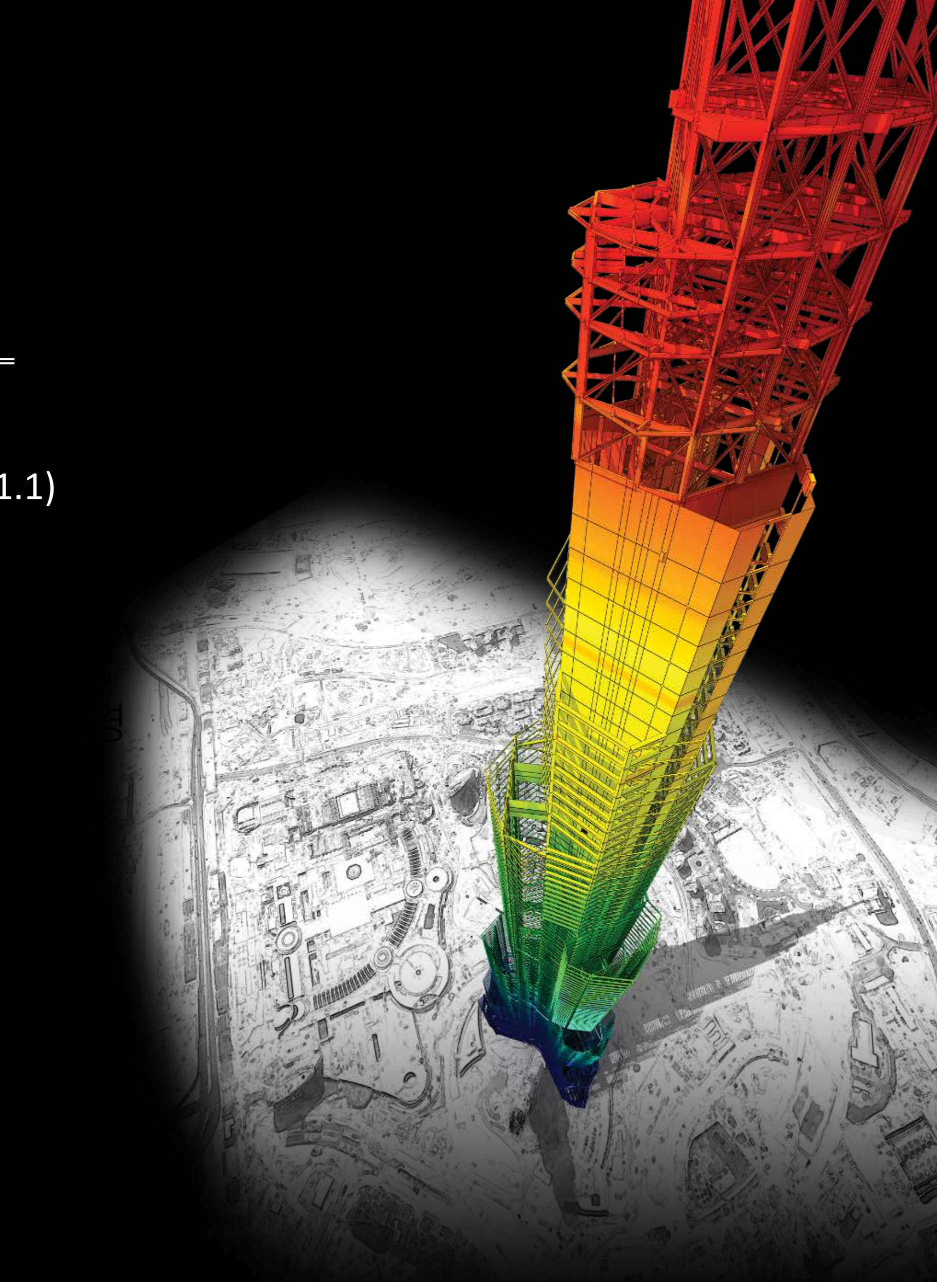
Release Note

Release Date: July, 2018

Product Ver. : Gen 2019 (v1.1) and Design + 2019 (v1.1)



DESIGN OF General Structures

Integrated Design System for Building and General Structures

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midas **Gen**

1. 構件設計 (歐規NTC 2018)

Reference in NTC 2018	Details
-	Add Material of NTC2018 in DShop
-	Add Material of NTC2018 in GSD
7.4.6.2.2	[Column] Modify the calculation of 'Volume of concrete core' in Check mechanical volumetric ratio of confining hoops within the critical regions.
	[Wall End] Modify the calculation of mechanical volumetric ratio within the critical regions.
7.4.4.5.1	1) Shear strength in wall elements under seismic combination is reduced by a 0.4 factor. 2) Design shear force of wall elements use the shear force from analysis without any modification in CD "B".
7.4.6.2.2	Minimum mechanical volumetric ratio is considered as 0.12 only for CD"A" in column and wall.
7.4.4.5.2.2	In wall element for seismic and non-seismic case, wall length for shear design is calculated by 'd=0.9Lw' and 'z= 0.8Lw'

1. 構件設計 (歐規NTC 2018)

- ***Detail Report for Punching Shear Checking as per 6.4.4 and 6.4.5 of EN1992-1-1***

```
Basic control perimeter
rholy   =       0.0000
rholz   =       0.0000
rhol    = min[ sqrt(rholy*rholz), 0.02 ] =       0.0000
K       = min[ 1+(200/d)^0.5, 2.0 ]      =   2.000 (d in mm)
gamma_c =    1.500
V_Rd,c  = max[ 0.035*k^1.5*sqrt(fck), (0.18/gamma_c)*K*(100*rhol*fck)^1/3 ]*u1*d
        =     432.1333 kN.

RatV    = Beta*V_Ed / V_Rd,c =    1.747  >  1.0  --->  Not Acceptable !!!
          (Need Vertical Reinforcements.)
fywd    =  347826.0870 KPa.
fywd_ef = min[ 250+0.25*d, fywd ]      =  293500.0000 KPa
Asw/sr  = Beta*V_Ed / (1.5*d*fywd_ef) =       0.0099 m^2/m.  (       0.0099 m^2/m.)
          (Calculating the outermost perimeter of shear reinforcement.)
uout,ef = Beta*V_Ed/(V_Rd,c/d1) =    0.0010 m.
```

Calculating "Area(Asw) / space(Sr)" of shear reinforcement.

as per EN 1992-1-1:2005/A1:2014

"(1) Where shear reinforcement is required it should be calculated in accordance with Expression (6.52):

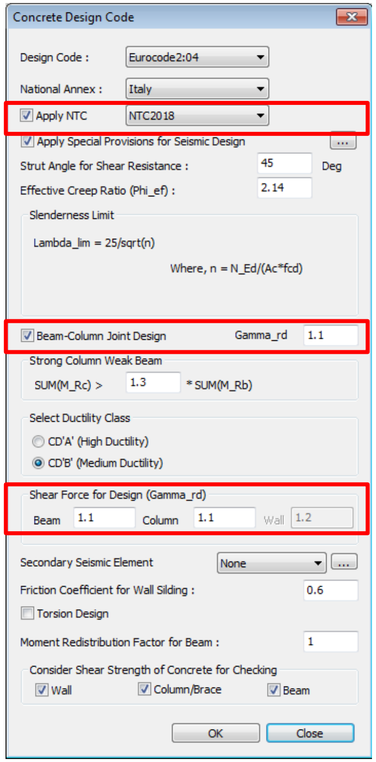
$$v_{Rd,cs} = 0,75\, v_{Rd,c} + 1,5\, (d / s_r)\, A_{sw}\, f_{ywd,ef}\, [1 / (u_1 d)] \sin\alpha \leq k_{max} \cdot v_{Rd,c} \qquad (6.52)$$

where

- A_{sw} is the area of one perimeter of shear reinforcement around the column [mm^2];
- s_r is the radial spacing of perimeters of shear reinforcement [mm];
- $f_{ywd,ef}$ is the effective design strength of the punching shear reinforcement according to $f_{ywd,ef} = 250 + 0,25\, d \leq f_{ywd}$ [MPa];
- d is the mean of the effective depths in the orthogonal directions [mm];
- α is the angle between the shear reinforcement and the plane of the slab;
- $v_{Rd,c}$ according to 6.4.4;
- k_{max} is the factor, limiting the maximum capacity that can be achieved by application of shear reinforcement.

NOTE The value of k_{max} for use in a country may be found in its National Annex. The recommended value is 1,5.

- ***Update default value and default options***



2. 優化材料非線性分析的後處理程序

- Strain results are provided for plastic materials, i.e. Tresca, Von Mises, Mohr-Coulomb, Drucker-Prager, and Concrete Damage.
- Damage ratios for compression and tension are provided for the 'Concrete Damage' model.

Results > Tables > Results Tables > Plate/ Solid > Strain(local)/ Strain(Global)

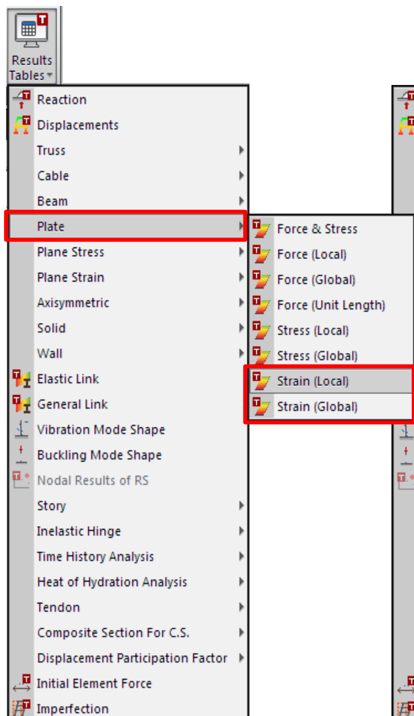
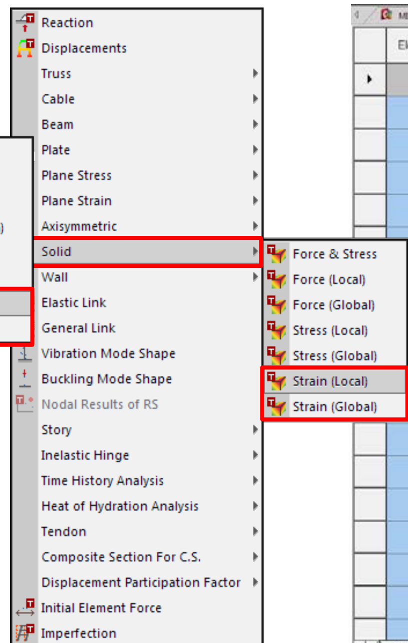
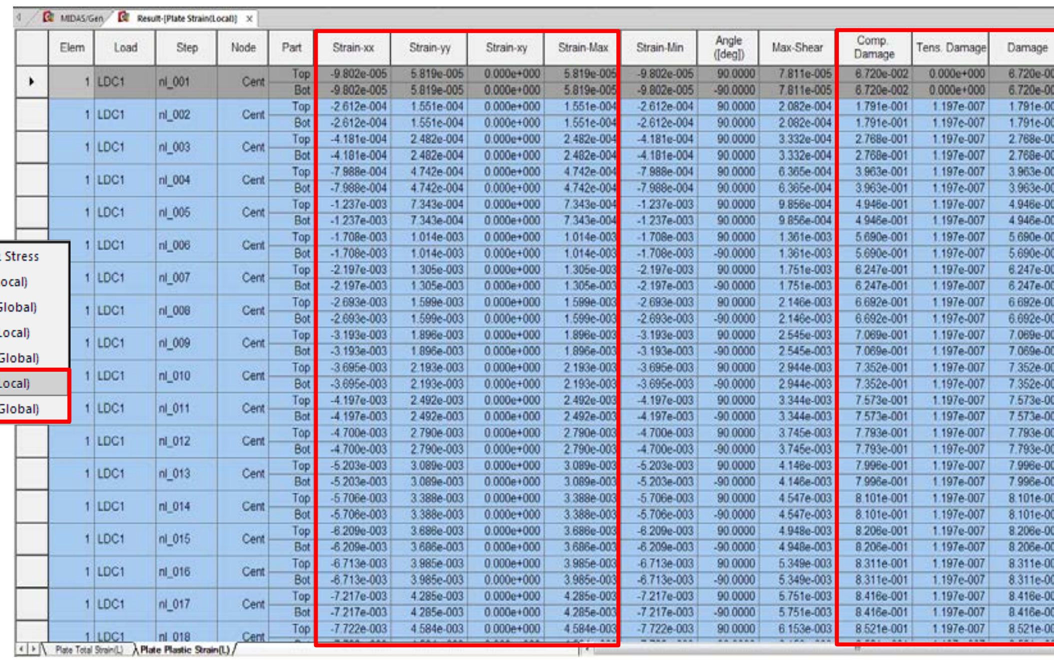


Plate Strain (local) menu



Solid Strain (local) menu



MIDAS/Gen | Result-[Plate Strain(Local)]

