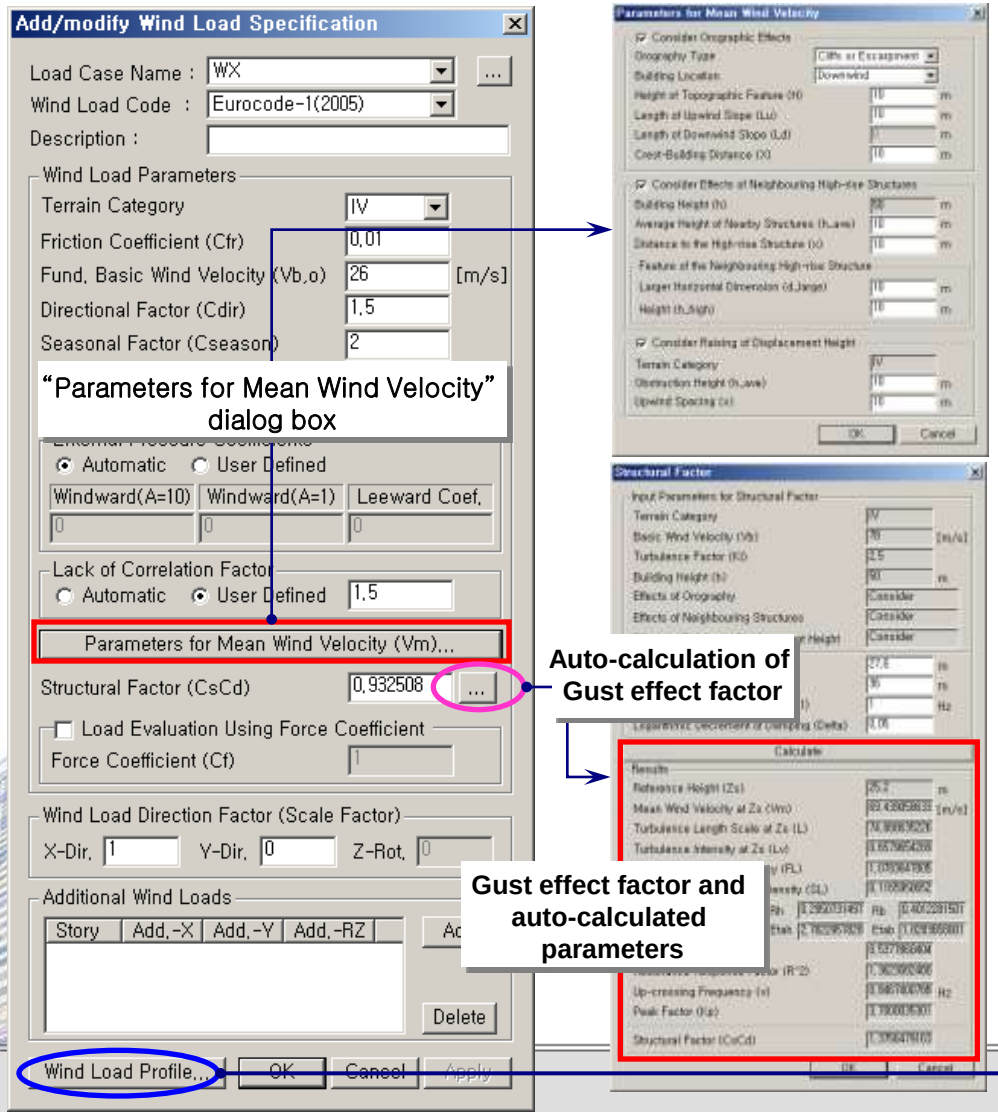
(3) Masonry Material Models have been added

(4) Addition of a function to enable the input of Eccentric Beam Loads

(5) Enhancements of Pushover Analysis function

(1) Wind Load Calculation Standard Eurocode 1 (2005) has been added

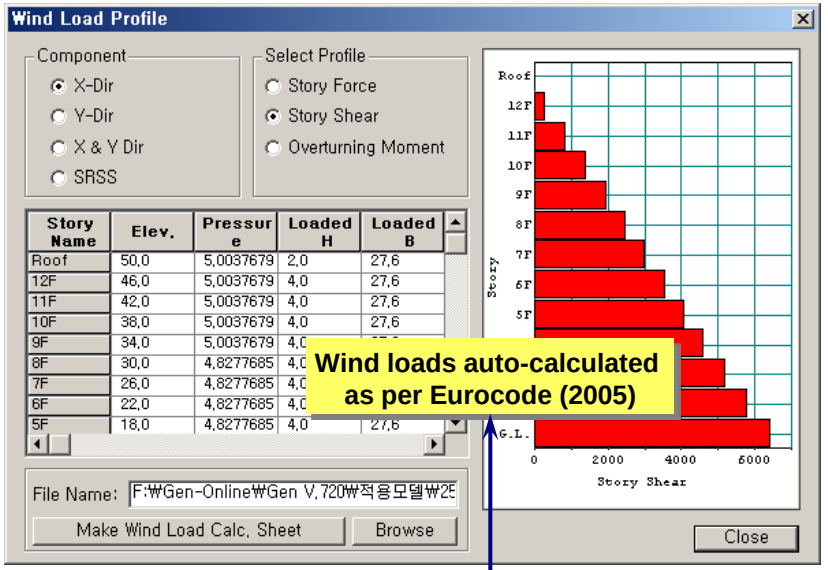
Loads > ***Lateral Loads*** > ***Wind Load***



"Parameters for Mean Wind Velocity" dialog box

Auto-calculation of Gust effect factor

Gust effect factor and auto-calculated parameters



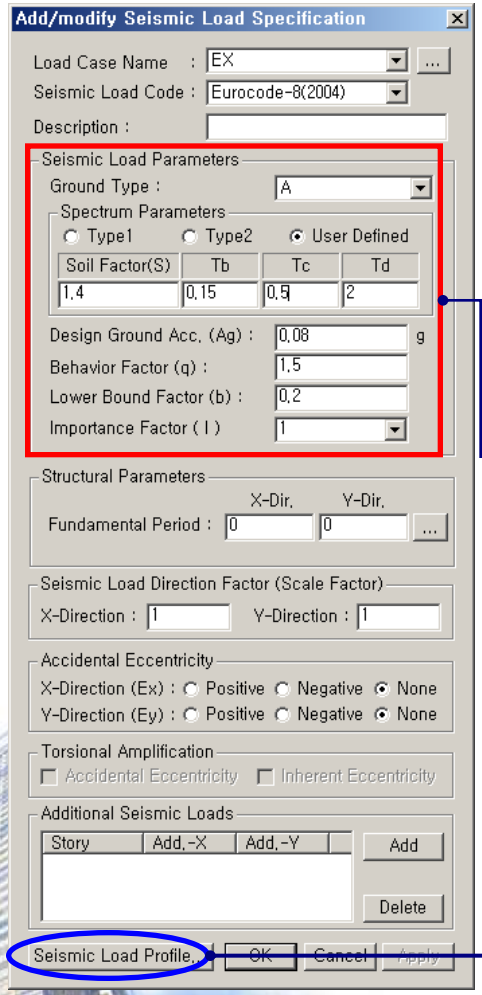
Wind loads auto-calculated as per Eurocode (2005)

Reference

- MIDAS/Gen Online Manual V.720
  - Refer to Loads > Lateral Loads > Wind Load

(2) Static Seismic Load Calculation Standard Eurocode 8 (2004) has been added

Loads > Lateral Loads > Static Seismic Load



Seismic Load Parameters

1. Ground Type
: A, B, C, D, E, S1, S2

2. Soil Factor (S)
: S>0

3. Design ground acceleration (Ag)
: Ag > 0

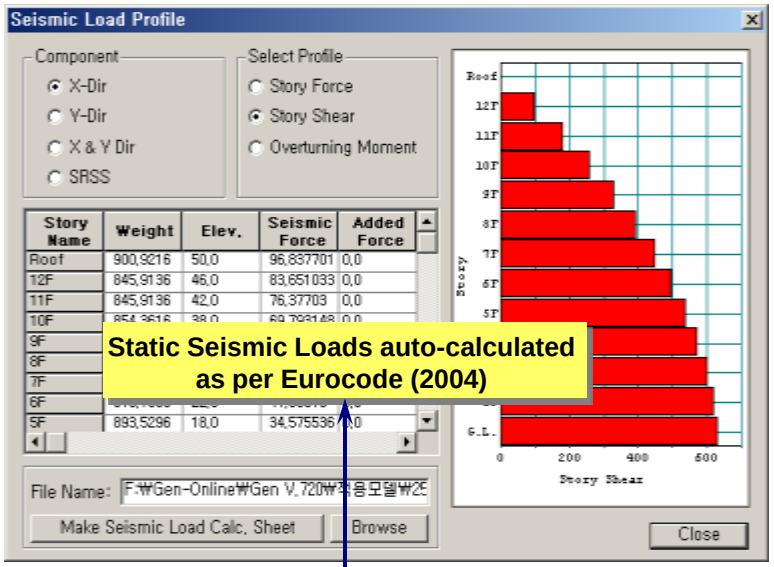
4. Behavior factor (q)
: q> 0

5. Lower bound factor (b)
: Lower bound factor for design spectrum (b> 0)

6. Importance Factor (I)

Reference

- MIDAS/Gen Online Manual V.720
  - Refer to Loads > Lateral Loads > Static Seismic Load

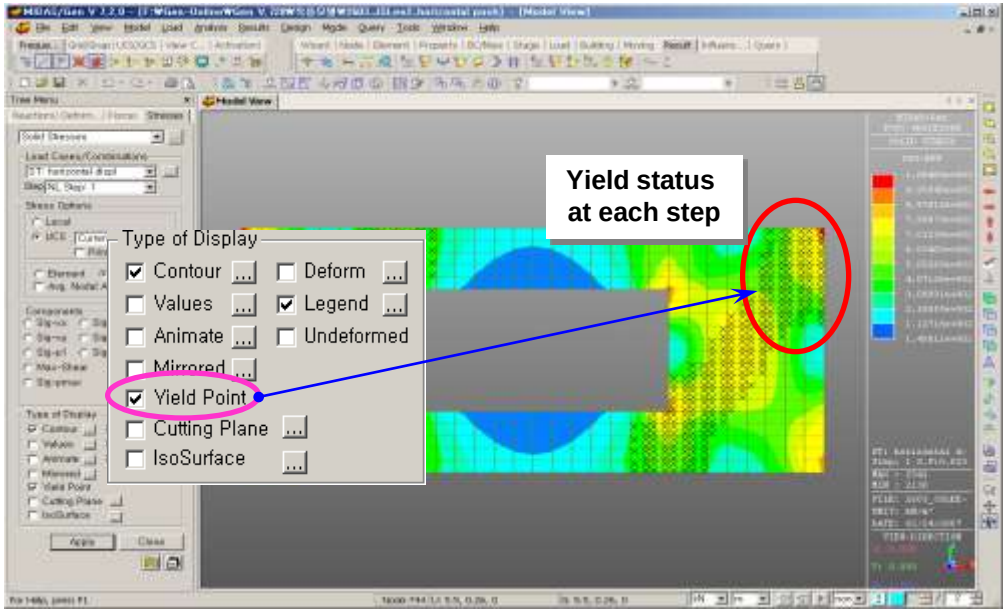


Static Seismic Loads auto-calculated as per Eurocode (2004)

