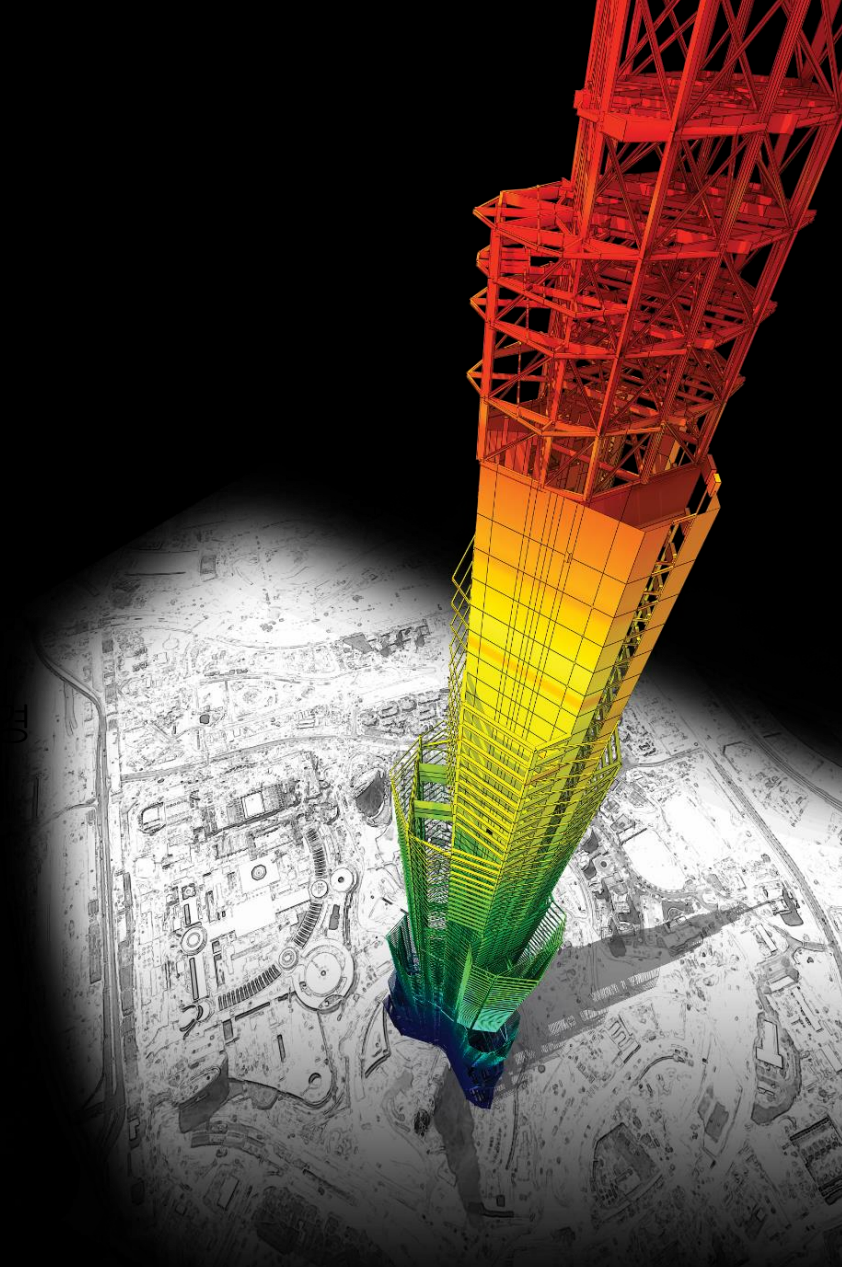


Release Note

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

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midas **Gen**

1. Member Design as per NTC 2018

Reference in NTC 2018	Details
-	Add Material of NTC2018 in DShop
-	Add Material of NTC2018 in GSD
7.4.6.2.2	<p>[Column] Modify the calculation of 'Volume of concrete core' in Check mechanical volumetric ratio of confining hoops within the critical regions.</p> <p>[Wall End] Modify the calculation of mechanical volumetric ratio within the critical regions.</p>
7.4.4.5.1	<ol style="list-style-type: none"> 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. Member Design as per NTC 2018

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

```

Basic control perimeter
rho1y = 0.0000
rho1z = 0.0000
rho1 = min[ sqrt(rho1y*rho1z), 0.02 ] = 0.0000
K = min[ 1+(200/d)^0.5, 2.0 ] = 2.000 (d in mm)
gamma_c = 1.500
U_Rd,c = max[ 0.035*k^1.5*sqr(fck), (0.18/gamma_c)*K*(100*rho1*fck)^1/3 ]*u1*d
        = 432.1333 kN.