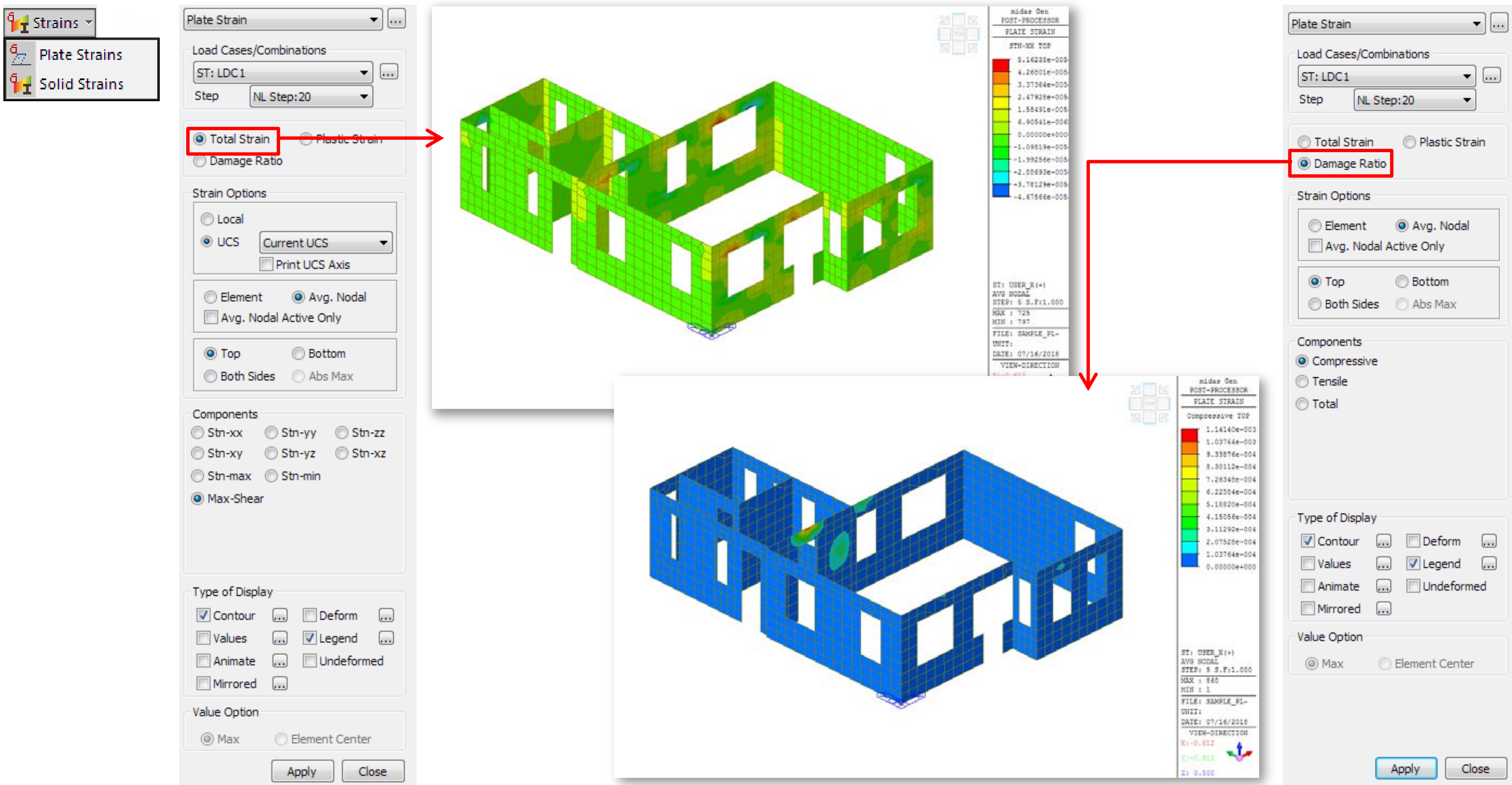
Elem	Load	Step	Node	Part	Strain-xx	Strain-yy	Strain-xy	Strain-Max	Strain-Min	Angle ([deg])	Max-Shear	Comp. Damage	Tens. Damage	Damage
1	LDC1	nl_001	Cent	Top	-9.802e-005	5.819e-005	0.000e+000	5.819e-005	-9.802e-005	90.0000	7.811e-005	6.720e-002	0.000e+000	6.720e-002
				Bot	-9.802e-005	5.819e-005	0.000e+000	5.819e-005	-9.802e-005	-90.0000	7.811e-005	6.720e-002	0.000e+000	6.720e-002
1	LDC1	nl_002	Cent	Top	-2.612e-004	1.551e-004	0.000e+000	1.551e-004	-2.612e-004	90.0000	2.082e-004	1.791e-001	1.197e-007	1.791e-001
				Bot	-2.612e-004	1.551e-004	0.000e+000	1.551e-004	-2.612e-004	90.0000	2.082e-004	1.791e-001	1.197e-007	1.791e-001
1	LDC1	nl_003	Cent	Top	-4.181e-004	2.482e-004	0.000e+000	2.482e-004	-4.181e-004	90.0000	3.332e-004	2.768e-001	1.197e-007	2.768e-001
				Bot	-4.181e-004	2.482e-004	0.000e+000	2.482e-004	-4.181e-004	90.0000	3.332e-004	2.768e-001	1.197e-007	2.768e-001
1	LDC1	nl_004	Cent	Top	-7.988e-004	4.742e-004	0.000e+000	4.742e-004	-7.988e-004	90.0000	6.365e-004	3.963e-001	1.197e-007	3.963e-001
				Bot	-7.988e-004	4.742e-004	0.000e+000	4.742e-004	-7.988e-004	90.0000	6.365e-004	3.963e-001	1.197e-007	3.963e-001
1	LDC1	nl_005	Cent	Top	-1.237e-003	7.343e-004	0.000e+000	7.343e-004	-1.237e-003	90.0000	9.856e-004	4.946e-001	1.197e-007	4.946e-001
				Bot	-1.237e-003	7.343e-004	0.000e+000	7.343e-004	-1.237e-003	90.0000	9.856e-004	4.946e-001	1.197e-007	4.946e-001
1	LDC1	nl_006	Cent	Top	-1.708e-003	1.014e-003	0.000e+000	1.014e-003	-1.708e-003	90.0000	1.361e-003	5.690e-001	1.197e-007	5.690e-001
				Bot	-1.708e-003	1.014e-003	0.000e+000	1.014e-003	-1.708e-003	-90.0000	1.361e-003	5.690e-001	1.197e-007	5.690e-001
1	LDC1	nl_007	Cent	Top	-2.197e-003	1.305e-003	0.000e+000	1.305e-003	-2.197e-003	90.0000	1.751e-003	6.247e-001	1.197e-007	6.247e-001
				Bot	-2.197e-003	1.305e-003	0.000e+000	1.305e-003	-2.197e-003	-90.0000	1.751e-003	6.247e-001	1.197e-007	6.247e-001
1	LDC1	nl_008	Cent	Top	-2.693e-003	1.599e-003	0.000e+000	1.599e-003	-2.693e-003	90.0000	2.146e-003	6.692e-001	1.197e-007	6.692e-001
				Bot	-2.693e-003	1.599e-003	0.000e+000	1.599e-003	-2.693e-003	-90.0000	2.146e-003	6.692e-001	1.197e-007	6.692e-001
1	LDC1	nl_009	Cent	Top	-3.193e-003	1.896e-003	0.000e+000	1.896e-003	-3.193e-003	90.0000	2.545e-003	7.069e-001	1.197e-007	7.069e-001
				Bot	-3.193e-003	1.896e-003	0.000e+000	1.896e-003	-3.193e-003	-90.0000	2.545e-003	7.069e-001	1.197e-007	7.069e-001
1	LDC1	nl_010	Cent	Top	-3.695e-003	2.193e-003	0.000e+000	2.193e-003	-3.695e-003	90.0000	2.944e-003	7.352e-001	1.197e-007	7.352e-001
				Bot	-3.695e-003	2.193e-003	0.000e+000	2.193e-003	-3.695e-003	-90.0000	2.944e-003	7.352e-001	1.197e-007	7.352e-001
1	LDC1	nl_011	Cent	Top	-4.197e-003	2.492e-003	0.000e+000	2.492e-003	-4.197e-003	90.0000	3.344e-003	7.573e-001	1.197e-007	7.573e-001
				Bot	-4.197e-003	2.492e-003	0.000e+000	2.492e-003	-4.197e-003	-90.0000	3.344e-003	7.573e-001	1.197e-007	7.573e-001
1	LDC1	nl_012	Cent	Top	-4.700e-003	2.790e-003	0.000e+000	2.790e-003	-4.700e-003	90.0000	3.745e-003	7.793e-001	1.197e-007	7.793e-001
				Bot	-4.700e-003	2.790e-003	0.000e+000	2.790e-003	-4.700e-003	-90.0000	3.745e-003	7.793e-001	1.197e-007	7.793e-001
1	LDC1	nl_013	Cent	Top	-5.203e-003	3.089e-003	0.000e+000	3.089e-003	-5.203e-003	90.0000	4.146e-003	7.996e-001	1.197e-007	7.996e-001
				Bot	-5.203e-003	3.089e-003	0.000e+000	3.089e-003	-5.203e-003	-90.0000	4.146e-003	7.996e-001	1.197e-007	7.996e-001
1	LDC1	nl_014	Cent	Top	-5.706e-003	3.388e-003	0.000e+000	3.388e-003	-5.706e-003	90.0000	4.547e-003	8.101e-001	1.197e-007	8.101e-001
				Bot	-5.706e-003	3.388e-003	0.000e+000	3.388e-003	-5.706e-003	-90.0000	4.547e-003	8.101e-001	1.197e-007	8.101e-001
1	LDC1	nl_015	Cent	Top	-6.209e-003	3.686e-003	0.000e+000	3.686e-003	-6.209e-003	90.0000	4.948e-003	8.206e-001	1.197e-007	8.206e-001
				Bot	-6.209e-003	3.686e-003	0.000e+000	3.686e-003	-6.209e-003	-90.0000	4.948e-003	8.206e-001	1.197e-007	8.206e-001
1	LDC1	nl_016	Cent	Top	-6.713e-003	3.985e-003	0.000e+000	3.985e-003	-6.713e-003	90.0000	5.349e-003	8.311e-001	1.197e-007	8.311e-001
				Bot	-6.713e-003	3.985e-003	0.000e+000	3.985e-003	-6.713e-003	-90.0000	5.349e-003	8.311e-001	1.197e-007	8.311e-001
1	LDC1	nl_017	Cent	Top	-7.217e-003	4.285e-003	0.000e+000	4.285e-003	-7.217e-003	90.0000	5.751e-003	8.416e-001	1.197e-007	8.416e-001
				Bot	-7.217e-003	4.285e-003	0.000e+000	4.285e-003	-7.217e-003	-90.0000	5.751e-003	8.416e-001	1.197e-007	8.416e-001
1	LDC1	nl_018	Cent	Top	-7.722e-003	4.584e-003	0.000e+000	4.584e-003	-7.722e-003	90.0000	6.153e-003	8.521e-001	1.197e-007	8.521e-001

Plate Total Strain(L) | Plate Plastic Strain(L)

Plate Strain (local) Table

2. 優化混凝土破壞模式分析的後處理程序

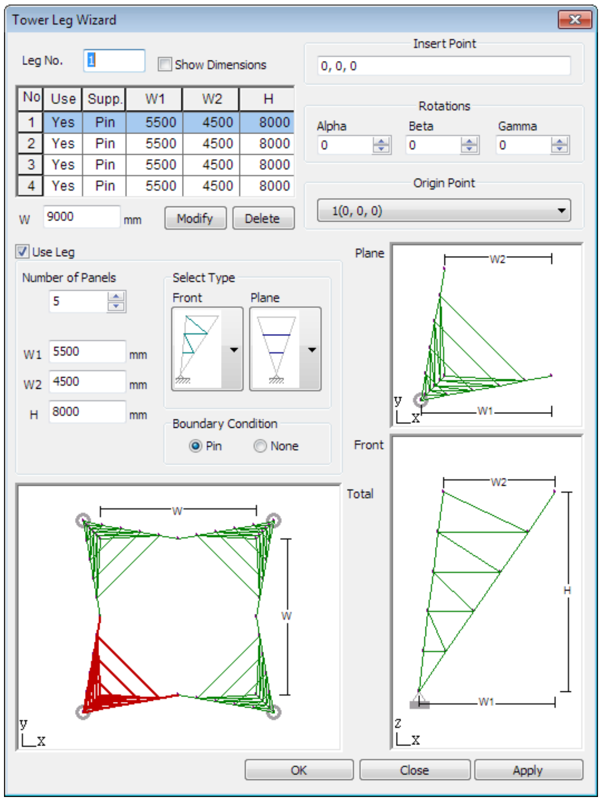
Results > Results > Strains > Plate Strains/ Solid Strains

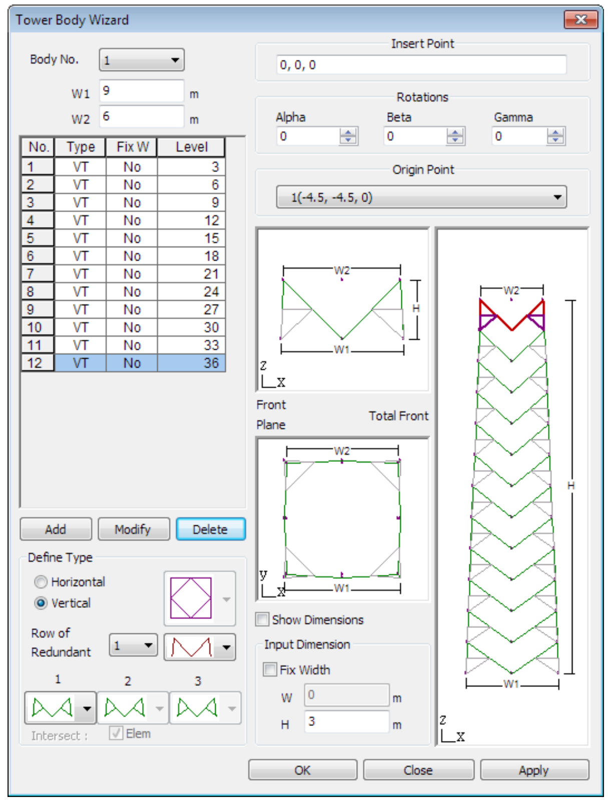


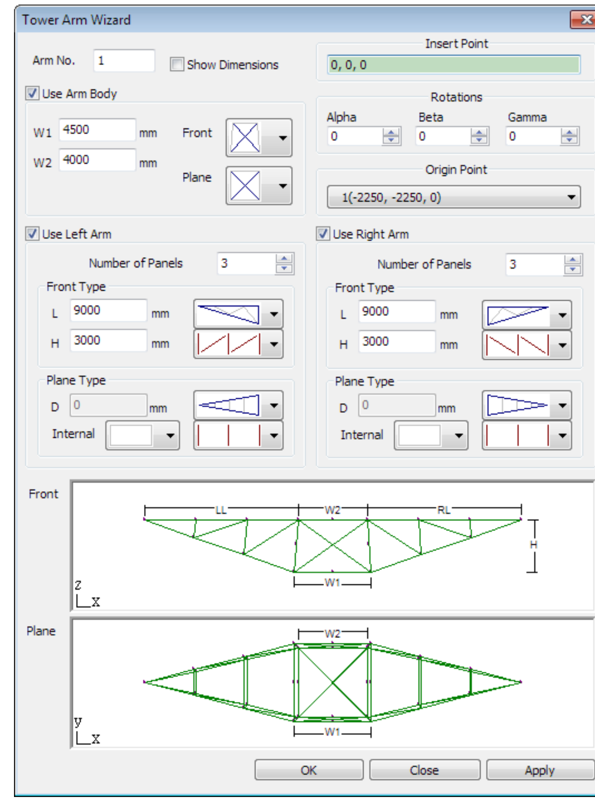
3. 建模精靈自動建立電塔模型

- Tower wizard makes it easy to model the leg / body / arm part of a complex 3D tower structure.

Structure > Wizard > Tower > Tower Leg/ Body/ Arm



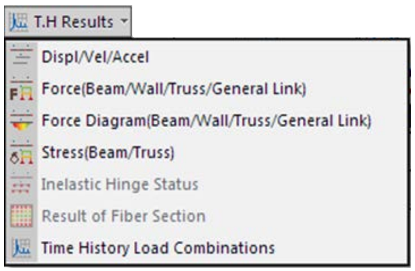


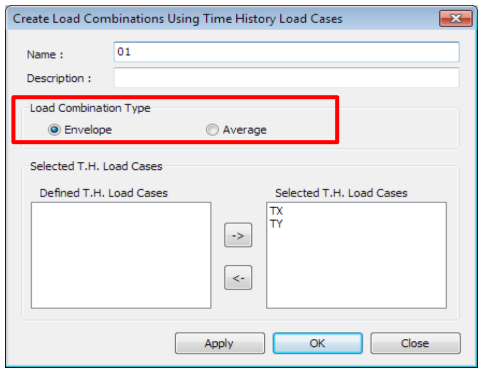


4. 優化歷時分析的後處理程序

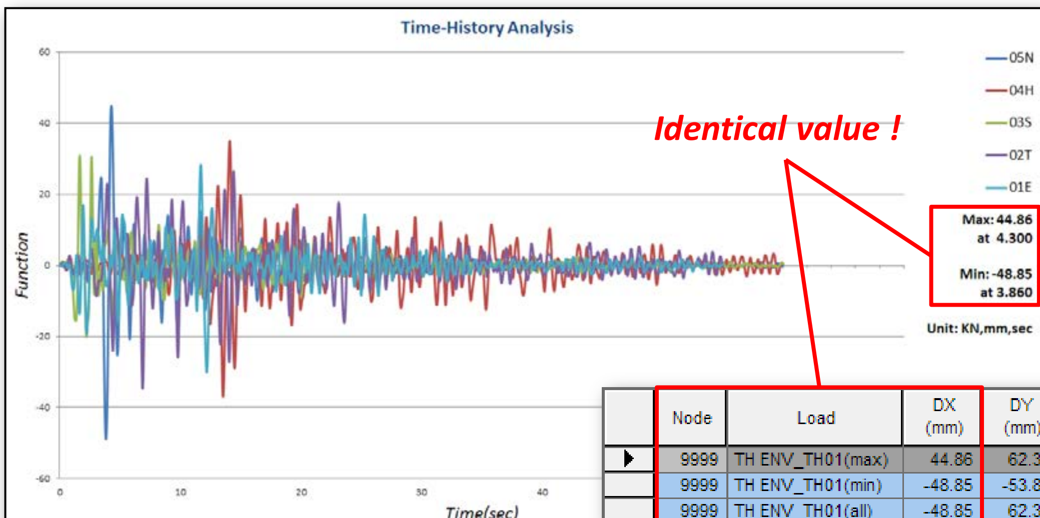
- The average and envelope load cases for the time-history load cases are generated in the table.
- The displacement and the member force are only supported.