Modeling & Analysis Part

(3) Masonry Material Models have been added

Model > Property > Plastic Material

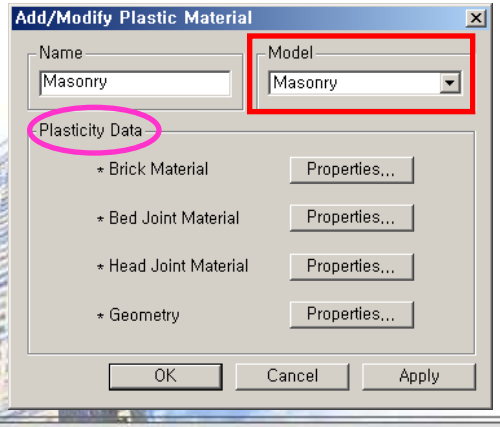


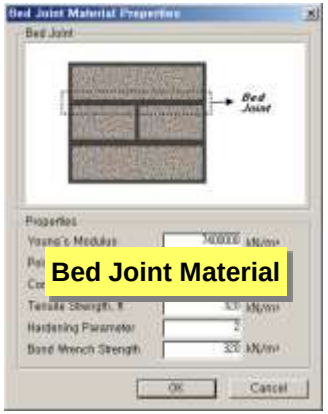
Related post-processor

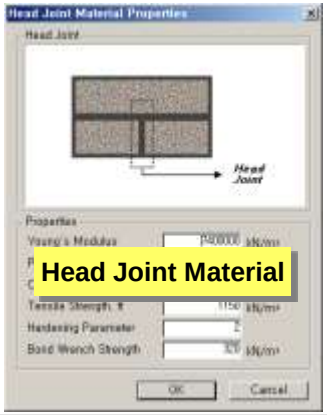
- Results > Stresses > **Solid Stress**

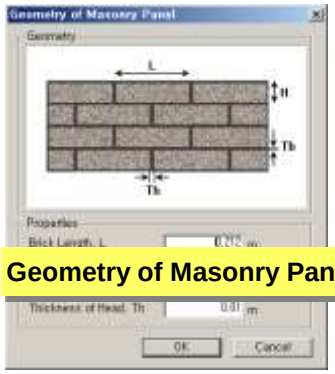
Comment & Reference

- Applicable only to 8-node Solid elements
- MIDAS/Gen Online Manual V.720
  - Refer to Model > Property > Plastic Material





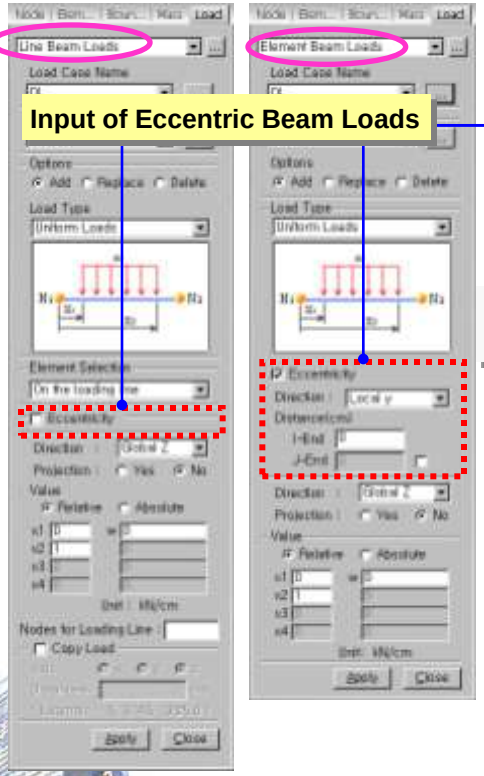




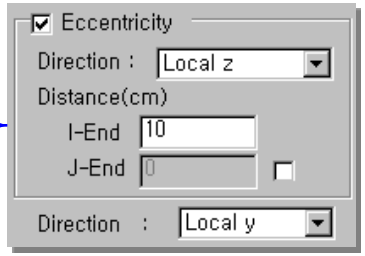
(4) Addition of a function to enable the input of Eccentric Beam Loads

Load >* *Element Beam Loads

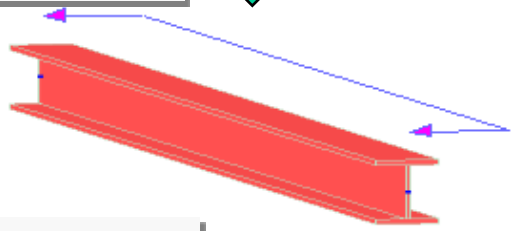
Load >* *Line Beam Loads



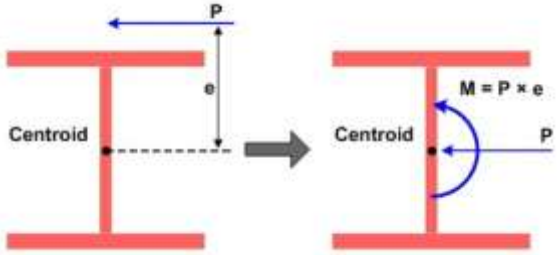
Input of Eccentric Beam Loads



Example of input of eccentric beam load



Applied eccentric loads



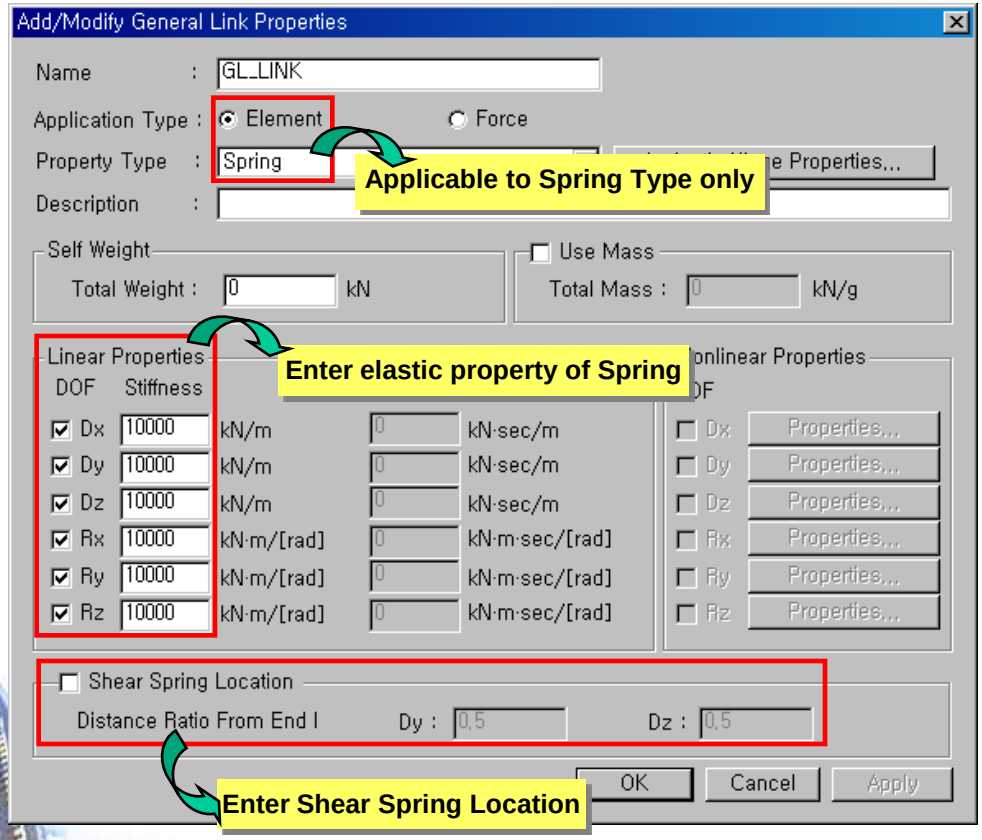
Comments & Reference

- Eccentric beam loads can be inputted in ECS or GCS.
- Eccentric beam load is applied as a concentrated load and a moment due to eccentricity internally by the program.
- MIDAS/Gen Online Manual V.720
  - Refer to Loads > Element Beam Load & Line Beam Load

(5) Enhancements of Pushover Analysis function

A. Pushover Analysis function can be applied to Spring type General Link Elements – Elastic property

Model > ***Boundary*** > ***General Link Property***



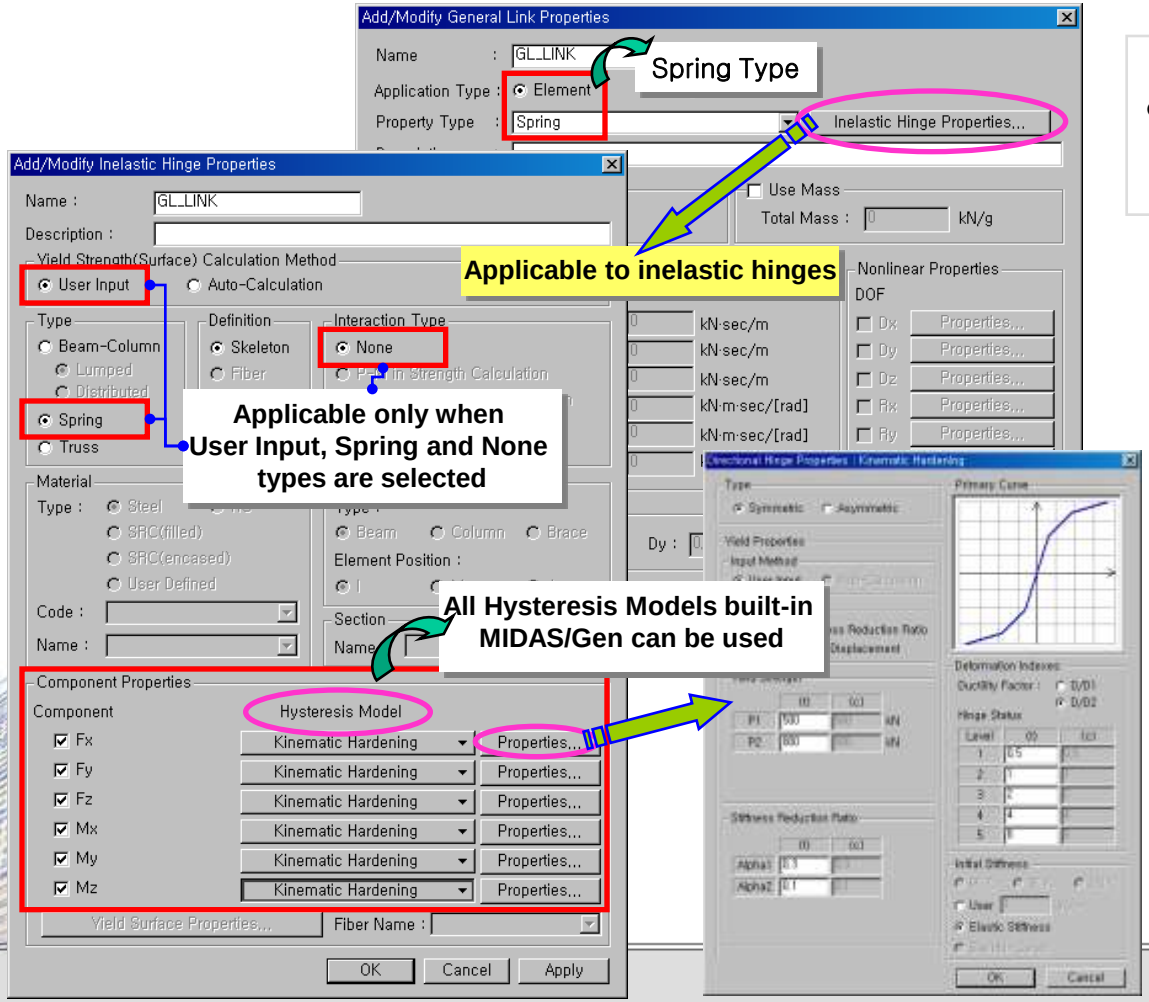
Comment & Reference

- User can define the Shear Spring Location (the option to consider the additional moment occurring at the end of the element due to shear deformation).
- MIDAS/Gen Online Manual V.720
  - Refer to Model > Boundary > General Link Property

B. Pushover Analysis function can be applied to Inelastic Hinges – Inelastic property

Model* > *Boundary* > *General Link Property

Model* > *Property* > *Inelastic Hinge Property



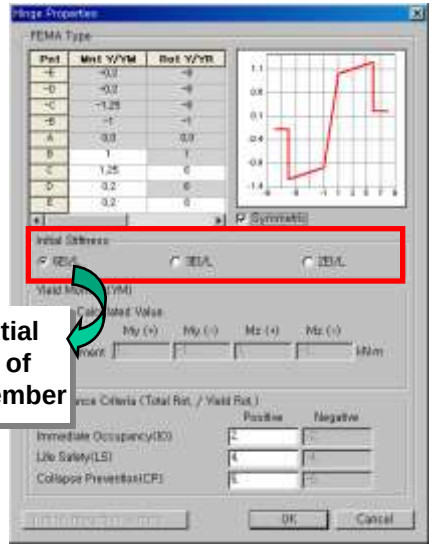
Comment & Reference

- MIDAS/Gen Online Manual V.720
  - Refer to Model > Property > Inelastic Hinge Property
  - Refer to Model > Boundary > General Link Property

C. Enhancements of Plastic Hinges

i. Disequilibrium force in a member has been resolved

a. FEMA Type: Enable the user to define the initial stiffness of flexural member to be used in inelastic analysis



b. Multi-linear Type: Distributed hinge type for inelastic time history analysis has been added