RatU = Beta*U_Ed / U_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*U_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*U_Ed / (0_Rd,c*U1) = 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):

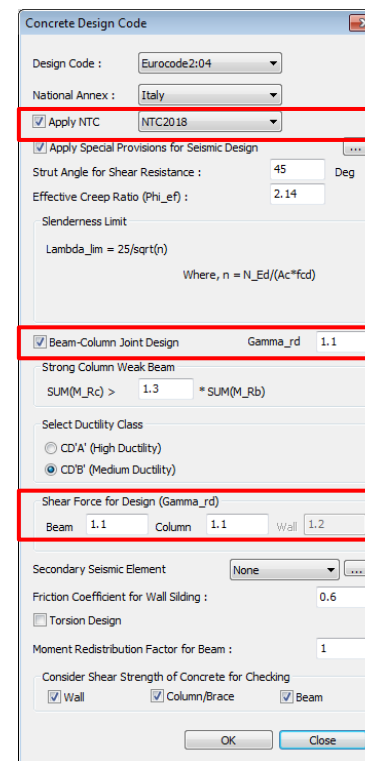
$$V_{Rd,cs} = 0,75 V_{Rd,c} + 1,5 (d / s_r) A_{sw} f_{ywd,ef} [1 / (u_1 d)] \sin \alpha \leq k_{max} \cdot V_{Rd,c} \quad (6.52)$$

where

- A_{sw} is the area of one perimeter of shear reinforcement around the column [mm²];
- 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. Improvement of post-processing in material nonlinear analysis

- 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)

The screenshot displays the MIDAS Gen software interface. On the left, the 'Results Tables' menu is open, showing a tree structure where 'Plate' and 'Solid' are selected, and 'Strain (Local)' is highlighted. On the right, a data table titled 'Result: (Plate Strain(Local))' is shown. The table has columns for 'Elem', 'Load', 'Step', 'Node', 'Part', 'Strain-xx', 'Strain-yy', 'Strain-xy', 'Strain-Max', 'Strain-Min', 'Angle (deg)', 'Max-Shear', 'Comp. Damage', 'Tens. Damage', and 'Damage'. The table contains 18 rows of data for different elements and nodes.

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
				Bot	-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 Strain (Local) menu

Solid Strain (Local) menu

Plate Strain (Local) Table

2. Improvement of post-processing in concrete damage model

Results > Results > Strains > Plate Strains/Solid Strains

The screenshot displays the midas Gen software interface for post-processing concrete damage models. The main window shows a 3D model of a concrete frame structure with a color-coded strain distribution. The left sidebar contains various settings for 'Plate Strain', including 'Load Cases/Combinations' (ST: LDC1, Step: NL Step:20), 'Strain Options' (Total Strain selected), 'Strain Options' (Avg. Nodal selected), and 'Components' (Max-Shear selected). The right sidebar shows 'Plate Strain' settings, including 'Load Cases/Combinations' (ST: LDC1, Step: NL Step:20), 'Strain Options' (Damage Ratio selected), 'Strain Options' (Avg. Nodal selected), and 'Components' (Compressive selected). The bottom window shows a different view of the same model with a blue color scheme. The top right window shows a legend for 'ST: USER_X(+)' with a color scale from -4.675666e-005 to 5.16238e-005. The bottom right window shows a legend for 'ST: USER_X(+)' with a color scale from 0.00000e+000 to 1.14140e-003. Red arrows indicate the flow of information from the settings to the model and then to the legends.

3. Structure wizard of transmission tower

- 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

Tower Leg Wizard

Leg No. Show Dimensions

Insert Point: 0, 0, 0

No	Use	Supp.	W1	W2	H
1	Yes	Pin	5500	4500	8000
2	Yes	Pin	5500	4500	8000
3	Yes	Pin	5500	4500	8000
4	Yes	Pin	5500	4500	8000

Rotations: Alpha 0, Beta 0, Gamma 0

Origin Point: 1(0, 0, 0)

W: 9000 mm

Use Leg

Number of Panels: 5

Select Type: Front, Plane

W1: 5500 mm, W2: 4500 mm, H: 8000 mm

Boundary Condition: Pin, None

OK Close Apply

Tower Body Wizard

Body No.