Results > Time History > T.H Results > Time History Load Combination

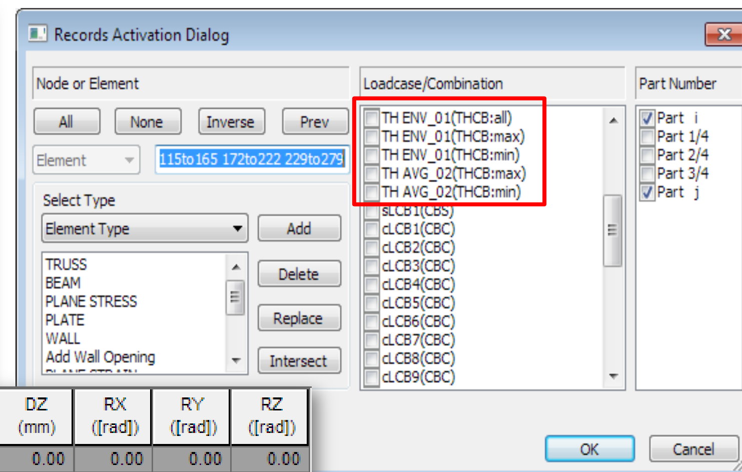




Time History Load Case	Result Type	Detail
Added nonlinear load combination	Cball : TH ENV_User input name	The maximum absolute value among the selected load cases
	Cbmax : TH ENV_User input name	The maximum value among the maximum value of selected load cases
	Cbmin : TH ENV_User input name	The minimum value among the minimum value of selected load cases
	Cbmax : TH AVR_User input name	The average value of the maximum value of selected load cases
	Cbmin : TH AVR_User input name	The average value of minimum value of selected load cases



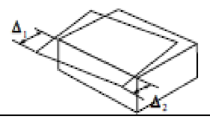
	Node	Load	DX (mm)	DY (mm)	DZ (mm)	RX ([rad])	RY ([rad])	RZ ([rad])
▶	9999	TH ENV_TH01(max)	44.86	62.31	0.00	0.00	0.00	0.00
	9999	TH ENV_TH01(min)	-48.85	-53.82	0.00	0.00	0.00	-0.00
	9999	TH ENV_TH01(all)	-48.85	62.31	0.00	0.00	0.00	-0.00



5. 優化扭轉不規則性檢核表格

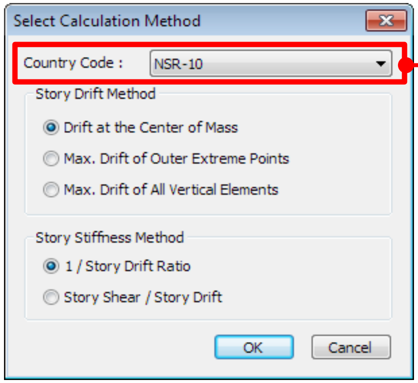
- The ϕp value is added in Torsional Irregularity Check Table as per the Colombia NSR-10 standard.
- The extreme irregular type is added in Remark field.

Tipo 1aP — Irregularidad torsional $\phi_p = 0.9$	Tipo 1bP — Irregularidad torsional extrema $\phi_p = 0.8$
$1.4\left(\frac{\Delta_1+\Delta_2}{2}\right) \geq \Delta_1 > 1.2\left(\frac{\Delta_1+\Delta_2}{2}\right)$	$\Delta_1 > 1.4\left(\frac{\Delta_1+\Delta_2}{2}\right)$



Øp is the factor regarding the plan irregularity. If the structure has normal torsional irregularity (between 1.2 and 1.4) it must use Øp as 0.9. If the structure has extreme torsional irregularity (more than 1.4), Øp will be 0.8. If the structure is regular, Øp will be 1.0.

← Figura A.3-1 — Irregularidades en planta



Regular : Story Drift of Maximum Value =< 1.2*Story Drift of Average Value of Extreme Points

Irregular : 1.2*Story Drift of Average Value of Extreme Points < Story Drift of Maximum Value =< 1.4*Story Drift of Average Value of Extreme Points

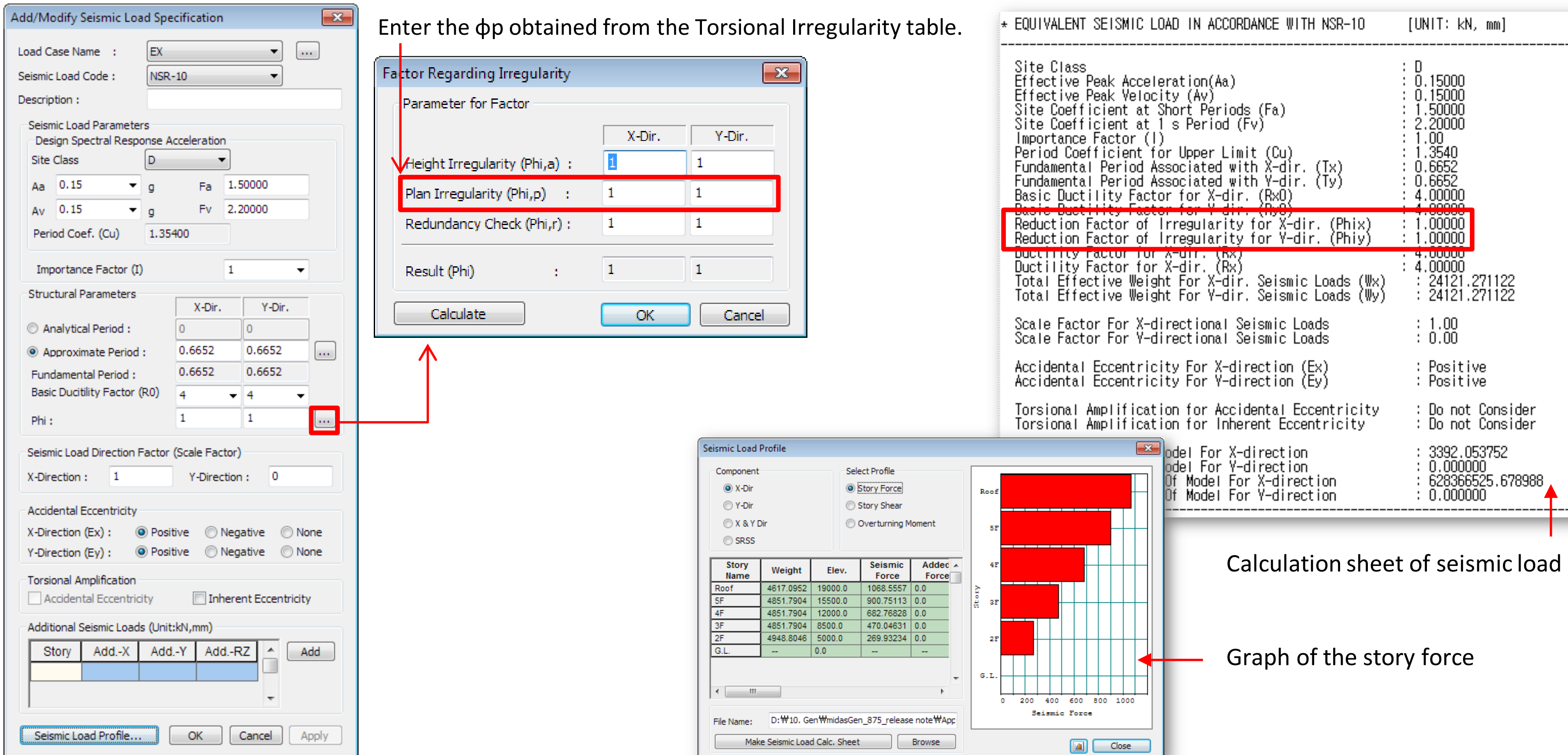
Extreme Irregular : 1.4*Story Drift of Average Value of Extreme Points < Story Drift of Maximum Value

MIDAS/Gen | Result-[Torsional Irregularity Check]

Load Case	Story	Level (mm)	Story Height (mm)	Average Value of Extreme Points		Maximum Value		Remark	Phi_p
				1.4*Story Drift (mm)	1.2*Story Drift (mm)	Node	Story Drift (mm)		
DL	5F	15500.00	3500.00	0.0002	0.0001	107	0.0001	Regular	1.0
DL	4F	12000.00	3500.00	0.0001	0.0000	85	0.0000	Regular	1.0
DL	3F	8500.00	3500.00	0.0000	0.0000	63	0.0000	Regular	1.0
DL	2F	5000.00	3500.00	0.0000	0.0000	21	0.0000	Regular	1.0
DL	1F	0.00	5000.00	0.0000	0.0000	41	0.0000	Regular	1.0
LL	5F	15500.00	3500.00	0.0005	0.0004	107	0.0003	Regular	1.0
LL	4F	12000.00	3500.00	0.0002	0.0002	85	0.0002	Regular	1.0
LL	3F	8500.00	3500.00	0.0002	0.0002	63	0.0001	Regular	1.0
LL	2F	5000.00	3500.00	0.0001	0.0001	21	0.0001	Regular	1.0
LL	1F	0.00	5000.00	0.0002	0.0002	41	0.0001	Regular	1.0
EX	5F	15500.00	3500.00	2.8645	2.4553	123	2.3180	Regular	1.0
EX	4F	12000.00	3500.00	4.1682	3.5728	101	3.5092	Regular	1.0
EX	3F	8500.00	3500.00	5.0753	4.3503	79	[illegible]	Irregular	0.9
EX	2F	5000.00	3500.00	5.7329	4.9139	40	5.3286	Irregular	0.9
EX	1F	0.00	5000.00	13.9758	11.9793	60	14.1114	Extreme Irregu	0.8
EY	5F	15500.00	3500.00	6.5717	5.6328	126	5.1114	Regular	1.0
EY	4F	12000.00	3500.00	11.2747	9.6641	104	8.7462	Regular	1.0
EY	3F	8500.00	3500.00	15.9000	13.6286	82	12.2937	Regular	1.0
EY	2F	5000.00	3500.00	23.9264	20.5084	40	18.3609	Regular	1.0
EY	1F	0.00	5000.00	93.3580	80.0211	60	70.8491	Regular	1.0
WX	5F	15500.00	3500.00	0.0000	0.0000	0	0.0000	Regular	1.0
WX	4F	12000.00	3500.00	0.0000	0.0000	0	0.0000	Regular	1.0
WX	3F	8500.00	3500.00	0.0000	0.0000	0	0.0000	Regular	1.0
WX	2F	5000.00	3500.00	0.0000	0.0000	0	0.0000	Regular	1.0
WX	1F	0.00	5000.00	0.0000	0.0000	0	0.0000	Regular	1.0

6. 自動計算不規則結構物的折減係數 (哥倫比亞規範NSR-10)

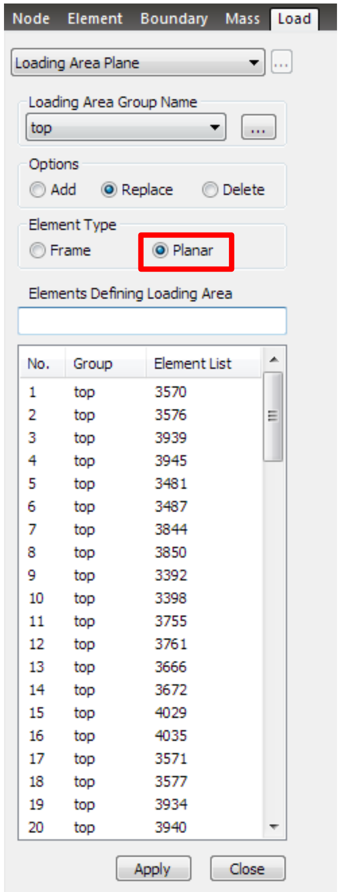
- Response modification factor R is calculated using three reduction factors to consider the irregularity of structure as per the Colombia NSR-10 standard. ($R=\phi a*\phi p*\phi r*R0$)
- Height Irregularity (ϕa), Plan irregularity (ϕp), Redundancy Check (ϕr)

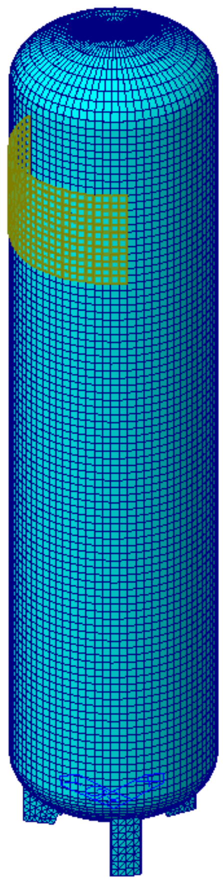


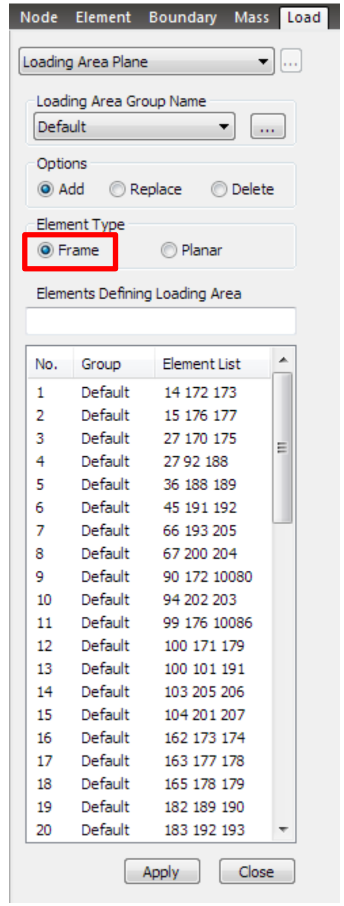
7. 定義面載重群組

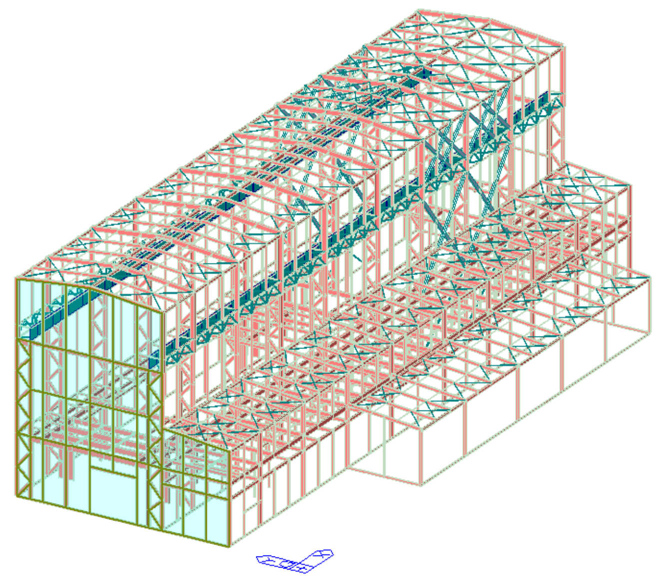
- Loading Area Group can be defined by selecting an area to apply wind pressure .