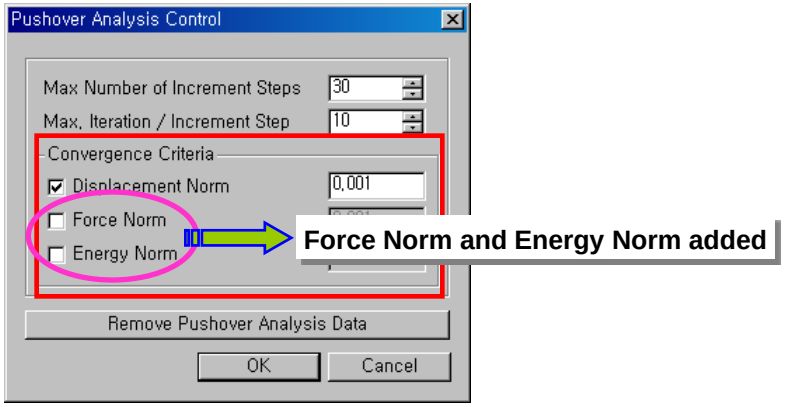
ii. Improvement in convergence of pushover analysis using wall elements

	Pushover Analysis	
	Multi-linear	FEMA
Flexural member	$M-\phi$	$M-\theta$
Inelastic hinge	At both ends of a member	At both ends of a member
Plastic length of a member	1/6L from both ends	0
Flexibility of a member	$F = F_{EI} + F_{Hinge}$	$F = F_{EI} + F_{Hinge}$

D. Enhancements in Convergence Problem and Reliability of Pushover Analysis

i. Convergence Criteria, Force Norm and Energy Norm have been added

Design > Pushover Analysis > Pushover Analysis Control



Reference

● MIDAS/Gen Online Manual V.720
- Refer to Design > Pushover Analysis > Pushover Analysis Control

ii. Residual disequilibrium force after the convergence for each increment is determined has been resolved

iii. Revision of hysteresis routine – Unloading routine added

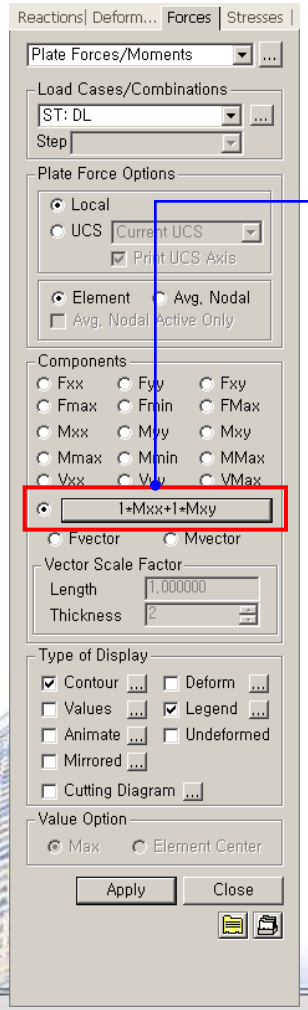
iiii. Enhancements of algorithm to improve other convergence problem

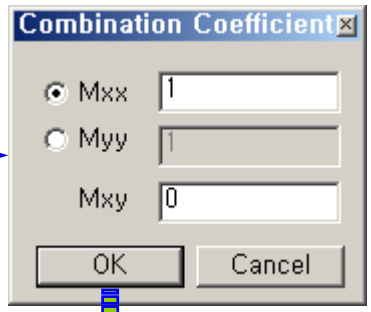
Contents

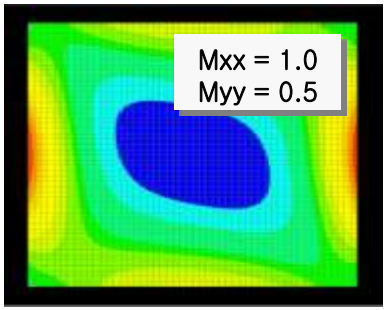
Results Part

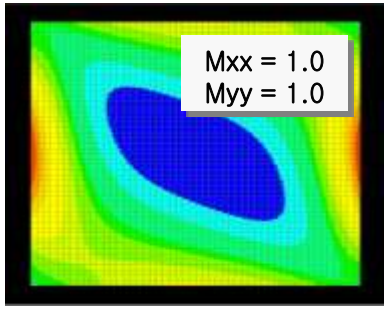
(1) Display of Moment Combination in Plate Force/Moment Result

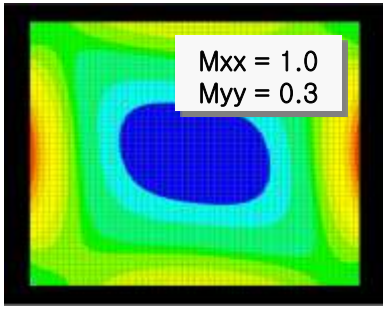
Results > ***Forces*** > ***Plate Forces / Moments***

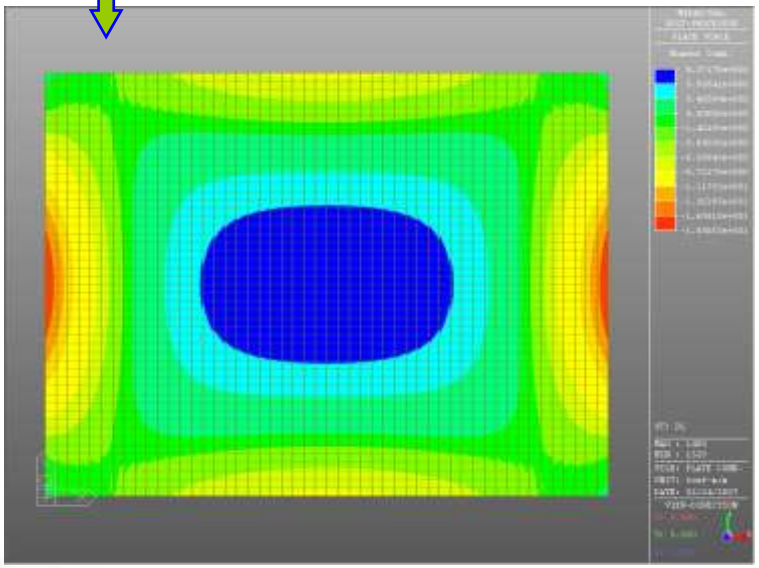












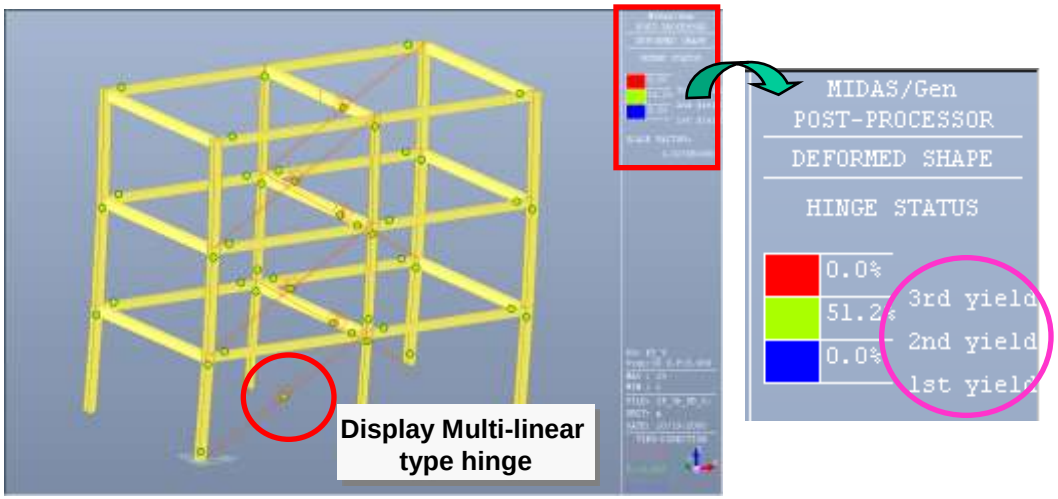
Reference

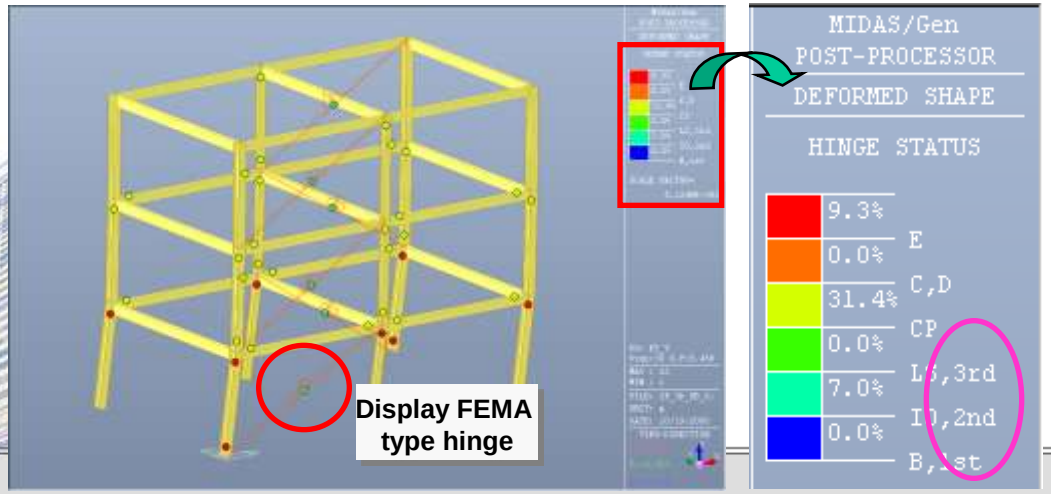
- MIDAS/Gen V.720 Online Manual
  - Refer to Results > Forces > Plate Force

(2) Enhancements of Pushover Analysis Result

A. Display Hinge Status of General Link Elements

Results > ***Deformations*** > ***Deformed Shape***





Related Functions

- Design > Pushover Analysis > **Hinge Status Table**

Reference

- MIDAS/Gen V.720 Online Manual
  Refer to Results > Deformations > Deformed Shape

(3) Enhancements of Story Result Tables

A. The method of calculating the Story Shear Force Ratio due to Response Spectrum loads has been changed

Results > ***Result Tables*** > ***Story*** > ***Story Shear Force Ratio***

	Story	Level (cm)	Load	Type	No	Angle1 ([deg])	Force1 (tonf)	Ratio1	Angle2 ([deg])	Force2 (tonf)	Ratio2
	Angle for static load case result: 0 [Deg]										
	Input angle and press 'Apply' button to change angle.				0	Apply					
▶	1F	500,0000	RX(RS)	Wall	7	0,00	135,4665	0,22	90,00	0,0000	0,00
	1F	500,0000	RX(RS)	Wall	6	0,00	96,8251	0,16	90,00	0,0000	0,00
	1F	500,0000	RX(RS)	Wall	5	0,00	0,0000	0,00	90,00	37,4619	0,44
	1F	500,0000	RX(RS)	Wall	4	0,00	89,6931	0,15	90,00	0,0000	0,00
	1F	500,0000	RX(RS)	Wall	3	0,00	25,4096	0,04	90,00	0,0000	0,00
	1F	500,0000	RX(RS)	Wall	2	0,00	94,2724	0,16	90,00	0,0000	0,00
	1F	500,0000	RX(RS)	Wall	1	0,00	0,0000	0,00	90,00	9,4073	0,11
	1F	500,0000	RX(RS)	Wall	8	0,00	0,0000	0,00	90,00	33,4247	0,39
	1F	500,0000	RX(RS)	Frame	111	0,00	6,0620	0,01	90,00	0,2199	0,00
	1F	500,0000	RX(RS)	Frame	110	0,00	5,7450	0,01	90,00	0,1442	0,00
	1F	500,0000	RX(RS)	Frame	127	0,00	6,6658	0,01	90,00	0,3536	0,00
	1F	500,0000	RX(RS)	Frame	126	0,00	5,7537	0,01	90,00	0,2176	0,00
	1F	500,0000	RX(RS)	Frame	125	0,00	11,0612	0,02	90,00	0,2640	0,00
	1F	500,0000	RX(RS)	Frame	124	0,00	5,8712	0,01	90,00	0,5577	0,01
	1F	500,0000	RX(RS)	Frame	123	0,00	4,2690	0,01	90,00	0,5943	0,01
	1F	500,0000	RX(RS)	Frame	122	0,00	10,6623	0,02	90,00	0,4565	0,01
	1F	500,0000	RX(RS)	Frame	121	0,00	11,1041	0,02	90,00		
	1F	500,0000	RX(RS)	Frame	120	0,00	3,9859	0,01	90,00		
	1F	500,0000	RX(RS)	Frame	119	0,00	4,1711	0,01	90,00		
	1F				118	0,00	10,7155	0,02	90,00		
	1F				117	0,00	11,0585	0,02	90,00		
	1F				116	0,00	15,4217	0,03	90,00		
	1F				115	0,00	15,2465	0,03	90,00		
	1F				114	0,00	10,6716	0,02	90,00	0,1018	0,00
	1F				113	0,00	5,9438	0,01	90,00	0,1458	0,00
	1F				112	0,00	6,1142	0,01	90,00	0,2190	0,00
	1F	500,0000	RX(RS)	Frame	129	0,00	5,9514	0,01	90,00	0,1790	0,00
	1F	500,0000	RX(RS)	Frame	128	0,00	6,5942	0,01	90,00	0,3184	0,00
	SUMMATION OF STORY SHEAR FORCE										
	1F		RX(RS)	Frame		0,00	163,0689	0,27	90,00	5,3606	0,06
	1F		RX(RS)	Wall		0,00	441,6667	0,73	90,00	80,2940	0,94
	1F		RX(RS)	Sum		0,00	604,7355		90,00	85,6546	

Sum of the story shear forces that Frame and Wall share respectively

The sum of the ratios of Frame and Wall is 1

Related Functions

- Model > Buildong > **Control Data**
  - Story Shear Force Ratio Check On

Reference

- MIDAS/Gen Online Manual V.720
  - Refer to Results > Result Tables > Story Shear Force Ratio
- Story Shear Force due to RS loads is calculated by combining the story shear forces of each mode using the modal combination method.