W1: 9 m, W2: 6 m

Insert Point: 0, 0, 0

No.	Type	Fix W	Level
1	VT	No	3
2	VT	No	6
3	VT	No	9
4	VT	No	12
5	VT	No	15
6	VT	No	18
7	VT	No	21
8	VT	No	24
9	VT	No	27
10	VT	No	30
11	VT	No	33
12	VT	No	36

Rotations: Alpha 0, Beta 0, Gamma 0

Origin Point: 1(-4.5, -4.5, 0)

Front Plane, Total Front

Add, Modify, Delete

Define Type: Horizontal, Vertical

Row of Redundant: 1

Intersect: Elem

Input Dimension: W 0 m, H 3 m

OK Close Apply

Tower Arm Wizard

Arm No. Show Dimensions

Insert Point: 0, 0, 0

Use Arm Body

W1: 4500 mm, W2: 4000 mm

Rotations: Alpha 0, Beta 0, Gamma 0

Origin Point: 1(-2250, -2250, 0)

Use Left Arm, Use Right Arm

Number of Panels: 3

Front Type: L 9000 mm, H 3000 mm

Plane Type: D 0 mm, Internal

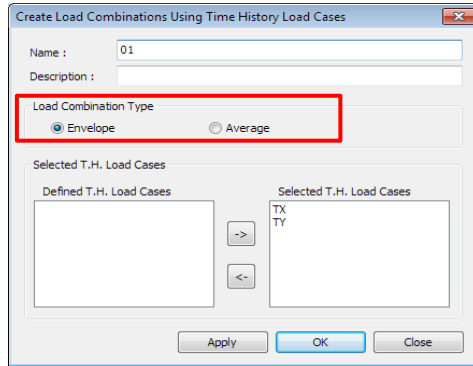
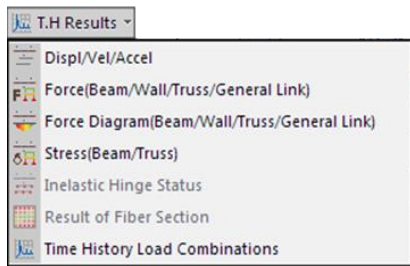
Front, Plane

OK Close Apply

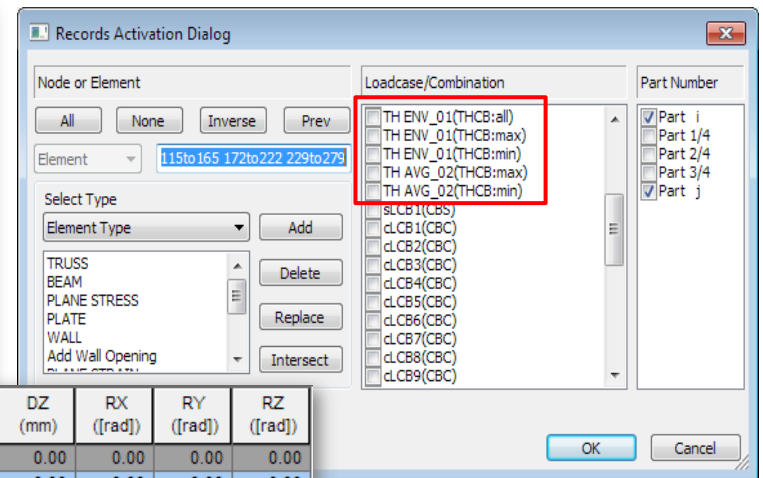
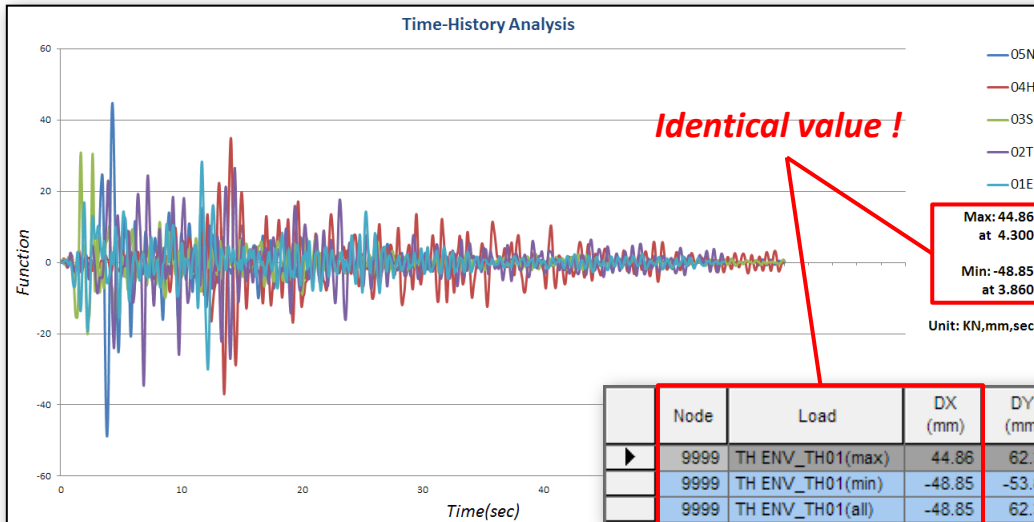
4. Improvement of post-processing in time-history analysis results

- 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



5. Improvement of Torsional Irregularity table

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

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

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

← Figura A.3-1 — Irregularidades en planta

Select Calculation Method

Country Code : NSR-10

Story Drift Method

Drift at the Center of Mass

Max. Drift of Outer Extreme Points

Max. Drift of All Vertical Elements