Structure > Group > B/L/T > Define Loading Area Group





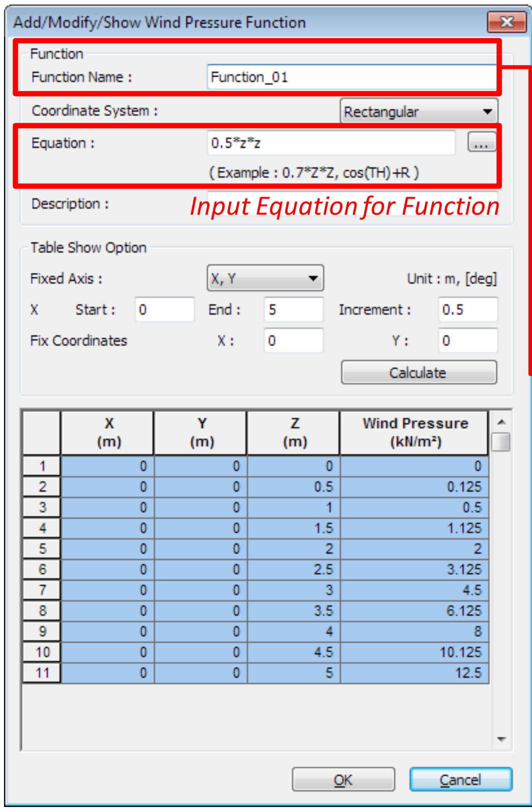




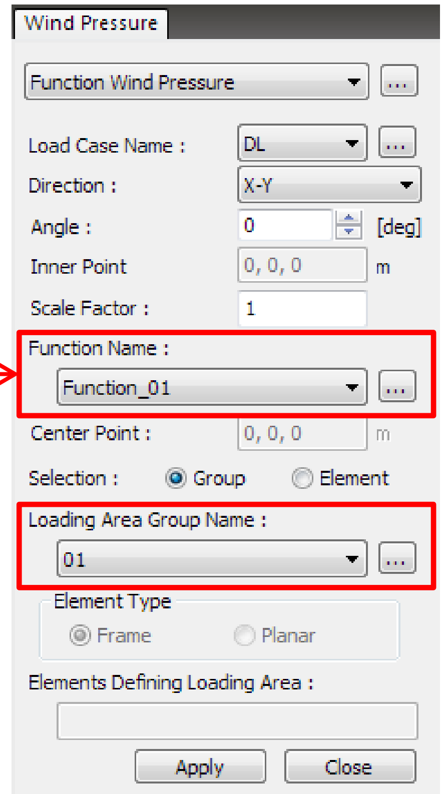
8. 定義風壓計算方程式

- Wind load is applied on the space structure according to user-defined function.
- Wind load is applied as the nodal load on the nodes compsing the defined loding area.

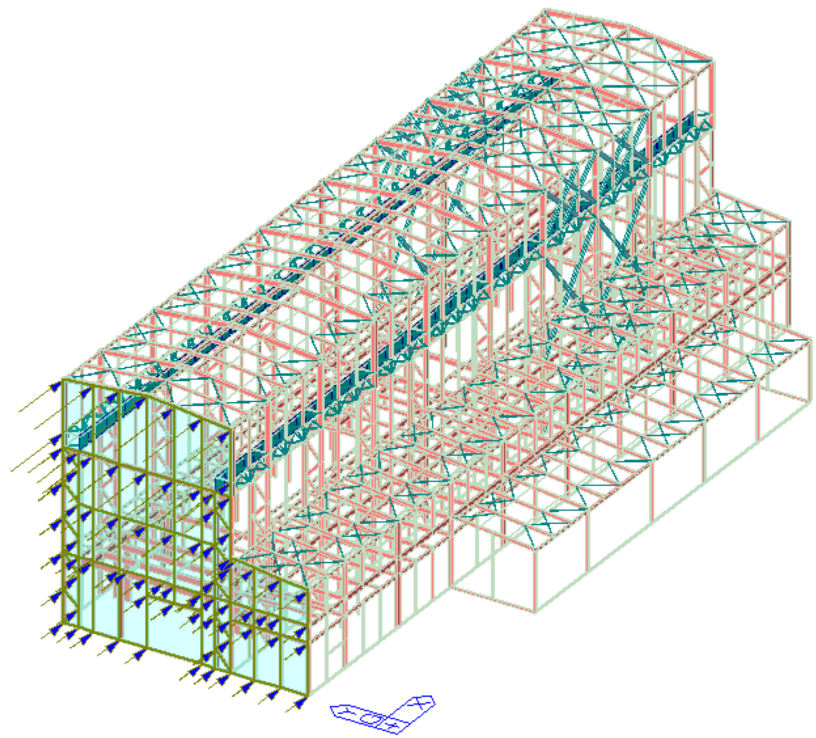
Load > Static Load > Lateral > Wind Pressure



Wind Pressure Function



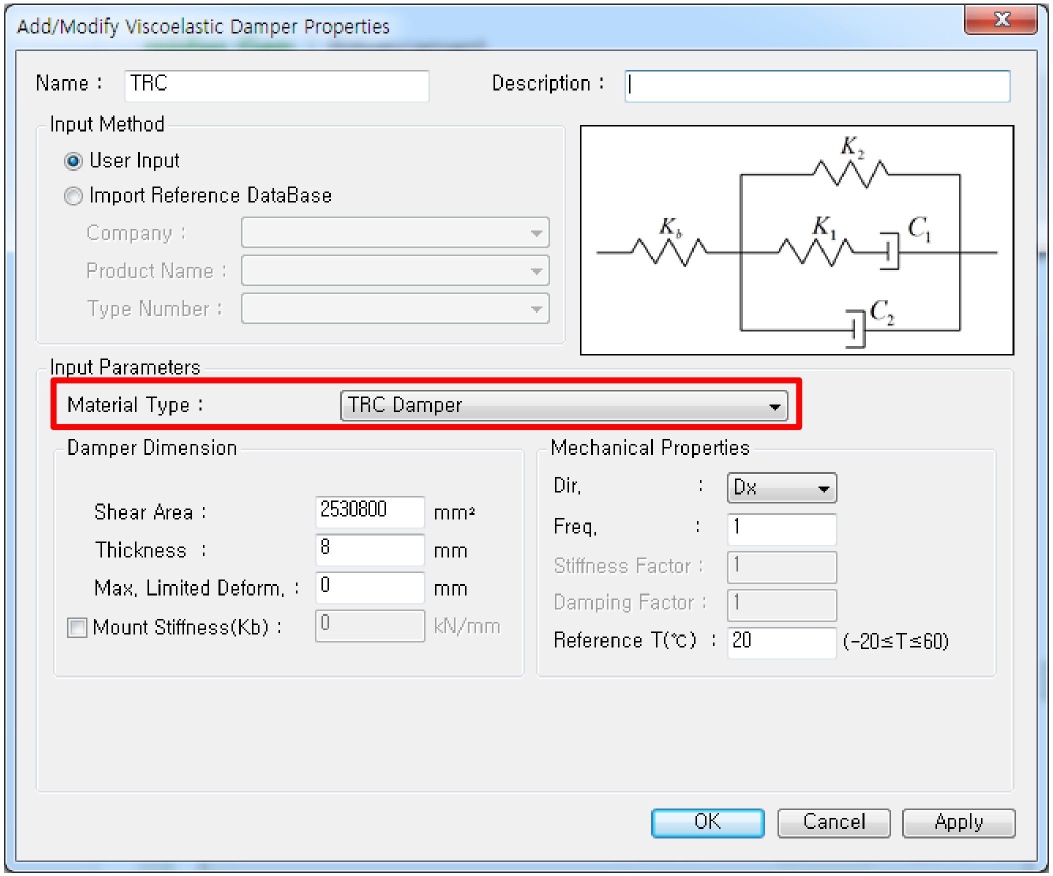
Function Wind Pressure



9. 優化黏彈性阻尼器設定

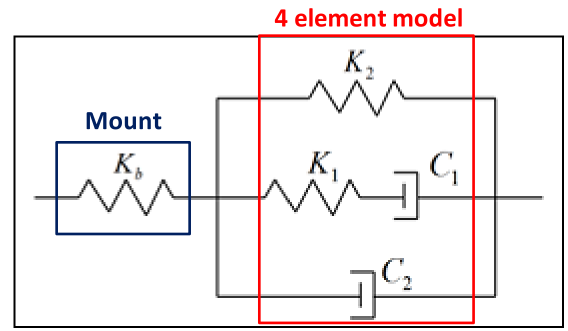
- TRC dampers manufactured by Sumitomo Riko Company Limited is added to the viscoelastic material properties.

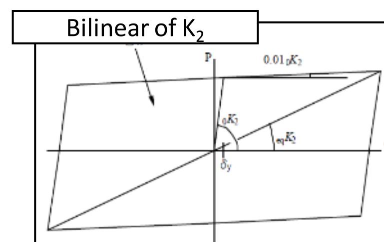
Boundary > General Link > Seismic Device Properties... > Viscoelastic Damper

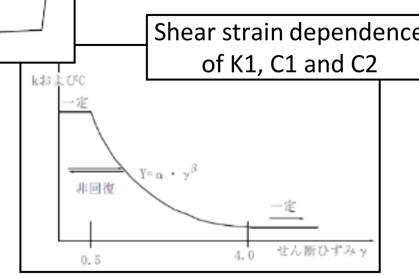


4 element model

Viscoelastic material properties TRC Damper







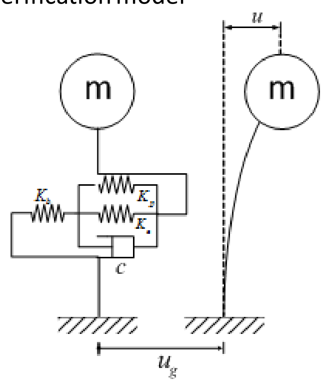
9. 優化黏彈性阻尼器設定

Boundary > General Link > Seismic Device Properties... > Viscoelastic Damper

TRC Damper (4 element model) : Total Components (K1(Maxwell) + K2(Voigt) + C1(Maxwell) + C2(Voigt)) + Mount

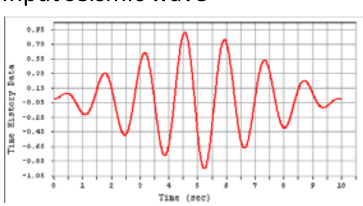
Compression with other products

- Verification model

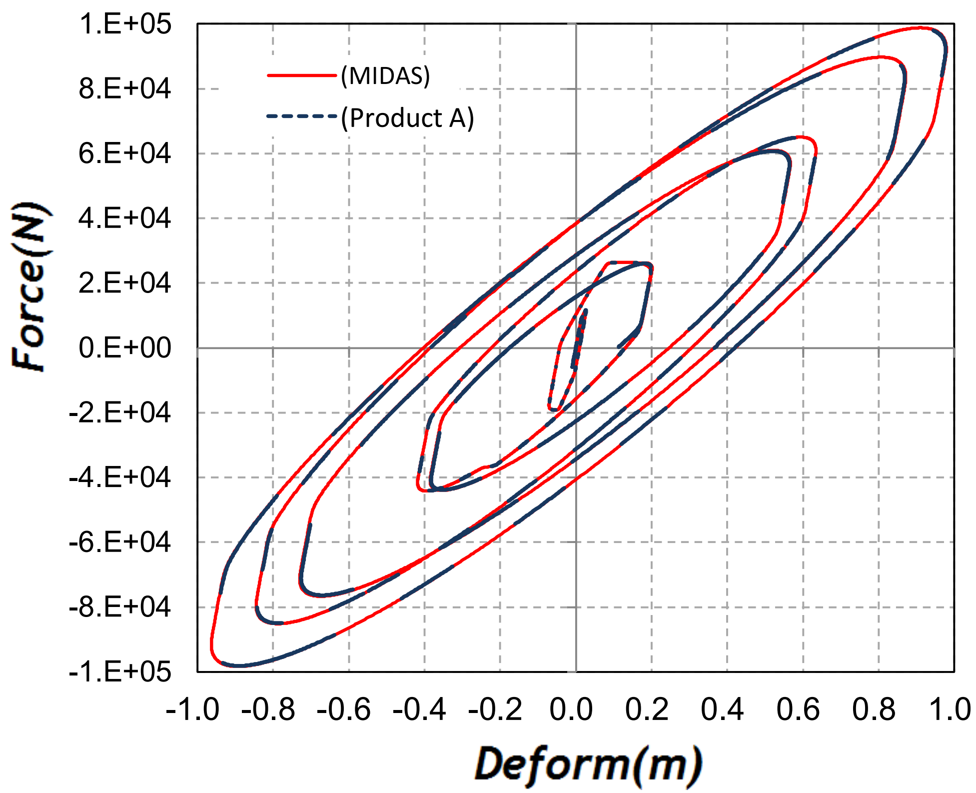


Mass = 5102.04 N/g
Elastic Stiffness = 10000 N/m
Undamped System
Mounting Stiffness = 1000000 N/m

- Input seismic wave



- Compression of historical loop

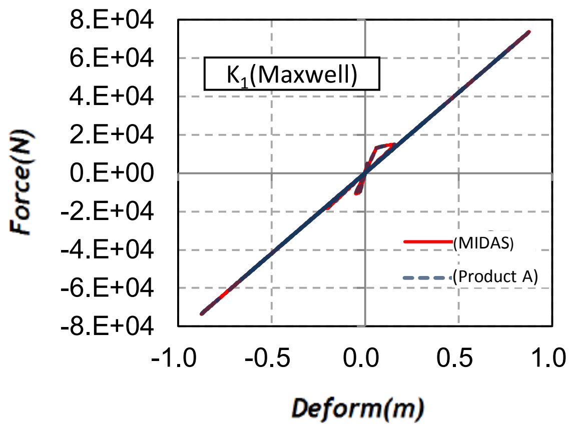


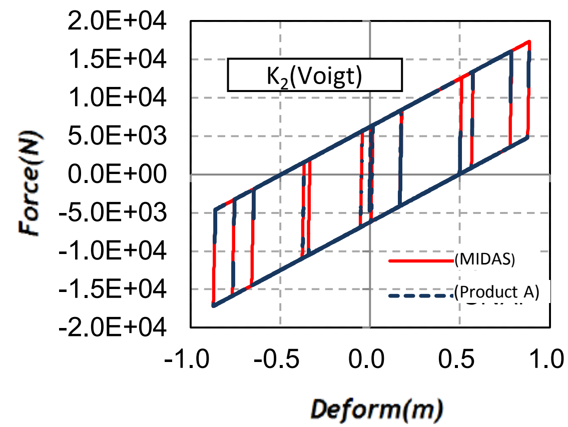
9. 優化黏彈性阻尼器設定

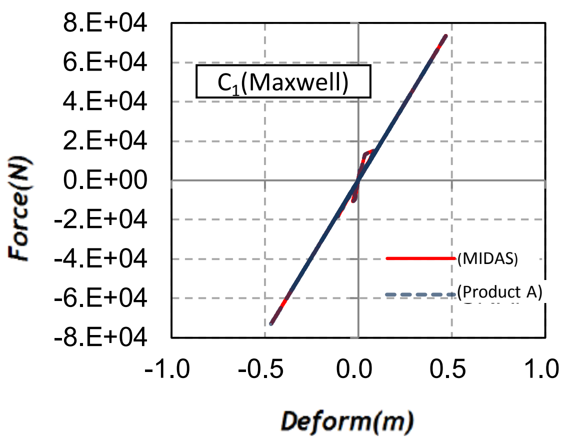
Boundary > General Link > Seismic Device Properties... > Viscoelastic Damper