B. Enhancements of Stiffness Irregularity Check Table

Results > ***Result Tables*** > ***Story*** > ***Stiffness Irregularity Check***

Example: Stiffness Irregularity Check

	Load Case	Story	Level (mm)	Story Height (mm)	Story Drift (mm)	Story Shear Force (tonf)	Story Stiffness	Upper Story Stiffness		Story Stiffness Ratio	Story Drift Angle Ratio	Remark
								0.7Ku1	0.8Ku123			
▶	RX(RS)	6F	13400.00	2600.00	0.7957	-5.30	3267.43	0.00	0.00	0.000	0.000	Regular
	RX(RS)	5F	10800.00	2600.00	2.6495	-10.15	981.31	2287.20	0.00	0.429	3.330	Irregular
	RX(RS)	4F	8200.00	2600.00	0.9014	-15.64	2884.29	686.92	0.00	4.199	0.340	Regular
	RX(RS)	3F	5600.00	2600.00	0.8323	-20.34	3123.69	2019.01	1902.14	1.547	0.923	Regular
	RX(RS)	2F	3000.00	2600.00	0.8444	-23.72	3079.25	2186.58	1863.81	1.408	1.014	Regular
	RX(RS)	1F	0.00	3000.00	0.7715	-25.62	3888.55	2155.48	2423.26	1.605	0.792	Regular
	RY(RS)	6F	13400.00	2600.00					0.00	0.000	0.000	Regular
	RY(RS)	5F	10800.00	2600.00					0.00	1.349	1.059	Regular
	RY(RS)	4F	8200.00	2600.00					0.00	2.621	0.545	Regular
	RY(RS)	3F	5600.00	2600.00	0.2205	6.99	11790.67	14273.15	-	0.826	1.729	Irregular
	RY(RS)	2F	3000.00	2600.00	0.2532	8.51	10269.89	8253.47	-	1.244	1.148	Regular
	RY(RS)	1F	0.00	3000.00	0.2552	9.32	11753.67	7188.93		1.038	0.874	Regular

Module not defined

	Module	Load Case	Story	Level (m)	Story Height (m)	Story Drift (m)	Story Shear Force (kN)	Story Stiffness	Upper Story Stiffness		Story Stiffness Ratio	Story Drift Angle Ratio	Remark
									0.7Ku1	0.8Ku123			
▶	Right	RX(RS)	15F	30.00	3.00	0.0014	565.55	2199.30	0.00	0.00	0.000	0.000	Regular
	Right	RX(RS)	13F	27.00	3.00	-0.0044	702.74	-	1539.51	0.00	0.444	3.210	Irregular
	Right	RX(RS)	11F	24.00	3.00	0.0063	1840.16	479.43	-	0.00	1.002	1.426	Regular
	Right	RX(RS)	9F	21.00	3.00	0.00				-	4.022	0.224	Regular
	Right	RX(RS)	7F	18.00	3.00	0.00			6.17	-	1.504	0.950	Regular
	Left	RX(RS)	15F	30.00	3.00	0.00			0.00	0.00	0.000	0.000	Regular
	Left	RX(RS)	13F	27.00	3.00	0.0018	282.56	1867.09	1521.65	0.00	1.413	1.011	Regular
	Left	RX(RS)	11F	24.00	3.00	-0.0083	408.63	-	1306.98	0.00	0.276	5.172	Irregular
	Left	RX(RS)	9F	21.00	3.00	0.0102	1474.84	292.69	-	-	-	1.233	Regular
	Left	RX(RS)	7F	18.00	3.00	0.0017	1640.75	1786.79	204.88	-	3.425	0.164	Regular
	Left	RX(RS)	5F	15.00	3.00	0.0016	1763.24	1837.99	1250.75	-	1.470	0.972	Regular
	Left	RX(RS)	3F	12.00	3.00	0.0016	1849.56	1933.03	1286.59		1.502	0.951	Regular
	Left	RX(RS)	1F	9.00	3.00	0.0014	1905.82	2087.51	1353.12	1482.00	1.409	0.909	Regular
	Base	RX(RS)	6F	15.00	3.00	0.0013	3188.66	2365.48	0.00	0.00	0.000	0.000	Regular
	Base	RX(RS)	5F	12.00	3.00	0.0005	3282.80	6478.40	1655.84	0.00	3.912	0.365	Regular
	Base	RX(RS)	4F	9.00	3.00	0.0016	5160.49	1846.34	4534.88	0.00	0.408	3.505	Irregular
	Base	RX(RS)	3F	6.00	3.00	0.0009	5470.63	3295.95	1293.84	2851.26	1.786	0.561	Regular
	Base	RX(RS)	2F	3.00	3.00	0.0007	5672.06	4099.03	2307.16	3099.39	1.419	0.749	Regular
	Base	RX(RS)	1F	0.00	3.00	0.0004	5758.05	7094.03	3079.32	2544.66	2.564	0.557	Regular

Module defined

Comment

- If Story Drift is negative (-), the stiffness of the corresponding story is displayed with "-".

C. NG is displayed in red in the Remark column of the Story Result Tables

Results > ***Result Tables*** > ***Story Tables***

Example: Story Drift

	Maximum Drift of All Vertical Elements				Drift at the Center of Mass				
			Story Drift Ratio	Remark	Story Drift (m)	Modified Drift (m)	Drift Factor (Maximum/Current)	Story Drift Ratio	Remark
	RMC=1, Cd/Ie=Not Used, Scale Factor=1, Allowable Ratio=0,000666667 Press right mouse button and click 'Set Story Drift Parameters...' menu to change RMC or Cd/Ie/Scale Factor/Allowable Ratio/Beta!								
▶	0,0023	0,0023	0,0006	OK	0,0022	0,0022	1,0378	0,0005	OK
	0,0025	0,0025	0,0006	OK	0,0024	0,0024	1,0414	0,0006	OK
	0,0026	0,0026	0,0006	OK	0,0025	0,0025	1,0434	0,0006	OK
	0,0028	0,0028	0,0007	NG	0,0027	0,0027	1,0384	0,0007	OK
	0,0033	0,0033	0,0008	NG	0,0032	0,0032	1,0309	0,0008	NG
	0,0036	0,0036	0,0009	NG	0,0035	0,0035	1,0261	0,0009	NG
	0,0038	0,0038	0,0010	NG	0,0038	0,0038	1,0223	0,0009	NG
	0,0039	0,0039	0,0010	NG	0,0038	0,0038	1,0177	0,0010	NG
	0,0039	0,0039	0,0010	NG	0,0038	0,0038	1,0141	0,0010	NG
	0,0041	0,0041	0,0009	NG	0,0041	0,0041	1,0112	0,0009	NG
	0,0035	0,0035	0,0008	NG	0,0035	0,0035	1,0125	0,0008	NG
	0,0021	0,0021	0,0004	OK	0,0020	0,0020	1,0190	0,0004	OK

Example: Capacity Irregularity Check

					Remark1	Story Shear Strength2 (tonf)	Upper Story Shear Strength2 (tonf)	Story Shear Strength Ratio2	Remark2
	Angle = 0 [Deg]								
	Input angle and	Apply							
▶	11F	1382,4824	0,0000	0,0000	Regular	1459,6755	0,0000	0,0000	Regular
	10F	1382,4824	1382,4824	1,0000	Regular	1459,6755	1459,6755	1,0000	Regular
	9F	1835,2650	1382,4824	1,3275	Regular	1459,6755	1459,6755	1,0000	Regular
	8F	2046,7073	1835,2650	1,1152	Regular	1590,9289	1459,6755	1,0899	Regular
	7F	1650,0829	2046,7073	0,8062	Regular	1590,9289	1590,9289	1,0000	Regular
	6F	1748,4406	1650,0829	1,0596	Regular	1640,9915	1590,9289	1,0315	Regular
	5F	1827,4179	1748,4406	1,0452	Regular	1697,3842	1640,9915	1,0344	Regular
	4F	2069,1307	1827,4179	1,1323	Regular	2048,2023	1697,3842	1,2067	Regular
	3F	27392598,9173	2069,1307	13238,6993	Regular	2137,9997	2048,2023	1,0438	Regular
	2F	41088157,3694	27392598,9173	1,5000	Regular	32871041,1802	2137,9997	15374,6703	Regular
	1F	41088157,3694	41088157,3694	1,0000	Regular	32871035,7020	32871041,1802	1,0000	Regular
	Base	13697835,1814	41088157,3694	0,3334	Height Limi	2577,4667	32871035,7020	0,0001	Height Limit

Related Functions

- Story Result Tables that display NG in the Remark column
  - Story Drift
  - Story Shear Force Coefficient
  - Torsional Irregularity Check
  - Stiffness Irregularity Check
  - Weight Irregularity Check
  - Capacity Irregularity Check

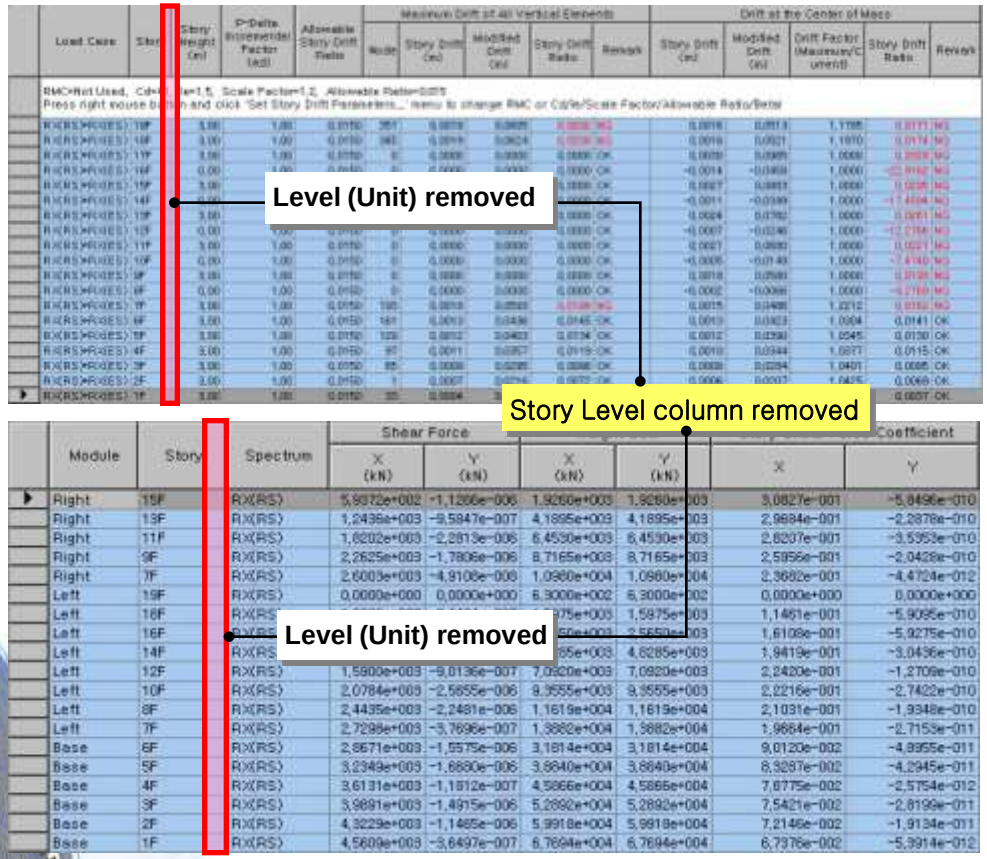
D. Application of Module function extended to more Story Result Tables