Story Stiffness Method

1 / Story Drift Ratio

Story Shear / Story Drift

	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	4.4255	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	

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

6. Automatic application of reduction factor for irregular structure (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. ($R = \phi_a * \phi_p * \phi_r * R_0$)
- Height Irregularity (ϕ_a), Plan irregularity (ϕ_p), Redundancy Check (ϕ_r)

Add/Modify Seismic Load Specification

Load Case Name : EX
 Seismic Load Code : NSR-10

Description :

Seismic Load Parameters

Design Spectral Response Acceleration

Site Class : D

Aa 0.15 g Fa 1.50000
 Av 0.15 g Fv 2.20000

Period Coef. (Cu) 1.35400

Importance Factor (I) 1

Structural Parameters

	X-Dir.	Y-Dir.
Analytical Period :	0	0
Approximate Period :	0.6652	0.6652
Fundamental Period :	0.6652	0.6652
Basic Ductility Factor (R0)	4	4
Phi :	1	1

Seismic Load Direction Factor (Scale Factor)

X-Direction : 1 Y-Direction : 0

Accidental Eccentricity

X-Direction (Ex) : Positive Negative None
 Y-Direction (Ey) : Positive Negative None

Torsional Amplification

Accidental Eccentricity Inherent Eccentricity

Additional Seismic Loads (Unit:kN,mm)

Story	Add.-X	Add.-Y	Add.-RZ

Enter the ϕ_p obtained from the Torsional Irregularity table.

Factor Regarding Irregularity

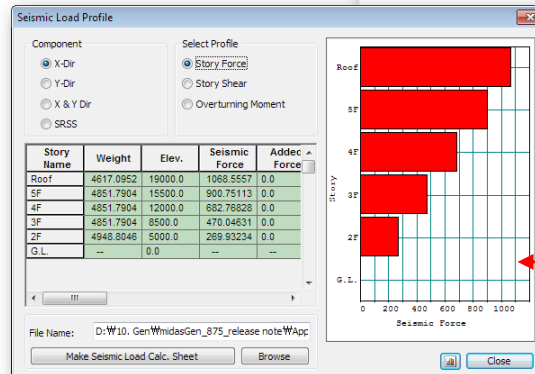
Parameter for Factor

	X-Dir.	Y-Dir.