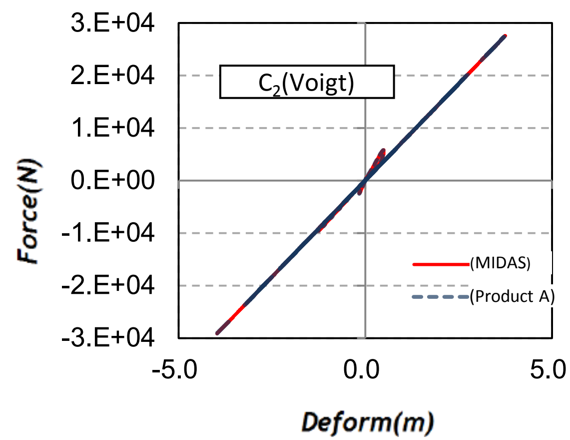
TRC Damper (4 element model) : Total Components (K1(Maxwell) + K2(Voigt) + C1(Maxwell) + C2(Voigt)) + Mount

Compression with other products(Historical loop)





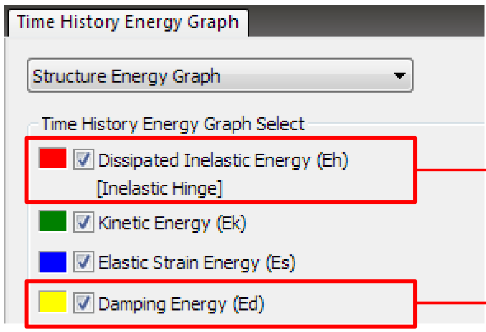


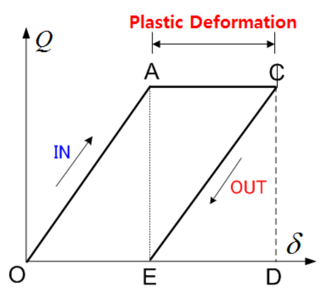


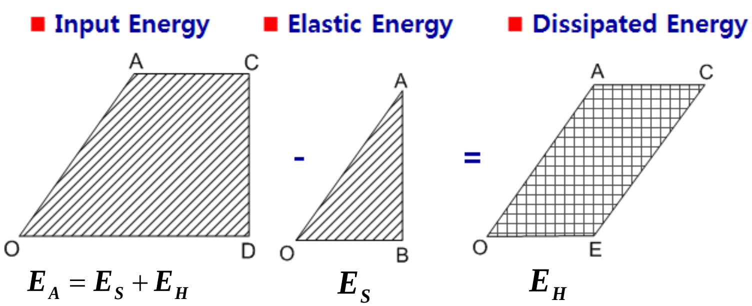
10. 新增地震能量消散圖

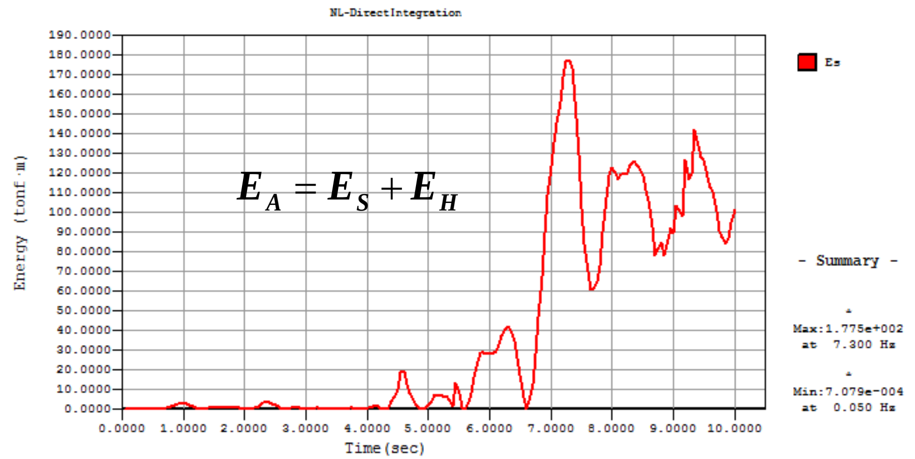
- Print out energy results graph for isolator and vibration control device in the nonlinear time history analysis.

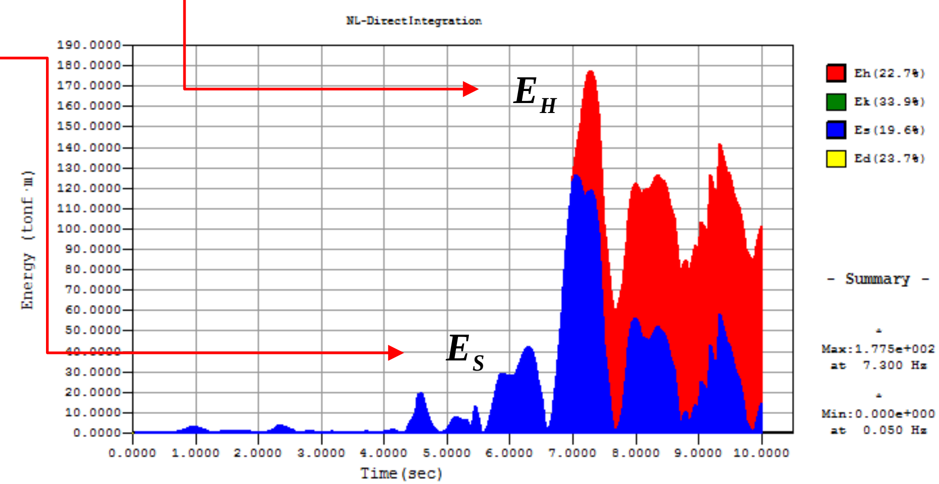
Result > T.H Graph/Text > Time History Energy Graph





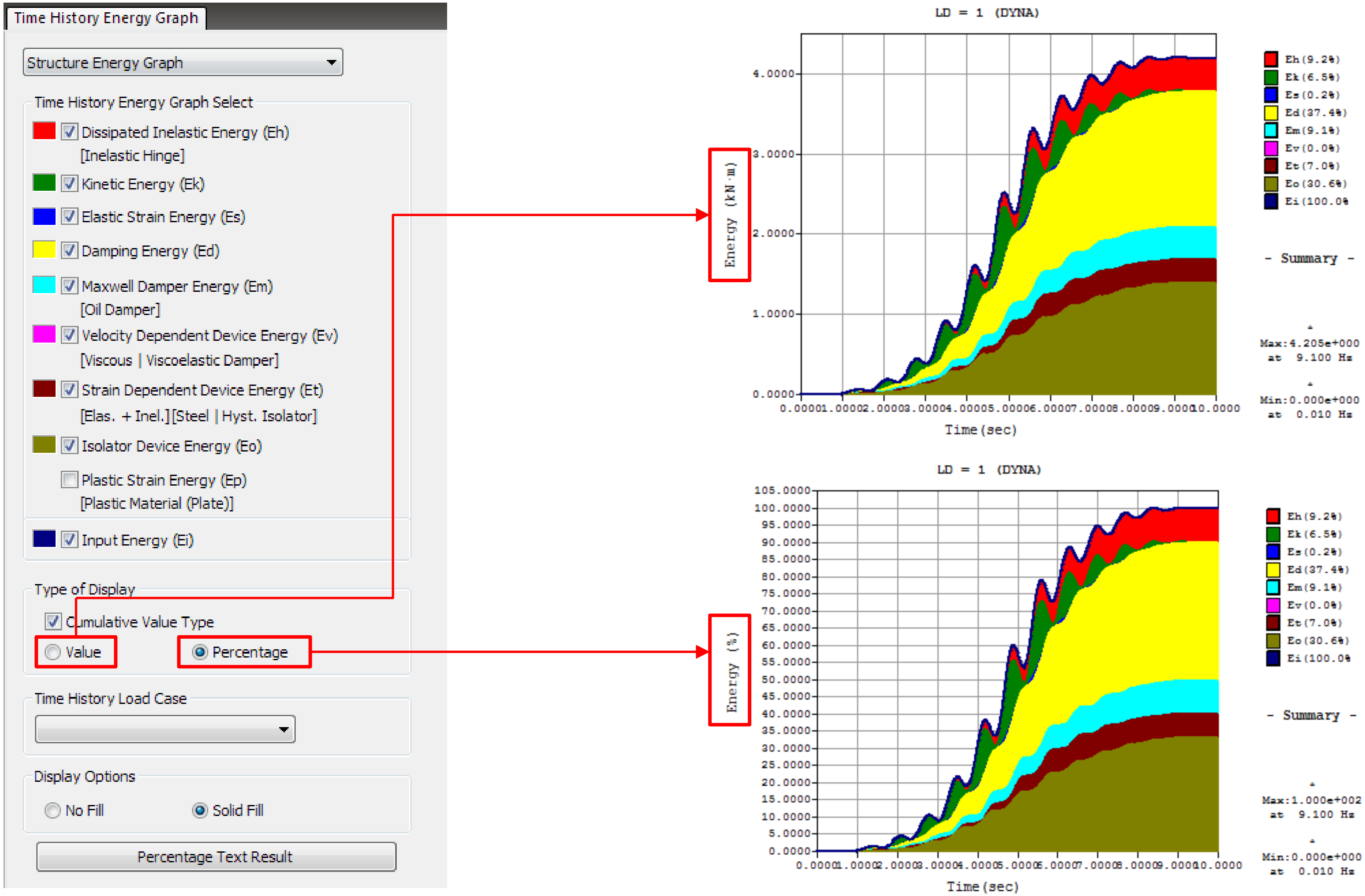






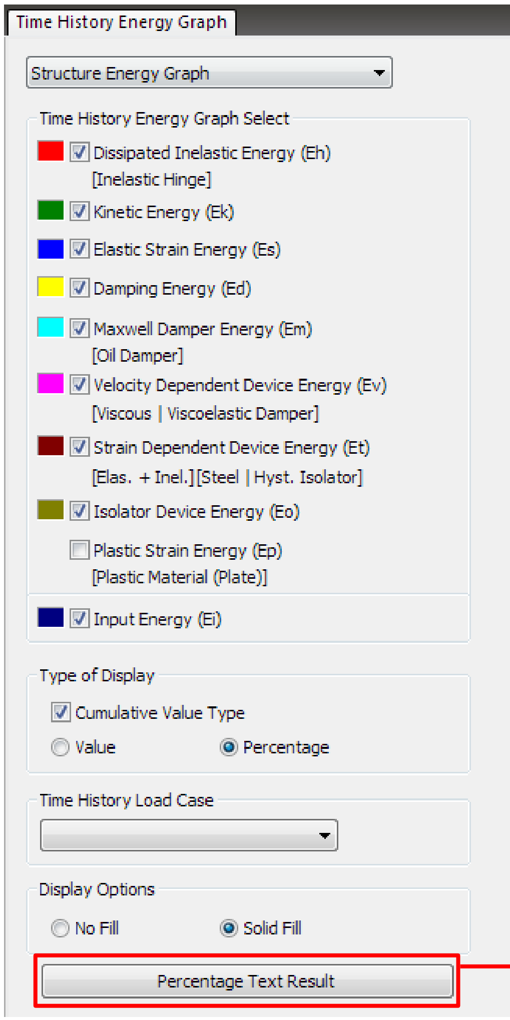
10. 新增地震能量消散圖

Result > T.H Graph/Text > Time History Energy Graph

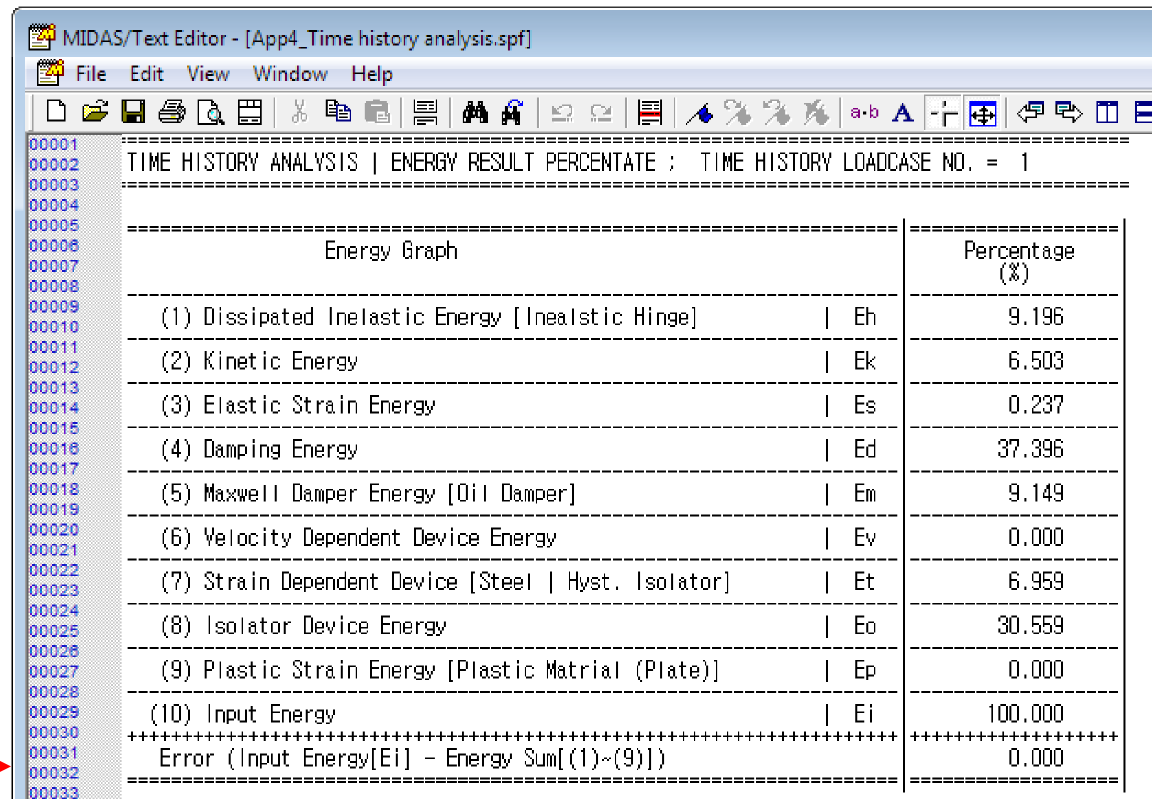


10. 新增地震能量消散圖

Result > T.H Graph/Text > Time History Energy Graph



Text result of the each energy ratio

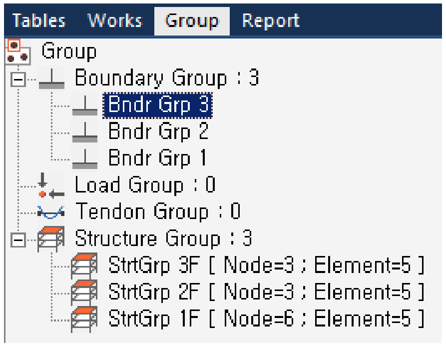


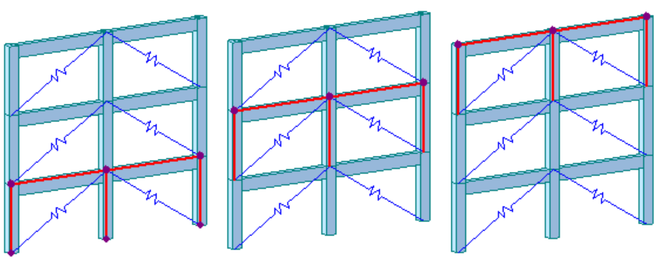
TIME HISTORY ANALYSIS | ENERGY RESULT PERCENTATE ; TIME HISTORY LOADCASE NO. = 1