Results > ***Result Tables*** > ***Story Tables***

Application of Module function	Remark
Story Drift	Already existed
Story Displacement	Already existed
Story Shear Forces (Response Spectrum Analysis)	Newly added
Story Mode Shape	Already existed
Story Eccentricity	Newly added
Story Shear Force Ratio	Newly added
Torsional Amplification Factor	Already existed
Overturning Moment	Already existed
Story Axial Force Sum	Already existed
Stability Coefficient	Already existed
Torsional Irregularity Check	Already existed
Stiffness Irregularity Check	Already existed
Capacity Irregularity Check	Already existed

E. Level column removed from the Story Drift and Story Shear Force Coefficient Tables

Results > ***Result Tables*** > ***Story*** > ***Story Drift, Story Drift (Time History Analysis), Story Shear (Response Spectrum Analysis) - Story Shear Force Coefficient***



Module	Story	Spectrum	Shear Force X (kN)	Shear Force Y (kN)	Shear Force X (kN)	Shear Force Y (kN)	Coefficient X	Coefficient Y
Right	15F	RX(RS)	5.9372e+002	-1.1266e-006	1.9260e+003	1.9260e+003	3.0827e-001	-5.8496e-010
Right	13F	RX(RS)	1.2436e+003	-9.5847e-007	4.1895e+003	4.1895e+003	2.9884e-001	-2.2878e-010
Right	11F	RX(RS)	1.8202e+003	-2.2813e-006	6.4530e+003	6.4530e+003	2.8207e-001	-3.5353e-010
Right	9F	RX(RS)	2.2625e+003	-1.7806e-006	8.7165e+003	8.7165e+003	2.5956e-001	-2.0428e-010
Right	7F	RX(RS)	2.6003e+003	-4.9108e-006	1.0960e+004	1.0960e+004	2.3692e-001	-4.4724e-012
Left	15F	RX(RS)	0.0000e+000	0.0000e+000	6.3000e+002	6.3000e+002	0.0000e+000	0.0000e+000
Left	13F	RX(RS)			1.5975e+003	1.5975e+003	1.1461e-001	-5.9095e-010
Left	11F	RX(RS)					1.6109e-001	-5.9275e-010
Left	9F	RX(RS)			4.6285e+003	4.6285e+003	1.9419e-001	-3.0436e-010
Left	7F	RX(RS)	1.5900e+003	-9.0136e-007	7.0920e+003	7.0920e+003	2.2420e-001	-1.2709e-010
Left	5F	RX(RS)	2.0784e+003	-2.5855e-006	9.3555e+003	9.3555e+003	2.2216e-001	-2.7422e-010
Left	3F	RX(RS)	2.4435e+003	-2.2481e-006	1.1619e+004	1.1619e+004	2.1031e-001	-1.9348e-010
Left	1F	RX(RS)	2.7298e+003	-3.7696e-007	1.3882e+004	1.3882e+004	1.9664e-001	-2.7153e-011
Base	6F	RX(RS)	2.8671e+003	-1.5575e-006	3.1814e+004	3.1814e+004	9.0120e-002	-4.8955e-011
Base	5F	RX(RS)	3.2349e+003	-1.6690e-006	3.8840e+004	3.8840e+004	8.3287e-002	-4.2945e-011
Base	4F	RX(RS)	3.6131e+003	-1.1812e-007	4.5866e+004	4.5866e+004	7.8775e-002	-2.5754e-012
Base	3F	RX(RS)	3.9891e+003	-1.4915e-006	5.2892e+004	5.2892e+004	7.5421e-002	-2.8199e-011
Base	2F	RX(RS)	4.3229e+003	-1.1465e-006	5.9918e+004	5.9918e+004	7.2146e-002	-1.9134e-011
Base	1F	RX(RS)	4.5609e+003	-3.8497e-007	6.7694e+004	6.7694e+004	6.7376e-002	-5.6914e-012

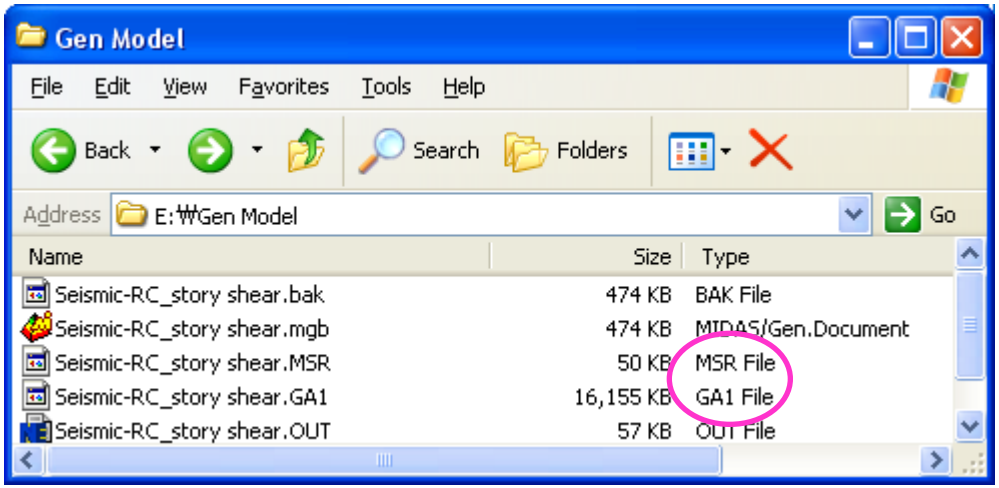
Reference

- MIDAS/Gen Online Manual V.720
  - Results > Result Tables > Story Drift
  - Results > Result Tables
    > Story Drift (Time History Analysis)
  - Results > Result Tables
    > Story Shear (Response Spectrum Analysis)

Results Part

(4) Display Story Shear Force for each Mode

Results* > *Result Text Output (*. MSR, *. GA1)



*. MSR file

INERTIA FORCE & STORY SHEAR FORCE OF RESPONSE SPECTRUM ANALYSIS

INERTIA FORCE & STORY SHEAR FORCE : RESPONSE SPECTRUM LOADCASE = 1

INERTIA FORCE & STORY SHEAR FORCE : MODE NUMBER = 1 UNIT : TONF,MM

STORY ID	STORY LEVEL	INERTIA FORCE X-DIR	INERTIA FORCE Y-DIR	SPRING FORCE X-DIR	SPRING FORCE Y-DIR	STORY SHEAR(W/O SPRING) X-DIR	STORY SHEAR(W/O SPRING) Y-DIR	STORY SHEAR(W/ SPRING) X-DIR	STORY SHEAR(W/ SPRING) Y-DIR
1	0.000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.7315E-01	-0.3866E+01	0.7315E-01	-0.3866E+01
2	5000.000	0.9790E-03	-0.2881E-01	0.0000E+00	0.0000E+00	0.7217E-01	-0.3837E+01	0.7217E-01	-0.3837E+01
3	9500.000	0.2721E-02	-0.7810E-01	0.0000E+00	0.0000E+00	0.6945E-01	-0.3759E+01	0.6945E-01	-0.3759E+01

INERTIA FORCE & STORY SHEAR FORCE : MODE NUMBER = 2 UNIT : TONF,MM

STORY ID	STORY LEVEL	INERTIA FORCE X-DIR	INERTIA FORCE Y-DIR	SPRING FORCE X-DIR	SPRING FORCE Y-DIR	STORY SHEAR(W/O SPRING) X-DIR	STORY SHEAR(W/O SPRING) Y-DIR	STORY SHEAR(W/ SPRING) X-DIR	STORY SHEAR(W/ SPRING) Y-DIR
1	0.000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.2010E+00	0.7207E+01	0.2010E+00	0.7207E+01
2	5000.000	0.1610E-02	0.3143E-01	0.0000E+00	0.0000E+00	0.1994E+00	0.7176E+01	0.1994E+00	0.7176E+01
3	9500.000	0.4794E-02	0.9274E-01	0.0000E+00	0.0000E+00	0.1946E+00	0.7083E+01	0.1946E+00	0.7083E+01

INERTIA FORCE & STORY SHEAR FORCE : MODE NUMBER = 3 UNIT : TONF,MM

STORY ID	STORY LEVEL	INERTIA FORCE X-DIR	INERTIA FORCE Y-DIR	SPRING FORCE X-DIR	SPRING FORCE Y-DIR	STORY SHEAR(W/O SPRING) X-DIR	STORY SHEAR(W/O SPRING) Y-DIR	STORY SHEAR(W/ SPRING) X-DIR	STORY SHEAR(W/ SPRING) Y-DIR
1	0.000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.5997E+03	-0.3340E+01	0.5997E+03	-0.3340E+01
2	5000.000	0.5436E+01	-0.6102E-01	0.0000E+00	0.0000E+00	0.5943E+03	-0.3279E+01	0.5943E+03	-0.3279E+01
3	9500.000	0.1448E+02	-0.1596E+00	0.0000E+00	0.0000E+00	0.5798E+03	-0.3120E+01	0.5798E+03	-0.3120E+01

Related Functions

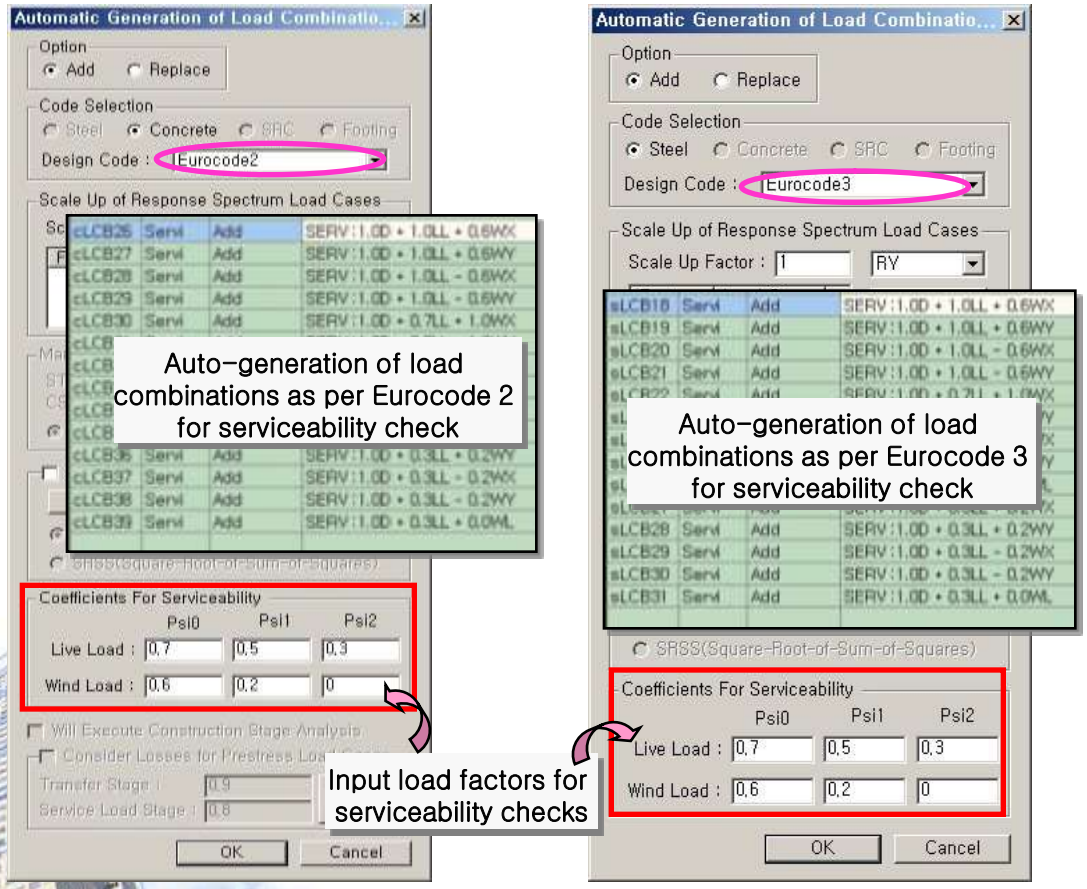
- Loads > Response Spectrum Analysis Data > **Response Spectrum Load Case**
- Analysis > **Eigenvalue Analysis Control**
- Results > Result Tables > Story > **Story Shear Force Ratio**, **Story Shear (Response Spectrum Analysis)**