Height Irregularity (Phi,a) :	1	1
Plan Irregularity (Phi,p) :	1	1
Redundancy Check (Phi,r) :	1	1
Result (Phi) :	1	1

Calculate OK Cancel

* EQUIVALENT SEISMIC LOAD IN ACCORDANCE WITH NSR-10 [UNIT: kN, mm]

Site Class	: 0
Effective Peak Acceleration(Aa)	: 0.15000
Effective Peak Velocity (Av)	: 0.15000
Site Coefficient at Short Periods (Fa)	: 1.50000
Site Coefficient at 1 s Period (Fv)	: 2.20000
Importance Factor (I)	: 1.00
Period Coefficient for Upper Limit (Cu)	: 1.3540
Fundamental Period Associated with X-dir. (Tx)	: 0.6652
Fundamental Period Associated with Y-dir. (Ty)	: 0.6652
Basic Ductility Factor for X-dir. (RxD)	: 4.00000
Basic Ductility Factor for Y-dir. (RyD)	: 4.00000
Reduction Factor of Irregularity for X-dir. (PhiX)	: 1.00000
Reduction Factor of Irregularity for Y-dir. (PhiY)	: 1.00000
Ductility Factor for X-dir. (Rx)	: 4.00000
Ductility Factor for Y-dir. (Ry)	: 4.00000
Total Effective Weight For X-dir. Seismic Loads (Wx)	: 24121.271122
Total Effective Weight For Y-dir. Seismic Loads (Wy)	: 24121.271122
Scale Factor For X-directional Seismic Loads	: 1.00
Scale Factor For Y-directional Seismic Loads	: 0.00
Accidental Eccentricity For X-direction (Ex)	: Positive
Accidental Eccentricity For Y-direction (Ey)	: Positive
Torsional Amplification for Accidental Eccentricity	: Do not Consider
Torsional Amplification for Inherent Eccentricity	: Do not Consider
Model For X-direction	: 3392.053752
Model For Y-direction	: 0.000000