Energy Graph		Percentage (%)
(1) Dissipated Inelastic Energy [Inealstic Hinge]	Eh	9.196
(2) Kinetic Energy	Ek	6.503
(3) Elastic Strain Energy	Es	0.237
(4) Damping Energy	Ed	37.396
(5) Maxwell Damper Energy [Oil Damper]	Em	9.149
(6) Velocity Dependent Device Energy	Ev	0.000
(7) Strain Dependent Device [Steel | Hyst. Isolator]	Et	6.959
(8) Isolator Device Energy	Eo	30.559
(9) Plastic Strain Energy [Plastic Matrial (Plate)]	Ep	0.000
(10) Input Energy	Ei	100.000
Error (Input Energy[Ei] - Energy Sum[(1)~(9)])		0.000

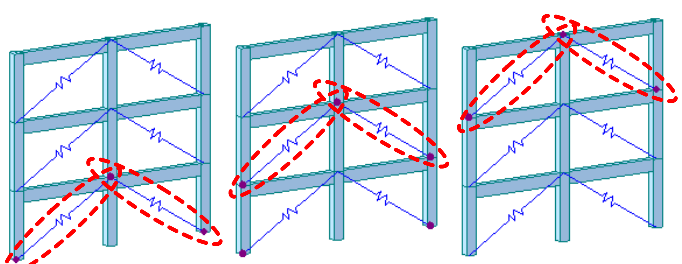
10. 新增地震能量消散圖

Result > T.H Graph/Text > ***Time History Energy Graph***

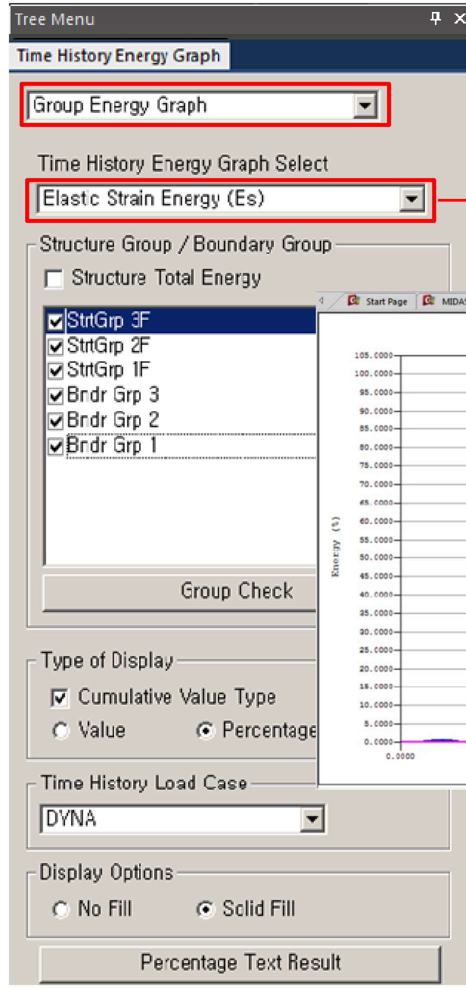


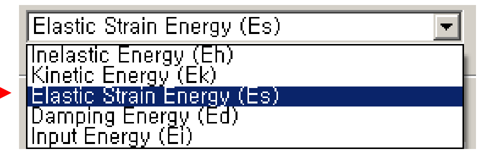


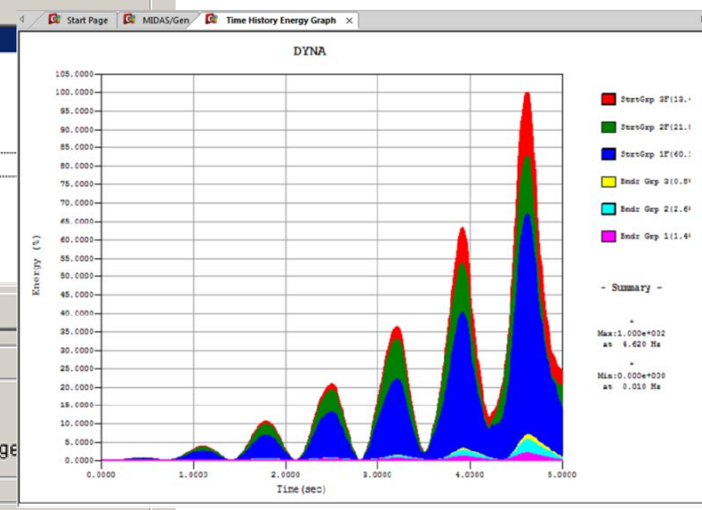
StrtGrp 1F　StrtGrp 2F　StrtGrp 3F



BndrGrp 1　BndrGrp 2　BndrGrp 3







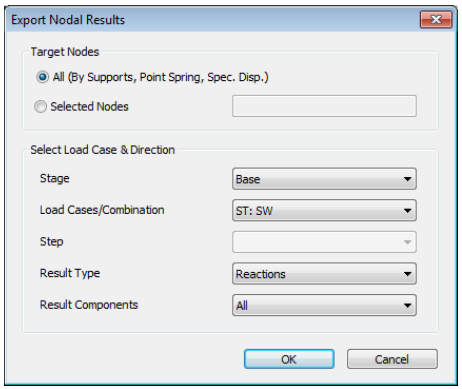
Result output of group distribution for each energy item

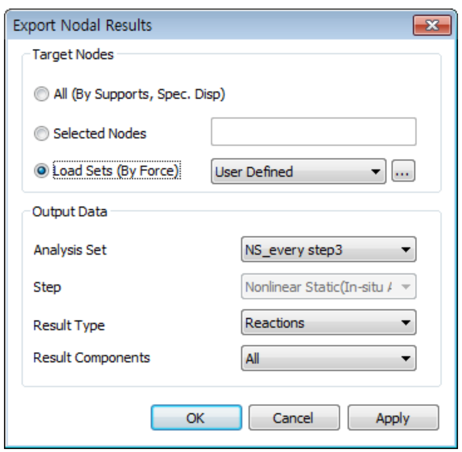
11.多線性彈簧性質與GTS NX的轉換介面

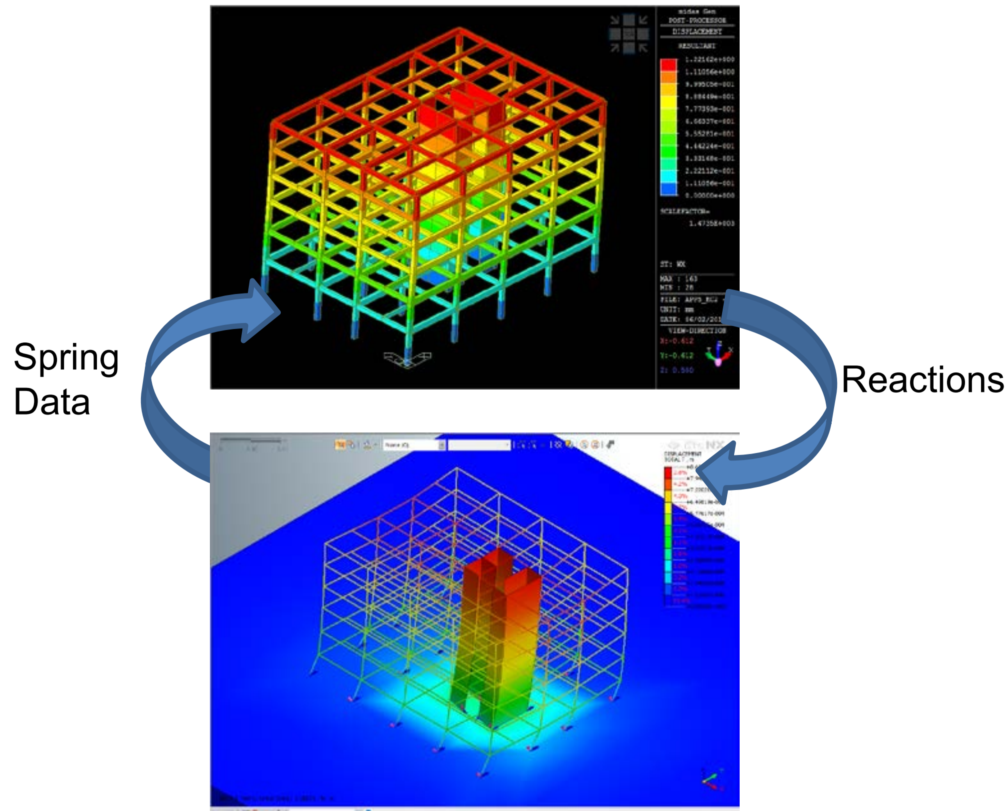
- Reactions from Point Spring Support can be exported to GTS NX.
- Force-displacement results of soil can be imported from GTS NX into midas Gen, and the input data of the multi-linear Point Spring Supports are updated.

File > Export > ***Nodal Results for GTS***

File > Import > ***Nodal Results for GTS***



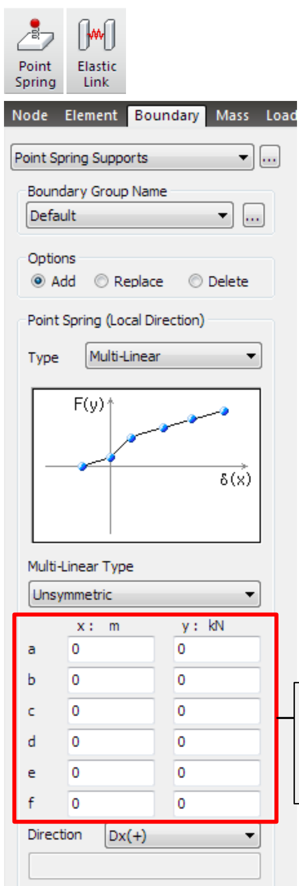




12. 可定義彈簧或線性連接的力與位移多線性關係

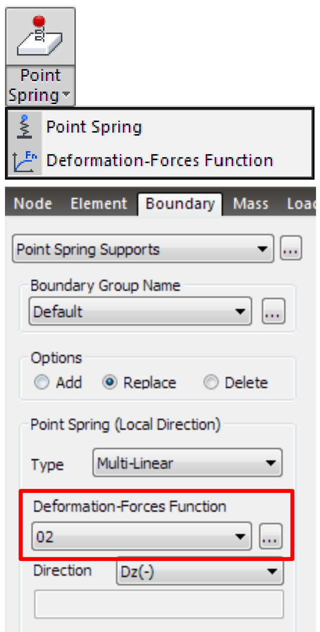
- Multiple linear type elastic springs are defined as functions without limitation.

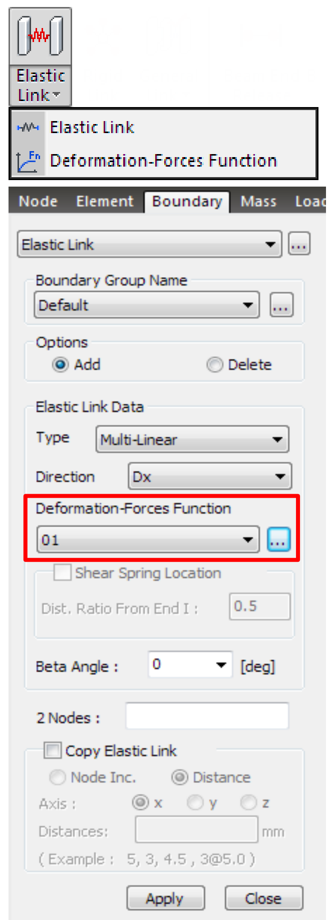
Previous version

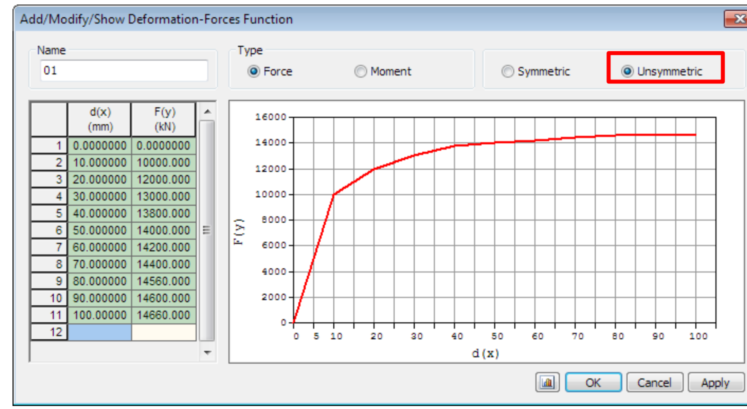


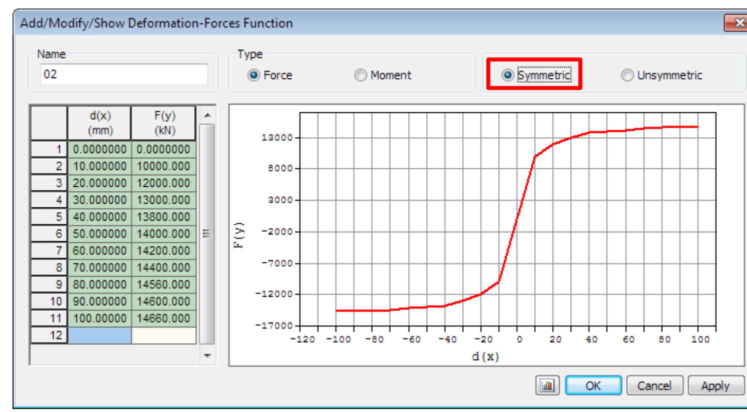
Multi-linear is defined as 6 points in the previous version.