Contents

(1) Serviceability Checks as per Eurocode 2 & 3

A. Generate Load Combinations for Serviceability Checks

Results > ***Combinations***



Related Function

- Design > General Design Parameters > **Serviceability Load Combination Type**

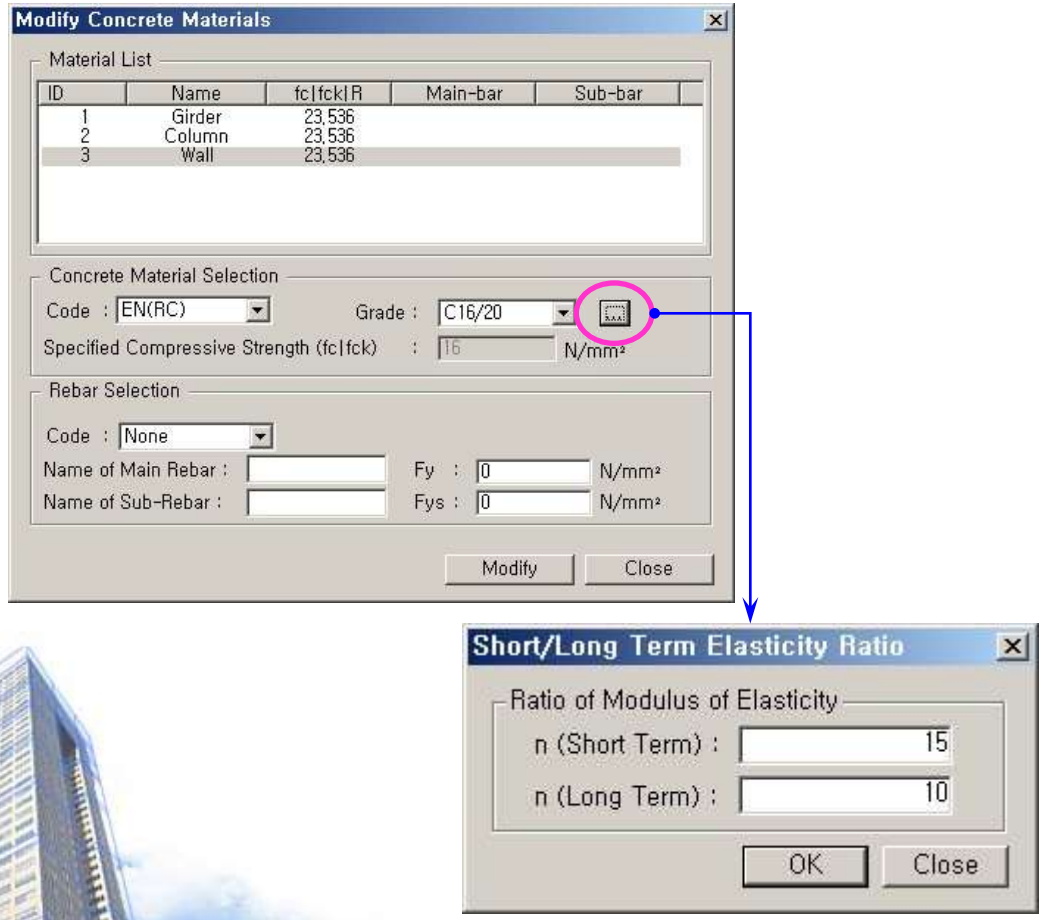
References

- MIDAS/Gen V.720 Online Manual

  - Refer to [Procedure for Serviceability Check as per Eurocode 2] in Design > Concrete Code Checking > Beam Checking
  - Refer to [Procedure for Serviceability Check as per Eurocode 3] in Design > Steel Code Check

B. Enter long term and short term Elastic Modulus Ratios

Design > ***Concrete Code Design*** > ***Modify Concrete Material***



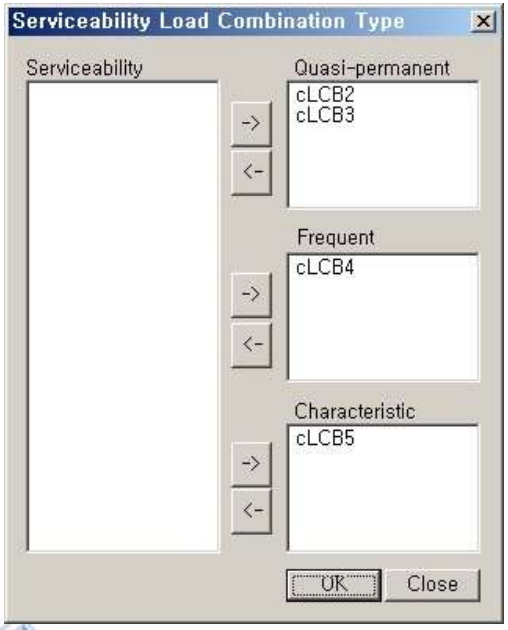
Comment & References

- Short/Long Term Elasticity Ratio
  - Default for Short Term: Es/Ec
  - Default for Long Term: 2(Es/Ec)
- MIDAS/Gen V.720 Online Manual

  - Refer to [Procedure for Serviceability Check as per Eurocode 2] in Design > Concrete Code Checking > Beam Checking
  - Refer to [Procedure for Serviceability Check as per Eurocode 3] in Design > Steel Code Check

C. Assign or check Serviceability Load Combination Type

Design > ***General Design Parameters*** > ***Serviceability Load Combination Type***

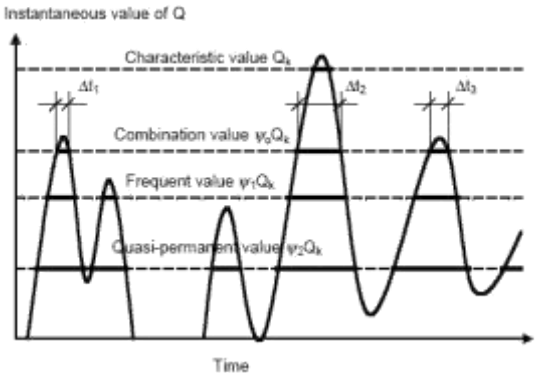


Load Combination Types for Serviceability Checks

1. Quasi-permanent

2. Frequent

3. Characteristic



Related Functions

- Results > **Combinations**

Comment & References

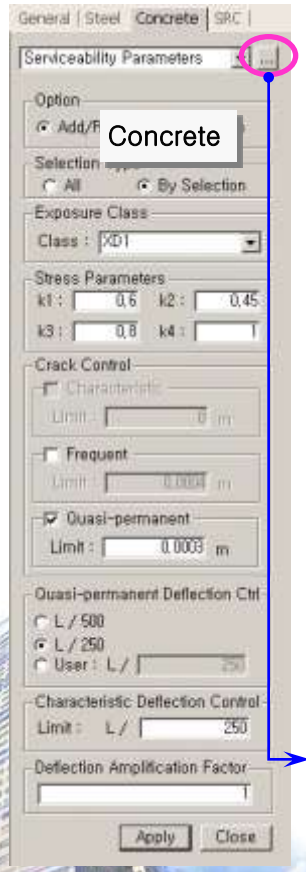
- Once serviceability load combinations are created by using Auto Generation of Results > Combination, the created load combinations are automatically classified into Serviceability Load Combination Type dialog box according to types.
- MIDAS/Gen V.720 Online Manual

  - Refer to [Procedure for Serviceability Check as per Eurocode 2] in Design > Concrete Code Checking > Beam Checking
  - Refer to [Procedure for Serviceability Check as per Eurocode 3] in Design > Steel Code Check

D. Enter Parameters for Serviceability Checks

Design > ***Concrete Design Parameters*** > ***Serviceability Parameters***

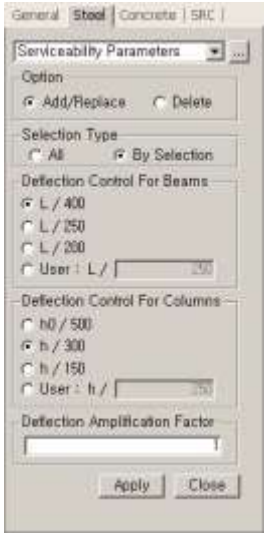
Design > ***Steel Design Parameters*** > ***Serviceability Parameters***



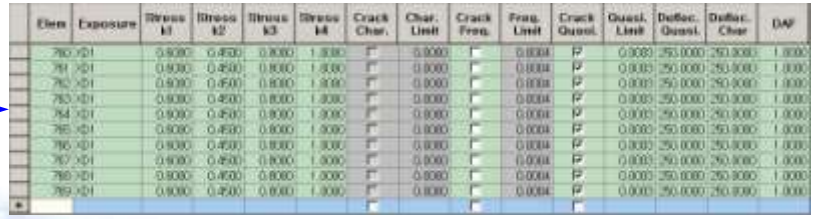
Parameters for Serviceability Checks

1. Concrete (Beam)
   - Crack Control
   - Deflection Control

2. Steel (Beam, Column)
   - Deflection Control



	Elem	Type	Deflec. Control	DAF
	304	Column	300.0000	1.0000
	1490	Beam	400.0000	1.0000
	1493	Beam	400.0000	1.0000
*				



Related Functions

- Design > Concrete Code Checking > **Beam Checking**
- Design > **Steel Code Check**

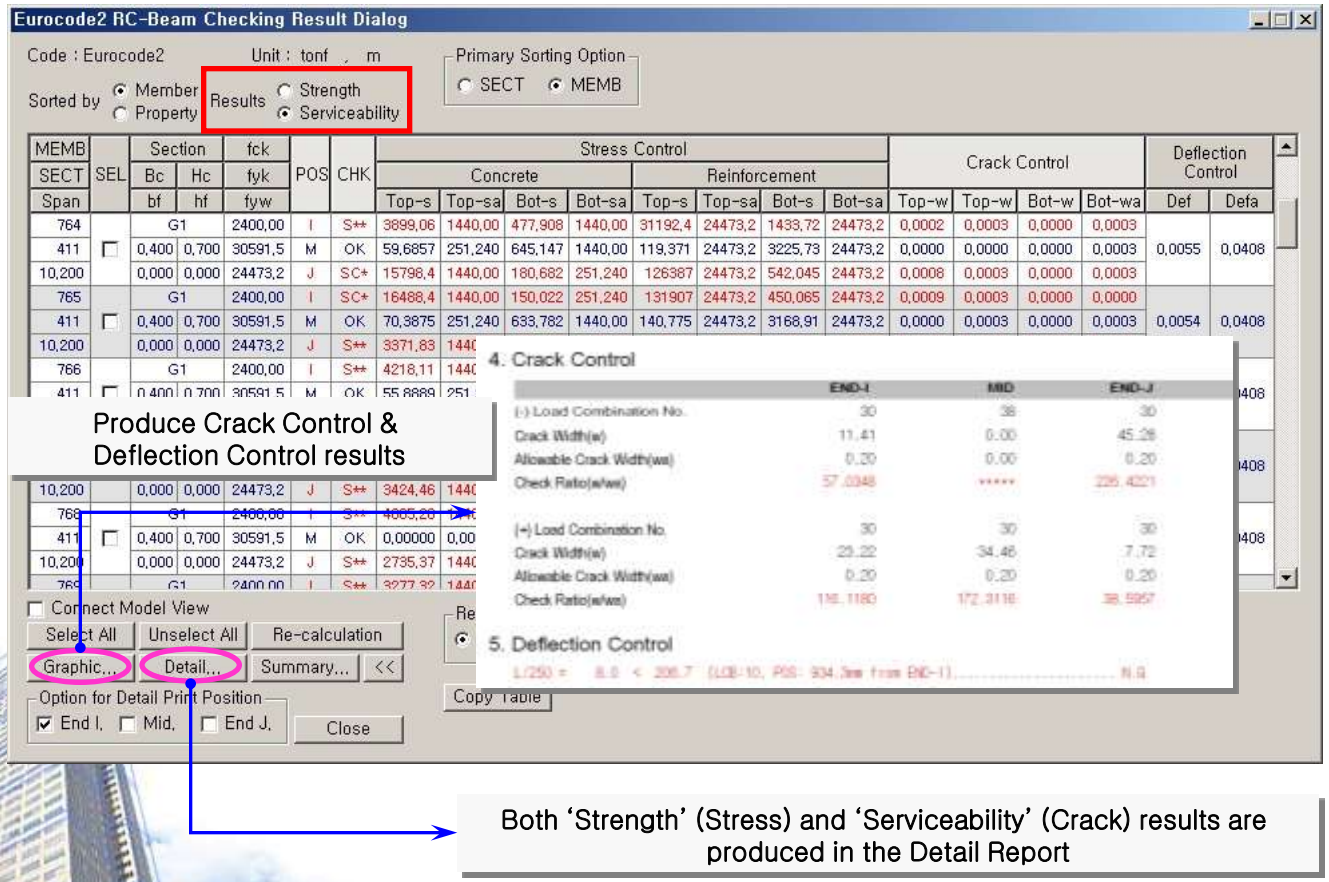
References

- MIDAS/Gen V.720 Online Manual

  - Refer to [Procedure for Serviceability Check as per Eurocode 2] in Design > Concrete Code Checking > Beam Checking
  - Refer to [Procedure for Serviceability Check as per Eurocode 3] in Design > Steel Code Check