Of Model For X-direction	: 628366525.678988
Of Model For Y-direction	: 0.000000



Calculation sheet of seismic load

Graph of the story force

7. Definition of Loading Area Group

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

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

Node Element Boundary Mass Load

Loading Area Plane

Loading Area Group Name
top

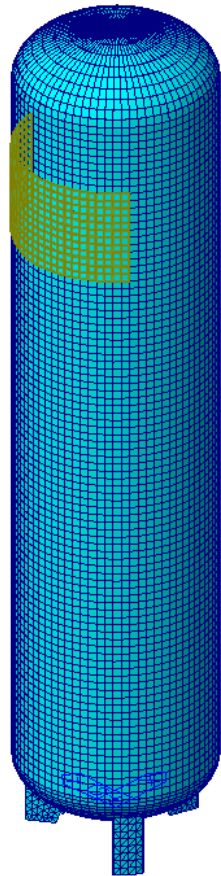
Options
 Add Replace Delete

Element Type
 Frame Planar

Elements Defining Loading Area

No.	Group	Element List
1	top	3570
2	top	3576
3	top	3939
4	top	3945
5	top	3481
6	top	3487
7	top	3844
8	top	3850
9	top	3392
10	top	3398
11	top	3755
12	top	3761
13	top	3666
14	top	3672
15	top	4029
16	top	4035
17	top	3571
18	top	3577
19	top	3934
20	top	3940

Apply Close



Node Element Boundary Mass Load

Loading Area Plane

Loading Area Group Name
Default

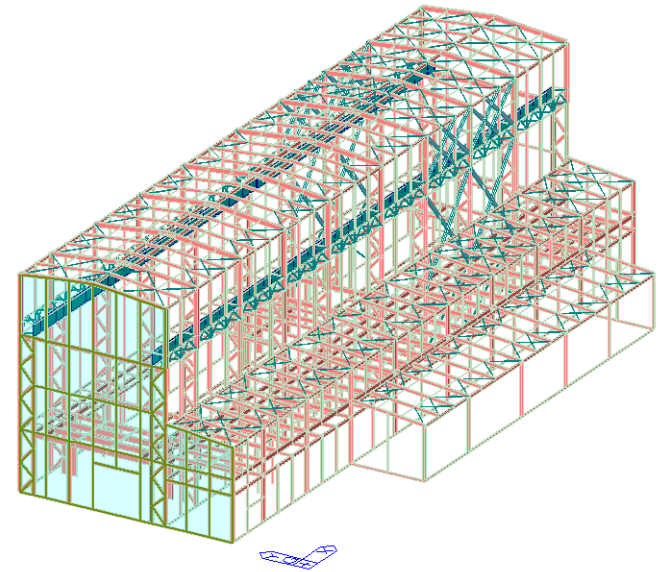
Options
 Add Replace Delete

Element Type
 Frame Planar

Elements Defining Loading Area

No.	Group	Element List
1	Default	14 172 173
2	Default	15 176 177
3	Default	27 170 175
4	Default	27 92 188
5	Default	36 188 189
6	Default	45 191 192
7	Default	66 193 205
8	Default	67 200 204
9	Default	90 172 10080
10	Default	94 202 203
11	Default	99 176 10086
12	Default	100 171 179
13	Default	100 101 191
14	Default	103 205 206
15	Default	104 201 207
16	Default	162 173 174
17	Default	163 177 178
18	Default	165 178 179
19	Default	182 189 190