Gen 2019 (v1.1)





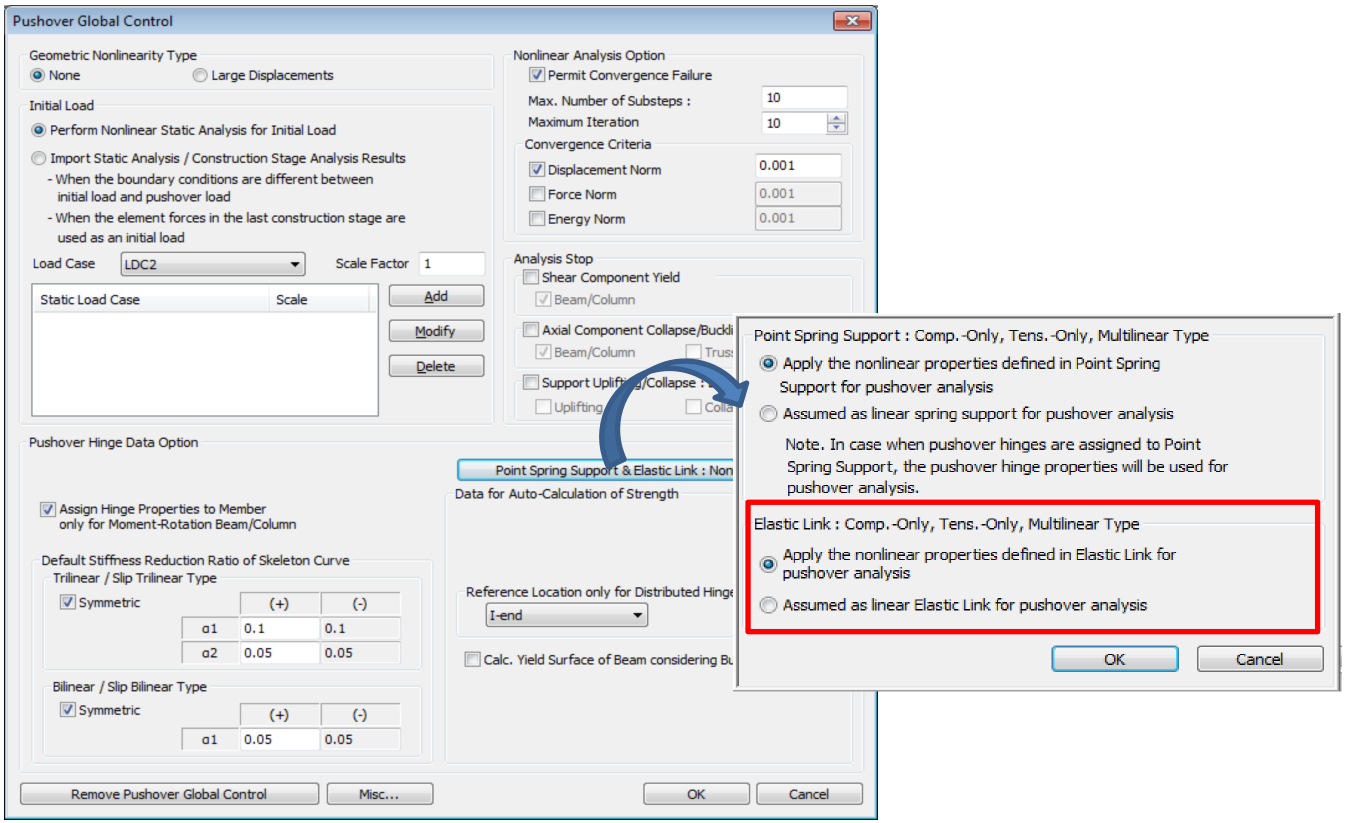




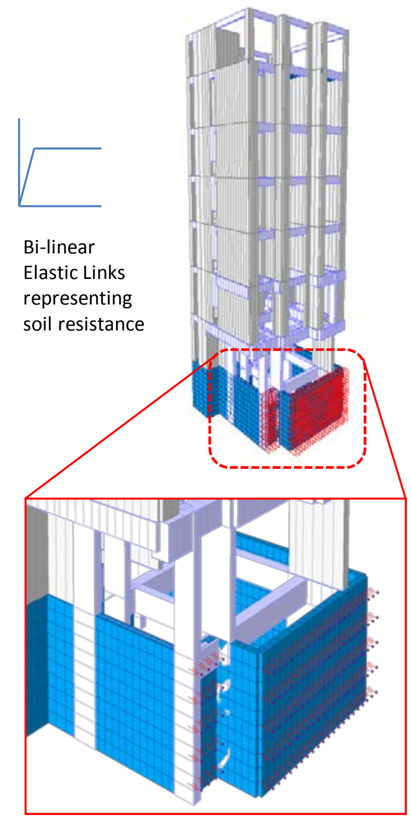
13. 側推分析可考慮非線性彈性連接

- Nonlinear behavior of the elastic links, i.e. comp.-only, tens.-only, multi-linear can be taken into account in the pushover analysis.
- Link forces imported from static analysis or construction stage analysis cannot be specified as initial loads for pushover analysis.

Pushover > Elements > Pushover Global Control



Pushover Global Control



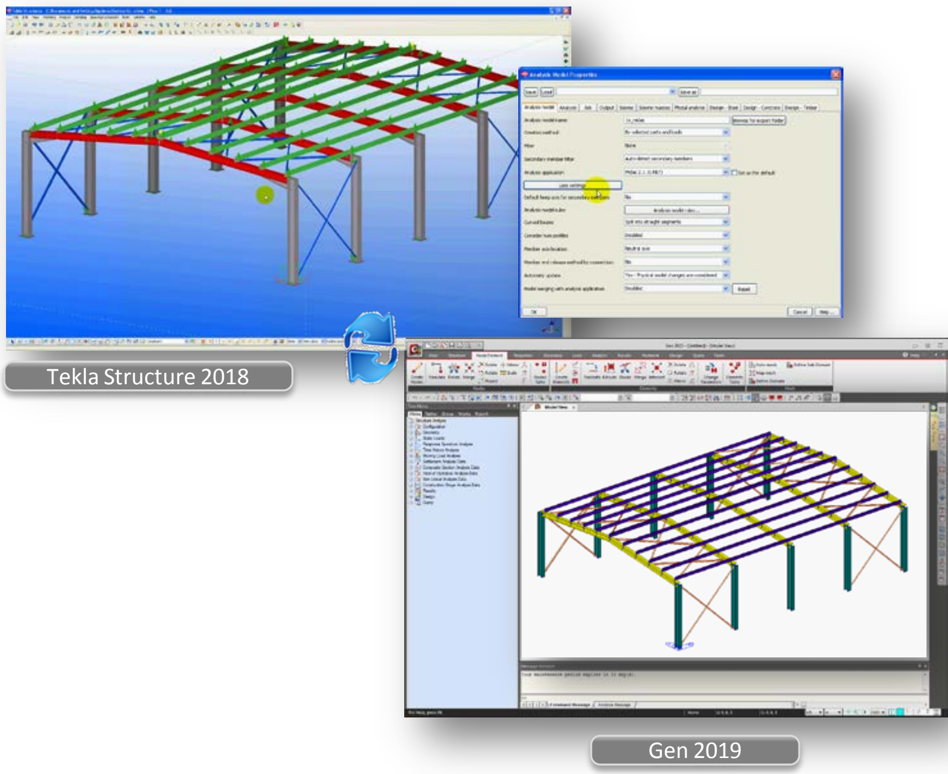
Pushover Analysis for the underground structure

14. Tekla Structure 2018 轉換介面

- Tekla Structures interface is a tool provided to speed up the entire modeling, analysis, and design procedure of a structure by data transfer with midas Gen. Data transfer is limited to structural elements. Tekla Structure interface enables us to transfer a Tekla model data to midas Gen, and delivery back to the Tekla model file. midas Gen text file (*.mgt) is used for the roundtrip.

File > Import > midas Gen MGT File

File > Export > midas Gen MGT File

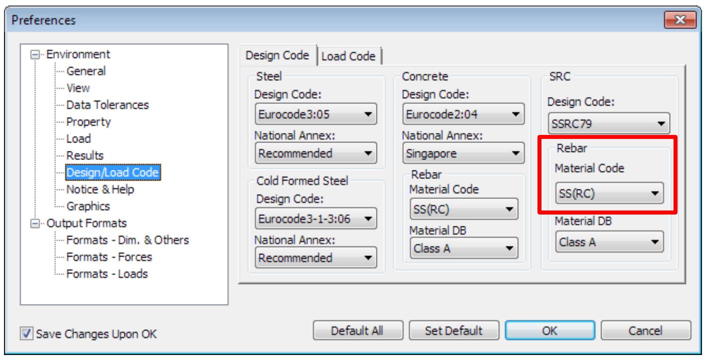


Category	Features	Tekla <> Gen
MATERIAL	concrete	<>
	steel	<>
	pre cast - wood and other types	<>
	Material user defined	<>
ELEMENT TYPE/ ROTATIONS	vertical column	<>
	inclined column	<>
	straight beam	<>
	curved beam	>
	Slab	<>
	vertical panel	>
2D ELEMENTS	Concrete panels and slab	<>
BOUNDARY CONDITIONS	support	>
	beam end release	<>
	section offset	>
STATIC LOAD	self weigth	>
	linear load (uniform or trapezoidal)	<>
MERGE OPTION	new element	<>
	new element that divide other elements	<>
	topology changes	<>

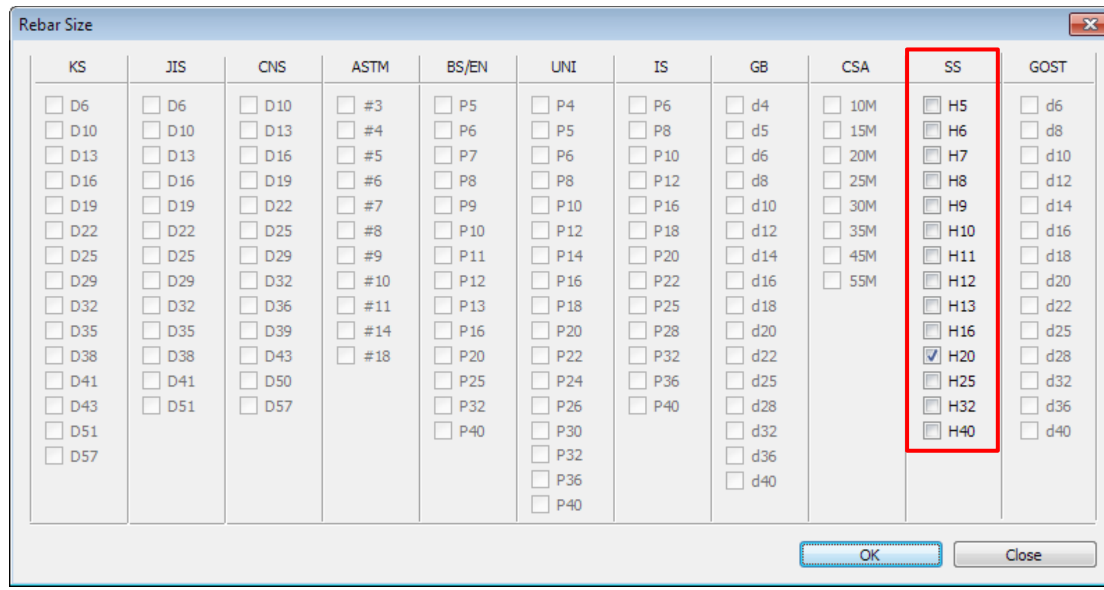
15. 新增鋼筋性質資料庫 (SS560 : 2010)

- Reinforcement as per Singapore SS560:2010 is added for the design.

Tools > Setting > Preferences



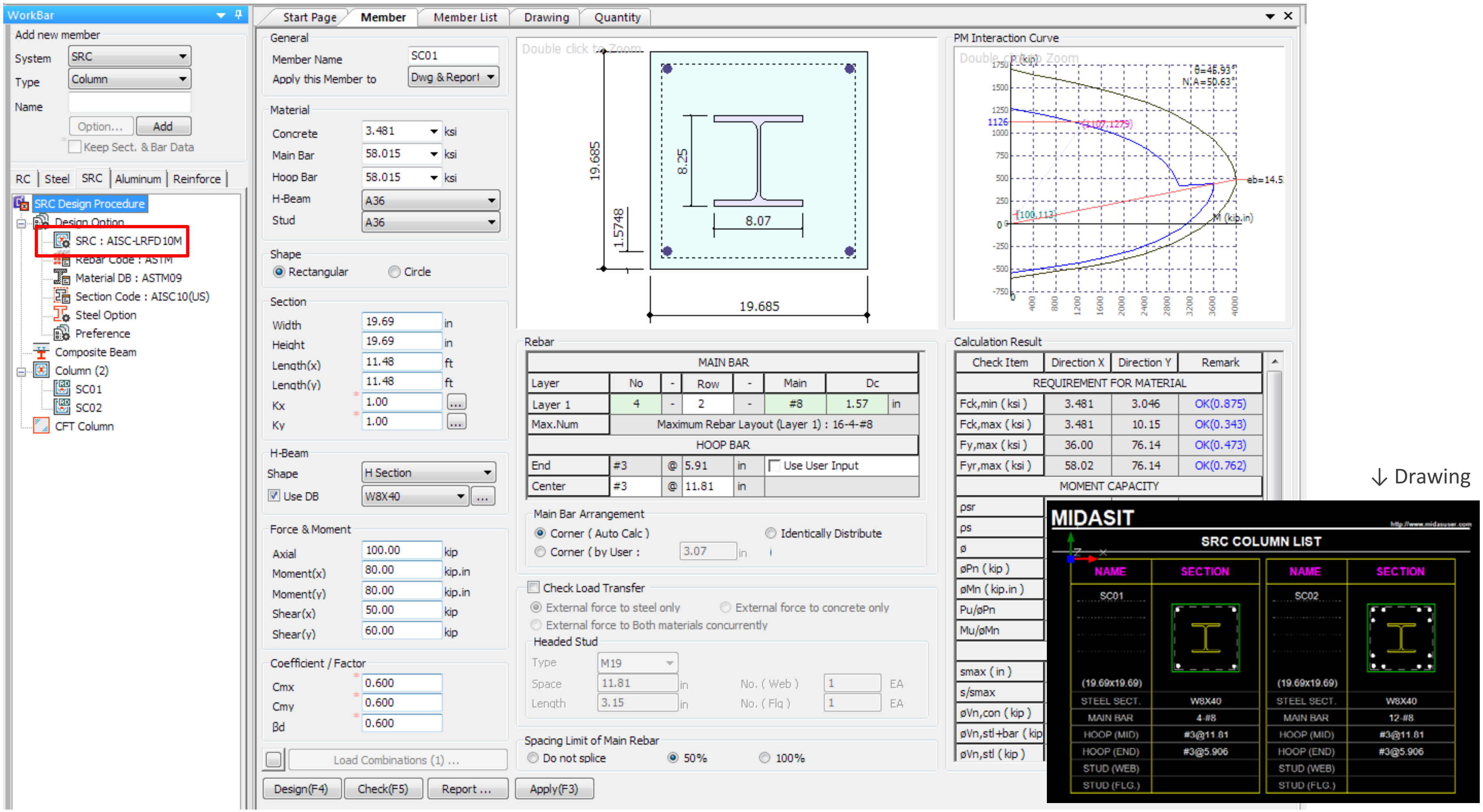
Design > Design> RC Design > Design Criteria for Rebar