E. Serviceability Checking Results as per Eurocode 2

Design* > *Concrete Code Checking* > *Beam Checking



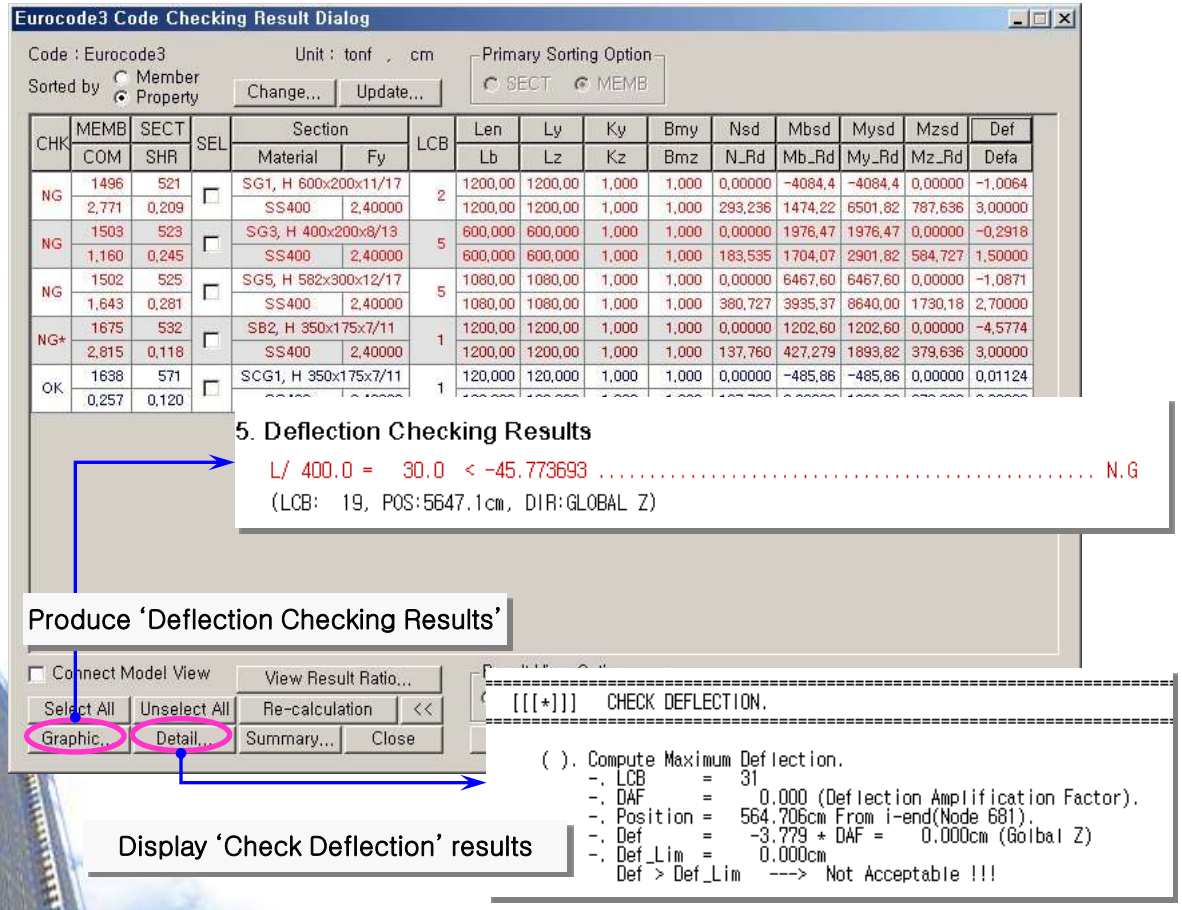
Comments & References

- Graphic Report
  - Crack Control
  - Deflection Control
- Detail Report
  - Stress (Strength Results)
  - Crack (Serviceability Results)
- MIDAS/Gen V.720 Online Manual

  - Refer to [Procedure for Serviceability Check as per Eurocode 2] in Design > Concrete Code Checking > Beam Checking
  - Refer to [Procedure for Serviceability Check as per Eurocode 3] in Design > Steel Code Check

F. Serviceability Checking Results as per Eurocode 3

Design > ***Steel Code Check***



Comments & References

- Graphic Report
  - Deflection Checking Results
- Detail Report
  - Check Deflection
- MIDAS/Gen V.720 Online Manual

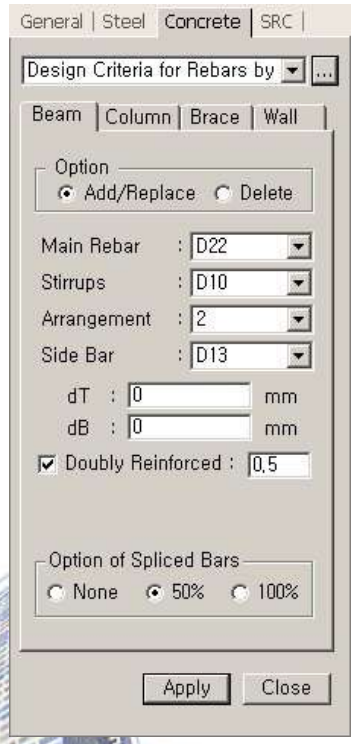
  - Refer to [Procedure for Serviceability Check as per Eurocode 2] in Design > Concrete Code Checking > Beam Checking
  - Refer to [Procedure for Serviceability Check as per Eurocode 3] in Design > Steel Code Check

Design Part

(2) Assign Rebars by Members

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

Design > ***Concrete Design Parameters***
> ***Concrete Design Tables*** > ***Design Criteria for Rebar by Members***



Beam Rebar Table

	Element	Main Rebar	Stirrups	Arrangement	Side Bar	dT (mm)	dB (mm)	Option of Sliced Bars
	1	D22	D10	2	D13	0.0000	0.0000	50%
	7	D22	D10	2	D13	0.0000	0.0000	50%
	13	D16	D10	2	D13	0.0000	0.0000	50%
*								

Column/Brace Rebar Table

	Element	Main Rebar	Ties/Spirals	Arrangement Y	Arrangement Z	d0 (mm)	Option of Sliced Bars
	15	D22	D10	4	3	50.000	50%
	16	D22	D10	2	2	50.000	50%
	21	D22	D10	2	4	50.000	50%
	22	D22	D10	2	3	50.000	50%
*							

Wall Rebar Table

	Wall ID	Story	Vertical Rebar	Horizontal Rebar	End Rebar From	dE (mm)	dW (mm)
	2	1F	D13	D10	D10	0.0000	0.0000
	7	1F	D13	D10	D10	70.000	50.000
	8	1F	D13	D10	D10	0.0000	0.0000
*							

Comment & References

- MIDAS/Gen V.720 Online Manual

  - Design > Concrete Design Parameters
    > Design Criteria for Rebar by Members
  - Design > Concrete Design Parameters
    > Concrete Design Tables > Design Criteria for Rebar by Members

- While 'Design Criteria for Rebars' enables the user to assign rebars by sections, 'Design Criteria for Rebar by Members' enables the user to assign rebars by members. 'Design Criteria for Rebar by Members' precedes 'Design Criteria for Rebars' when both are assigned.

(3) Disregard of Extremely Small Compression/Tension in Nonlinear Members

Design > ***Concrete Code Design*** > ***RC, Column, Wall, Brace Design***

Design > ***SRC Code Check*** > ***Column Checking***

Design > ***Steel Code Check***

Revision of V720

In cases where tension-only/compression-only elements have extremely small compression/tension, the compression/tension forces are ignored in the design process.

Steel Design
- Compression/tension forces are ignored if they are less than 1/10000 of (Steel Sectional Area × Fy).
- This is identically applied to tapered sections and the area is measured at the section where the strength check is to be performed.

RC Design
- Compression/tension forces are ignored if they are less than 1/10000 of (Concrete Area × Fck).
- Reinforcement is not taken into account since the forces are calculated before design.

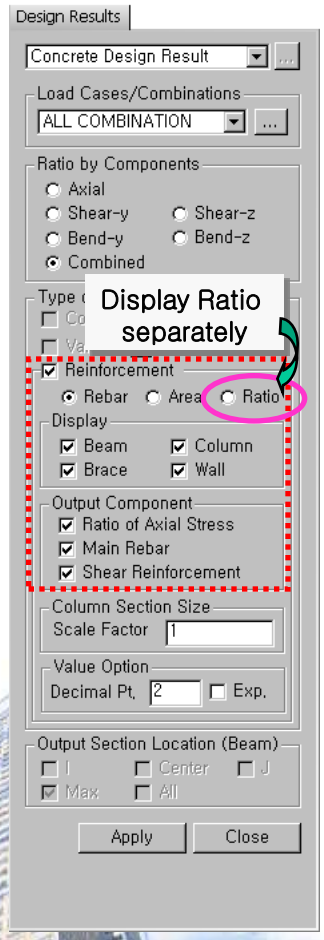
SRC Design
- Compression/tension forces are ignored if they are less than 1/10000 of (Steel Sectional Area × Fy).
- In SRC Design, it is common to design in a way that only the steel section can resist compression and tension

Related Functions

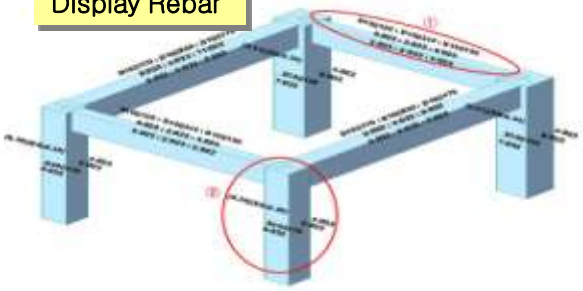
- Model > Elements > Create Element
  Tension Only/Hook/Cable, Compression Only/Gab
- Load >
  Create Load Cases Using Load Combinations
- Analysis > **Main Control Data**

(4) Enhancements of Concrete Design Result (Rebar, Area and Ratio separately displayed)