20	Default	183 192 193

Apply Close



8. Wind pressure function

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

Load > Static Load > Lateral > Wind Pressure

Add/Modify/Show Wind Pressure Function

Function Name : Function_01

Coordinate System : Rectangular

Equation : $0.5*z*z$
(Example : $0.7*Z*Z, \cos(\text{TH})+R$)

Description : *Input Equation for Function*

Table Show Option

Fixed Axis : X, Y Unit : m, [deg]

X Start : 0 End : 5 Increment : 0.5

Fix Coordinates X : 0 Y : 0

Calculate

	X (m)	Y (m)	Z (m)	Wind Pressure (kN/m ²)
1	0	0	0	0
2	0	0	0.5	0.125
3	0	0	1	0.5
4	0	0	1.5	1.125
5	0	0	2	2
6	0	0	2.5	3.125
7	0	0	3	4.5
8	0	0	3.5	6.125
9	0	0	4	8
10	0	0	4.5	10.125
11	0	0	5	12.5

OK Cancel

Wind Pressure Function

Wind Pressure

Function Wind Pressure

Load Case Name : DL

Direction : X-Y

Angle : 0 [deg]

Inner Point : 0, 0, 0 m

Scale Factor : 1

Function Name : Function_01

Center Point : 0, 0, 0 m

Selection : Group Element

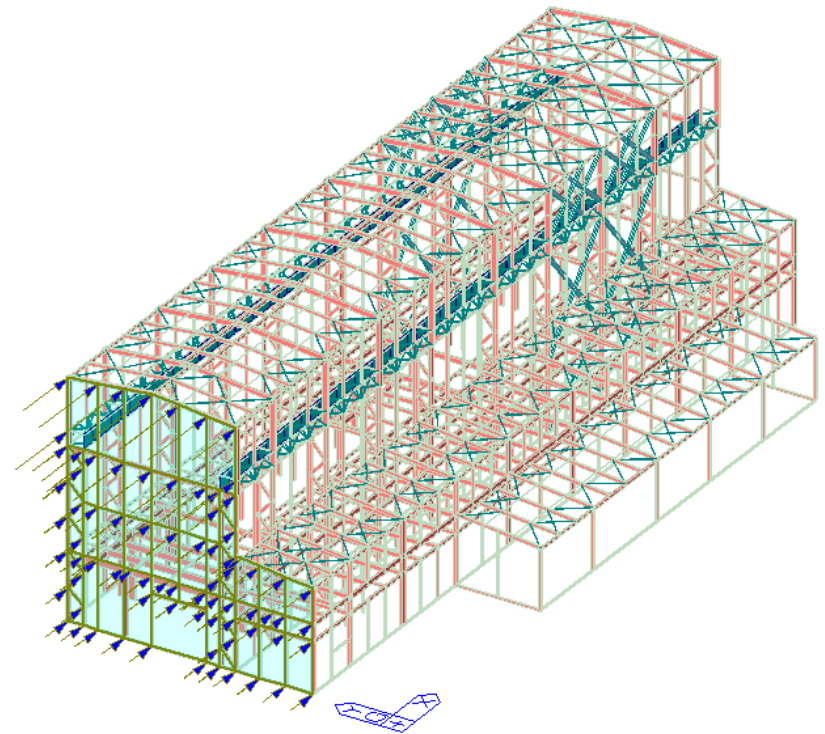
Loading Area Group Name : 01

Element Type
 Frame Planar

Elements Defining Loading Area :

Apply Close

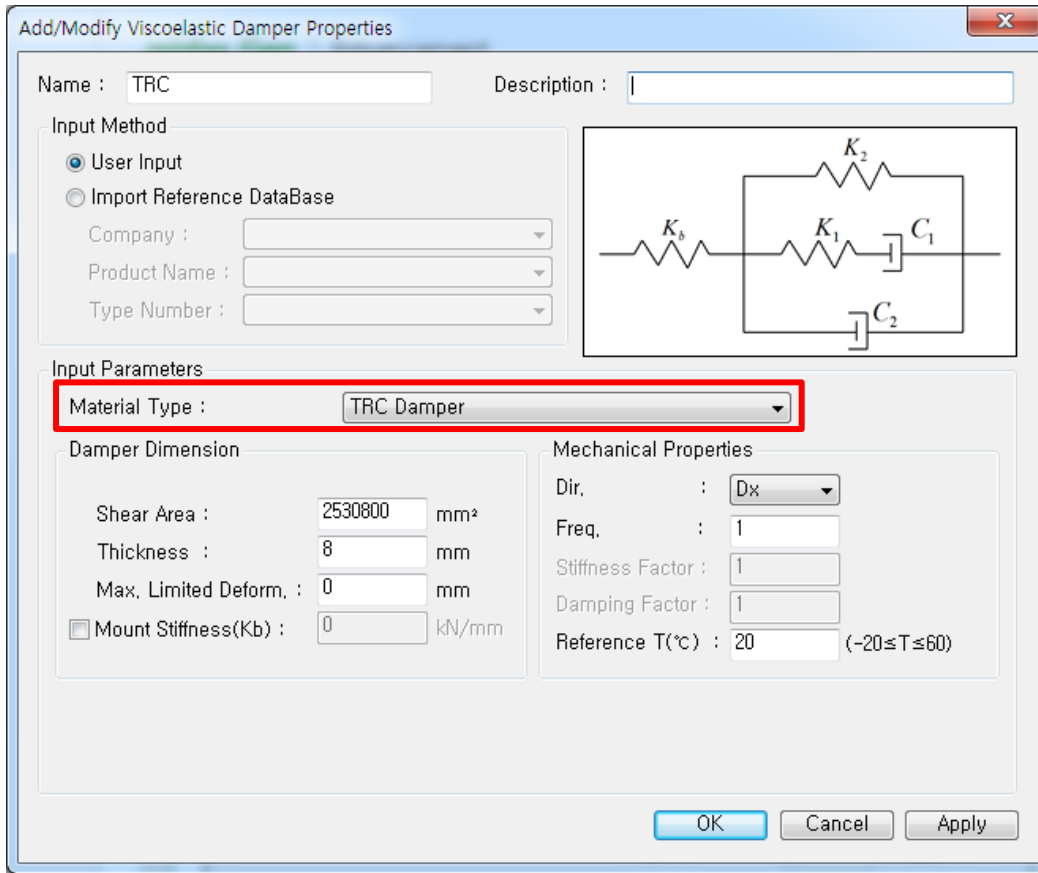
Function Wind Pressure



9. Improvement of viscoelastic damper

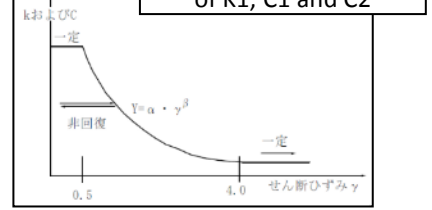
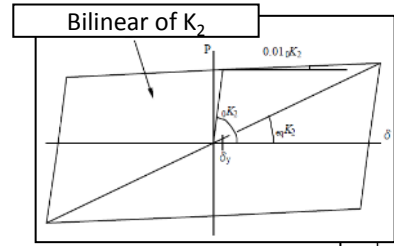
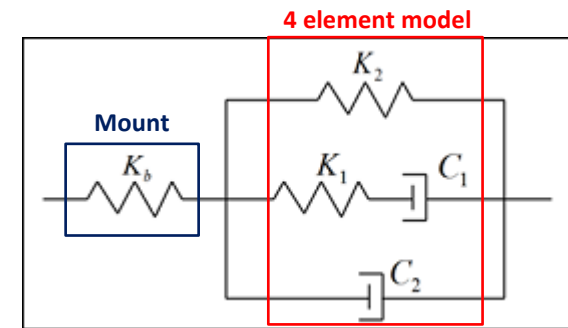
- TRC dampers manufactured by Sumitomo Riko Company Limited is added to the viscoelastic material properties.