midas Design+

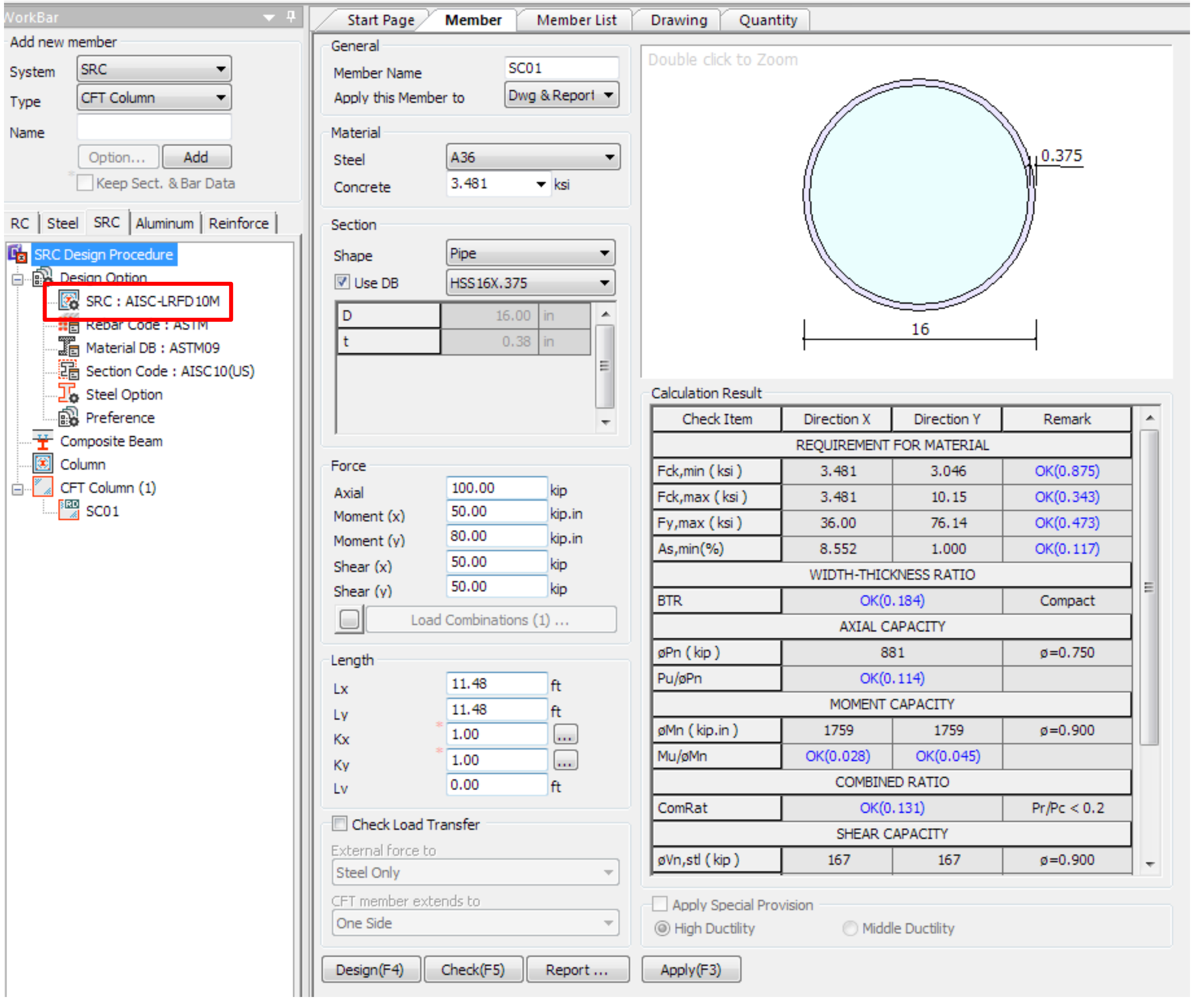
1. SRC柱設計 (AISC-LRFD 10M)

- The automatic design / check of the SRC column is performed as per AISC-LRFD 10M.

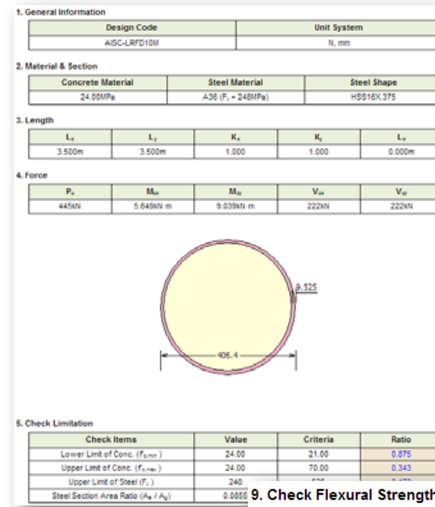


2. CFT柱設計 (AISC-LRFD 10M)

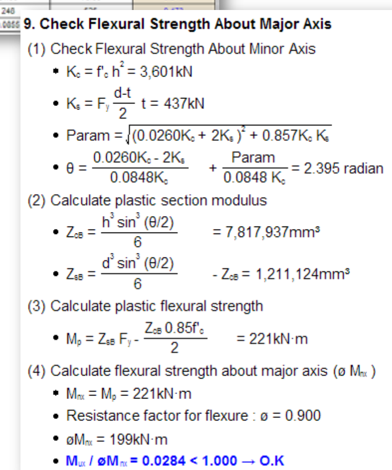
- The automatic design / check of the CFT column is performed as per AISC-LRFD 10M.



↓ Summary report



Detail report →



9. Check Flexural Strength About Major Axis

(1) Check Flexural Strength About Minor Axis

- $K_c = f'_c\, h^2 = 3{,}601\text{kN}$
- $K_s = F_y \dfrac{d-t}{2}\, t = 437\text{kN}$
- $\text{Param} = \sqrt{(0.0260K_c + 2K_s)^2 + 0.857K_c K_s}$
- $\theta = \dfrac{0.0260K_c - 2K_s}{0.0848K_c} + \dfrac{\text{Param}}{0.0848\,K_c} = 2.395\ \text{radian}$

(2) Calculate plastic section modulus

- $Z_{sB} = \dfrac{h^3 \sin^3(\theta/2)}{6} = 7{,}817{,}937\text{mm}^3$
- $Z_{sB} = \dfrac{d^3 \sin^3(\theta/2)}{6} - Z_{cB} = 1{,}211{,}124\text{mm}^3$

(3) Calculate plastic flexural strength

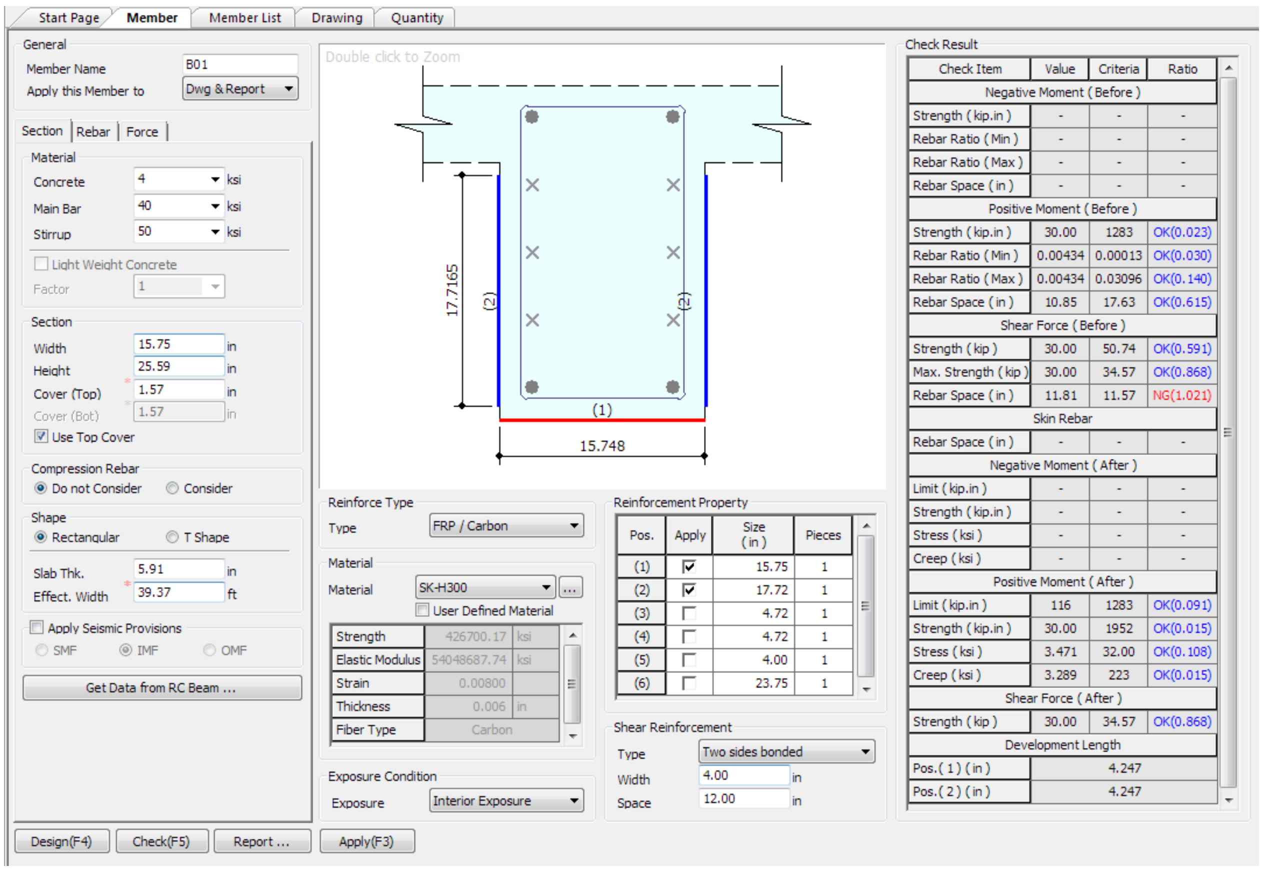
- $M_p = Z_{sB} F_y - \dfrac{Z_{cB}\, 0.85f'_c}{2} = 221\text{kN·m}$

(4) Calculate flexural strength about major axis ($ø M_{nx}$)

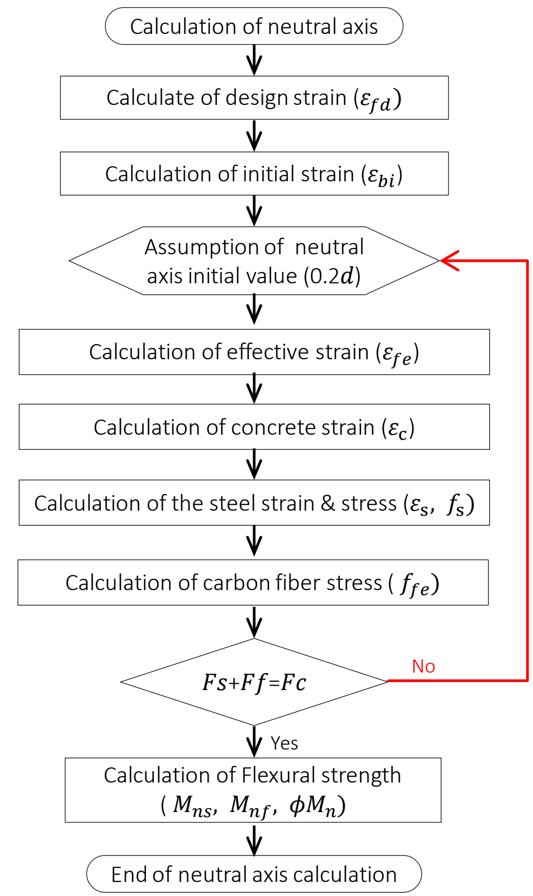
- $M_{nx} = M_p = 221\text{kN·m}$
- Resistance factor for flexure : $ø = 0.900$
- $øM_{nx} = 199\text{kN·m}$
- **M_{ux} / $øM_{nx}$ = 0.0284 < 1.000 → O.K**

3. 使用碳纖/玻纖進行構件補強

- Reinforced concrete beam strengthened with FRP / carbon fiber is automatically designed or checked.
- ACI318-08/11/14, ACI318M-08/11/14, NSR-10, and KCI-USD07/12 are supported.



Flow chart of neutral axis calculation



4. 鋁構材之梁/柱設計

- The aluminum beam / column design check is based on the Aluminum Design Manual (ADM1:2005) of AA (Aluminum Associate, USA).
- The automatic check of the aluminum beam / column is performed as per AISC-LRFD 10M.

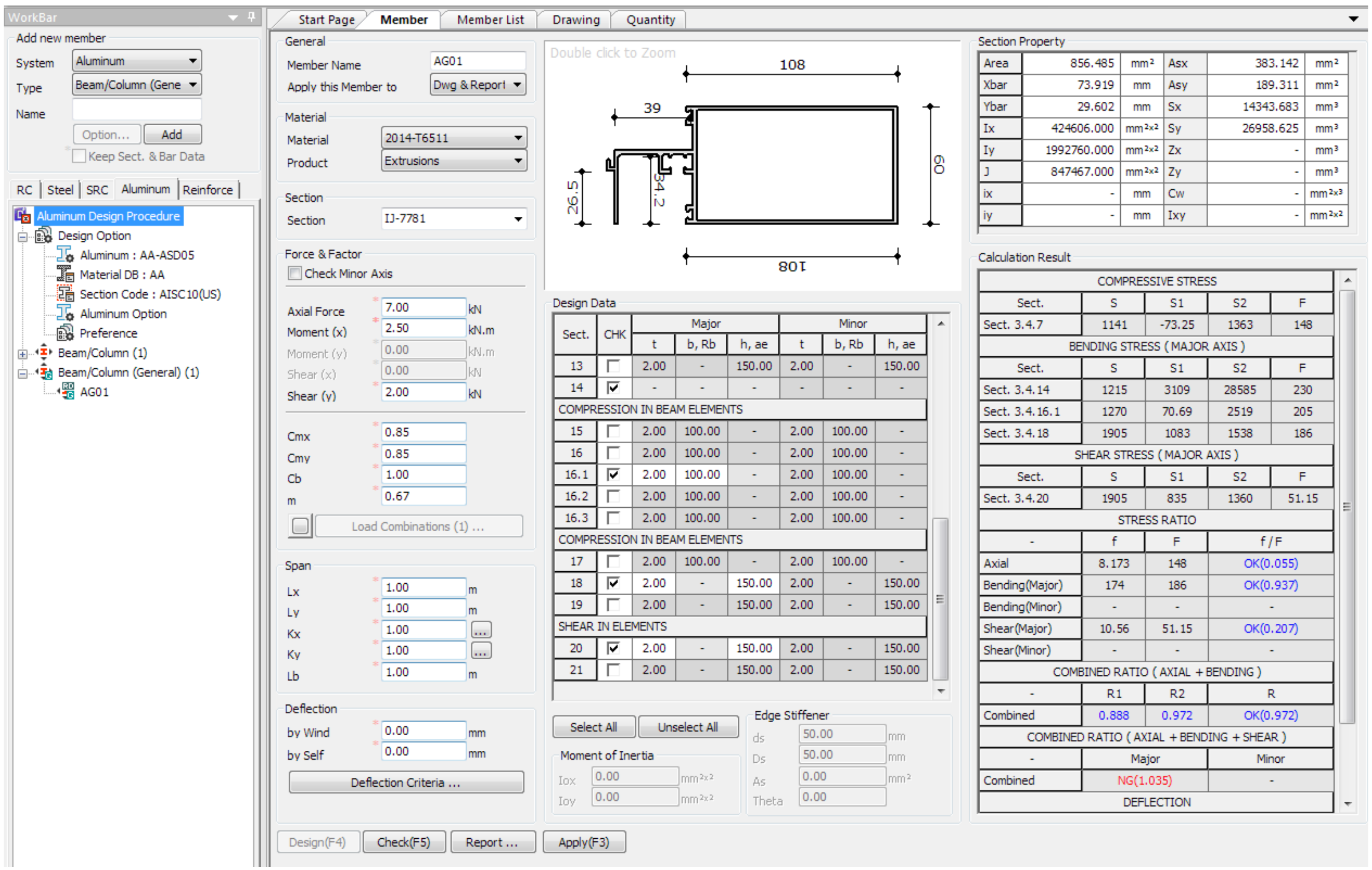
< Design Code >

AA-ASD05
AA-ASD05M ☐
AA-LRFD05
AA-LRFD05M

< Shape of Section>

Beam/ Column
H Section
T Section
Angle
Channel
Box
Pipe
Solid Round
Solid Box

Beam/ Column(General)
IJ-7781
IJ-8382



5. 優化基座板設計之肋板配置

- When the rib plate is inserted in the baseplate and the length of the rib plate is larger than 1/2 of the thickness of the base plate, the rib plate is created on the flange of the column.
- AISC-LRFD 10, ASIC-LRFD 05, Eurocode3:05, KSSC-LSD 16, and KSSC-LSD 09 are supported.