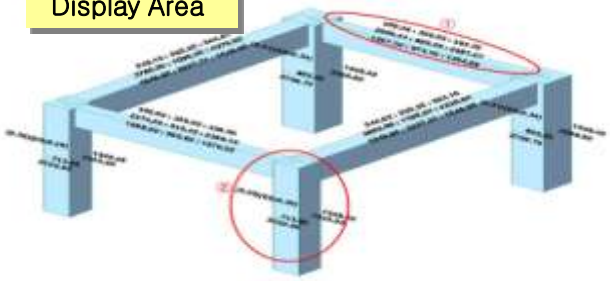
Design > ***Concrete Design Result***



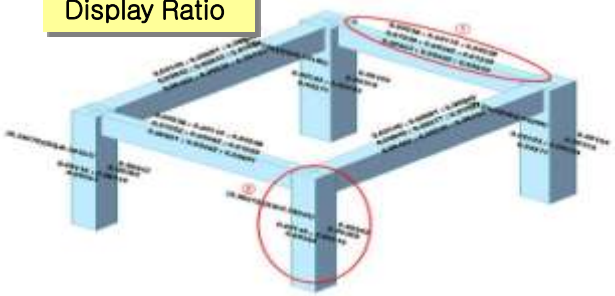
Display Rebar



Display Area



Display Ratio



Reference

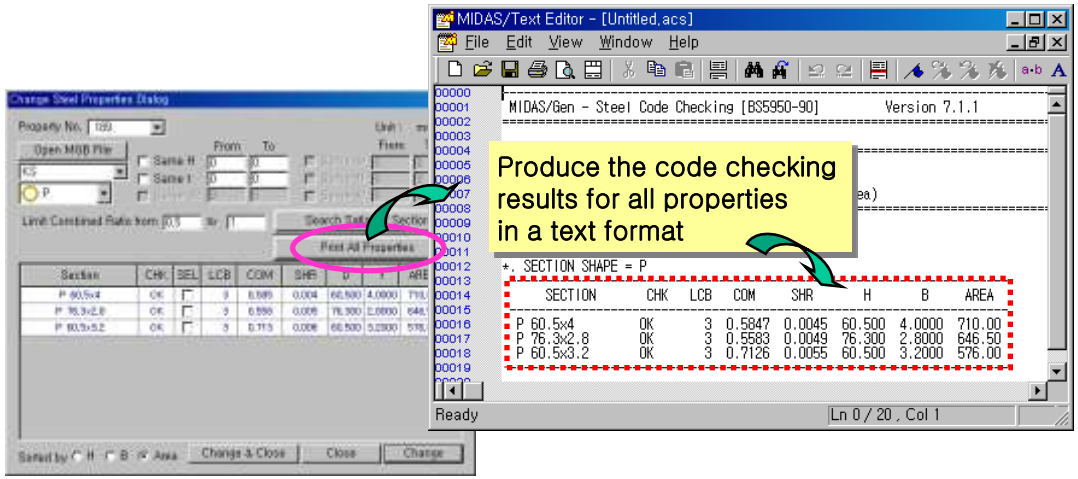
- MIDAS/Gen V.720 Online Manual

  - Refer to Design > Concrete Design Result

(5) Enhancements of Steel Design

A. 'Change Steel Properties Dialog' displays code checking results for all Properties

Design > ***Steel Code Check***



B. Revision of Steel Code Checking Detail Calculations

Revision of **V720**

Old Version: Detail report used to display the calculations corresponding to the location of member and load combination, which produced the most critical combined stress.

New Version: Detail report displays the calculations corresponding to the location of member, which produces the more critical one of the most unfavorable combined stress and the most unfavorable shear stress.

Design Part

(6) Enhancements of Orthogonal Effect in Seismic Load Cases

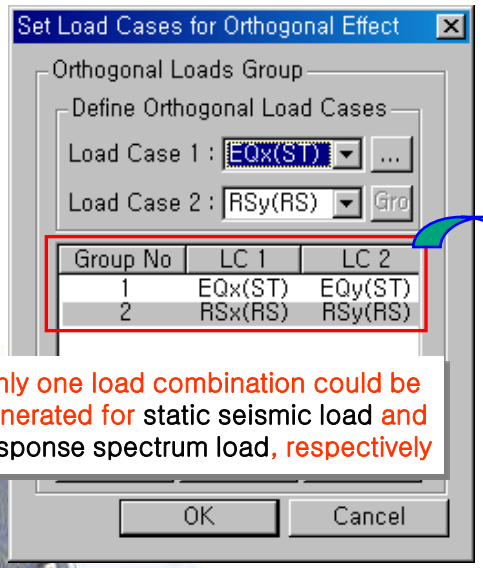
V702

- While generating static seismic load combinations with Orthogonal Effect considered, only one load combination was generated. For example, only one of [E(X), E(Y)], [E(Y),E(Z)] and [E(Z),E(X)] could be generated. (This was identically applied to Response Spectrum Loads.)

V720

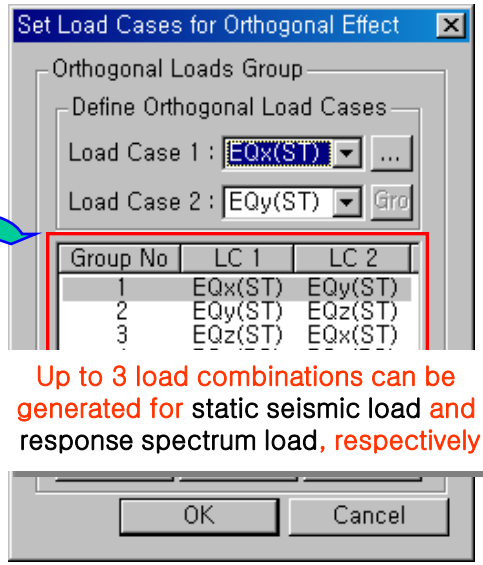
- [E(X), E(Y)], [E(Y),E(Z)] and [E(Z),E(X)] can be all generated. (This is identically applied to Response Spectrum Loads.)

V710 (R2)



Only one load combination could be generated for static seismic load and response spectrum load, respectively

V710 (R3)



Up to 3 load combinations can be generated for static seismic load and response spectrum load, respectively

Related Function

- Results > Combinations
  Set Load Cases for Orthogonal Group

Miscellaneous

Contents

(1) Enhancements of Display function

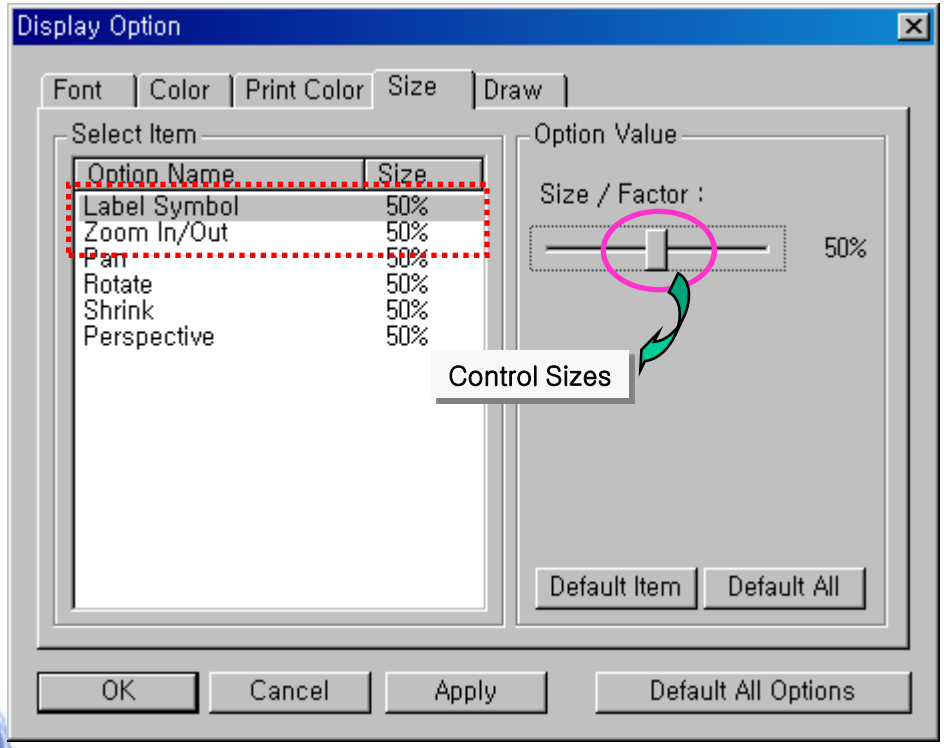
(2) Graphics Option added in Preferences Menu

(3) Save all Graphic Design Results as a graphic file format

(1) Enhancements of Display function

A. Hinge Size can be controlled

View > *Display Option*



Related Functions

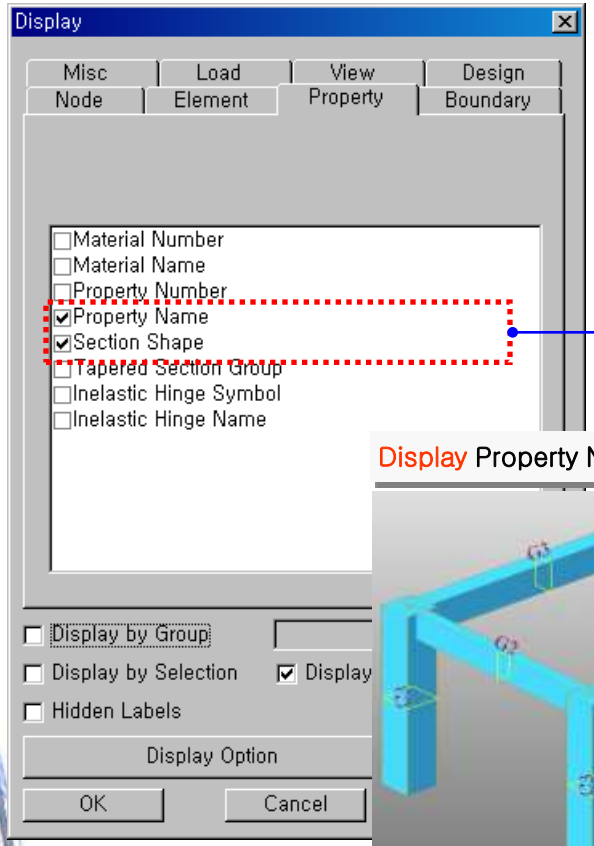
- Results > Deformations > **Deformed Shape**
  - Inelastic Time History Analysis Result
  - Pushover Analysis Result

Reference

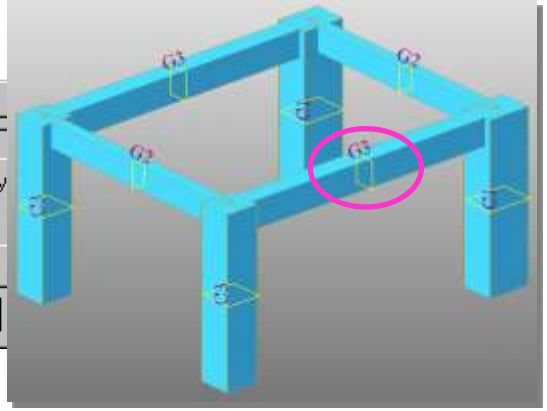
- MIDAS/Gen V.712 Online Manual
  - Refer to View > Display Option

B. Simultaneously display the Section Shape and the Section Property Name

View > ***Display***



Display Property Name and Section Shape simultaneously



Related Functions

- Model > Property > **Sections**

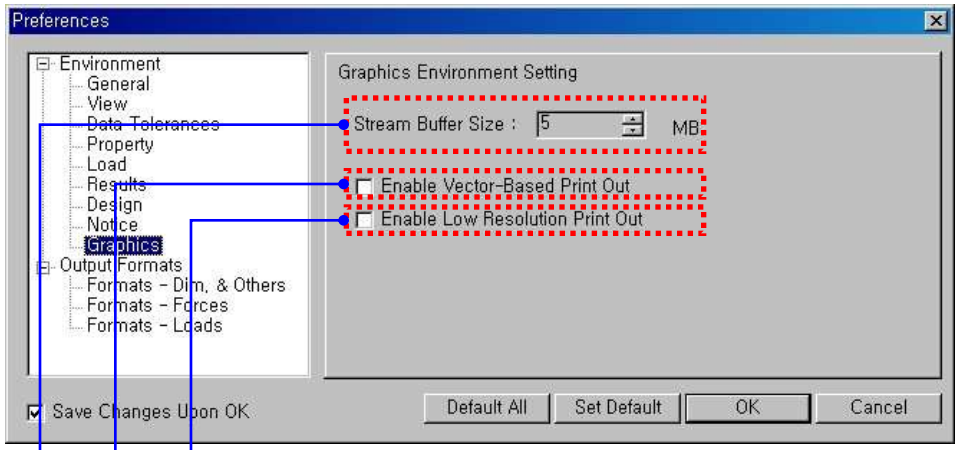
Reference

- MIDAS/Gen V.712 Online Manual
  - Refer to View > Display

Miscellaneous

(2) Graphics Option added in Preferences Menu

Tools > ***Preference***



Enable Low Resolution Print Out
Optimize the background when the Vector-Based Print Out option is enabled

Enable Vector-Based Print Out
Reduce time for printout using the Vector-Based Engine of low resolution

Stream Buffer Size
Specify the Buffer Size according to the configuration of the graphic card

Reference

- MIDAS/Gen V.720 Online Manual
  - Refer to Tools > Preference

(3) Save all Graphic Design Results as a graphic file format

Design* > *Design Result Dialog & Code Check Result Dialog

Revision of V720

Old Version: Save the graphic design result of a single member or property

New Version: Save the graphic design results of a lot of members or properties