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



4 element model

Viscoelastic material properties TRC Damper



9. Improvement of viscoelastic damper

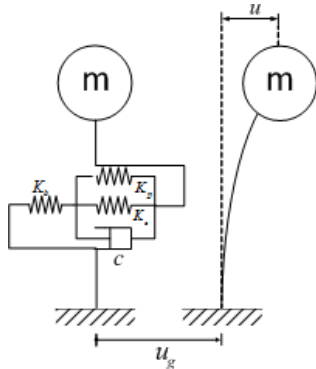
Boundary > General Link > Seismic Device Properties... > Viscoelastic Damper

TRC Damper (4 element model)

: Total Components ($K_1(\text{Maxwell}) + K_2(\text{Voigt}) + C_1(\text{Maxwell}) + C_2(\text{Voigt})$) + Mount

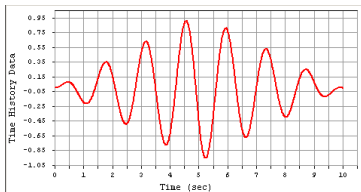
Compression with other products

- Verification model

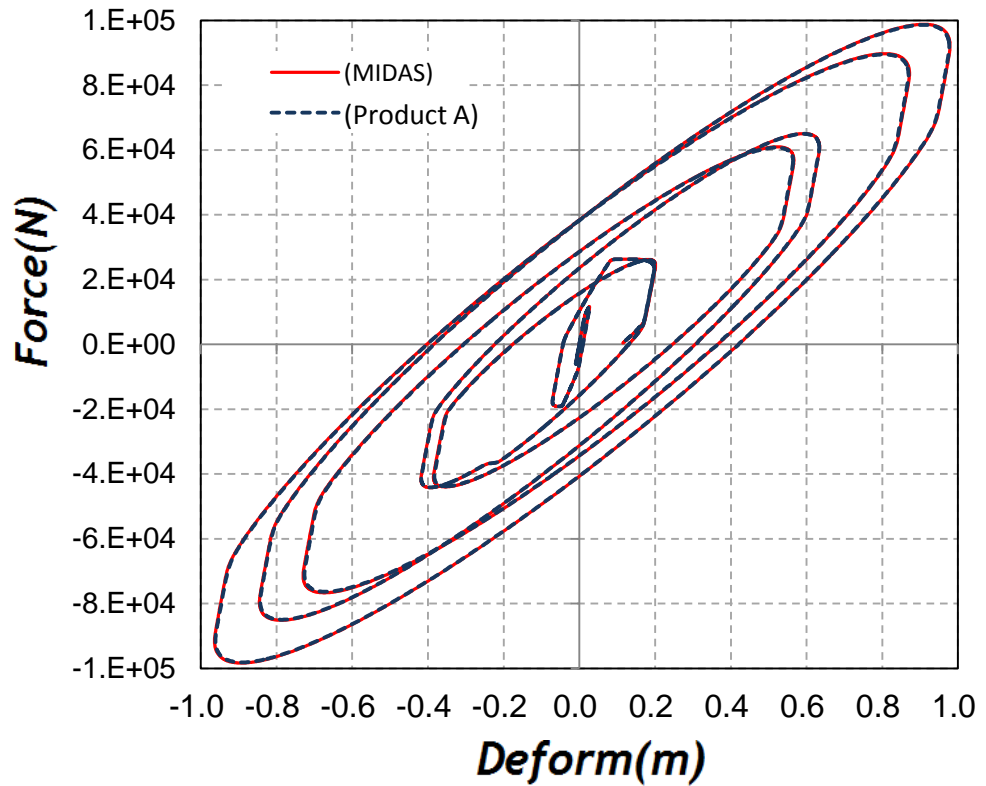


Mass = 5102.04 N/g
 Elastic Stiffness = 10000 N/m
 Undamped System
 Mounting Stiffness = 1000000 N/m

- Input seismic wave



- Compression of historical loop



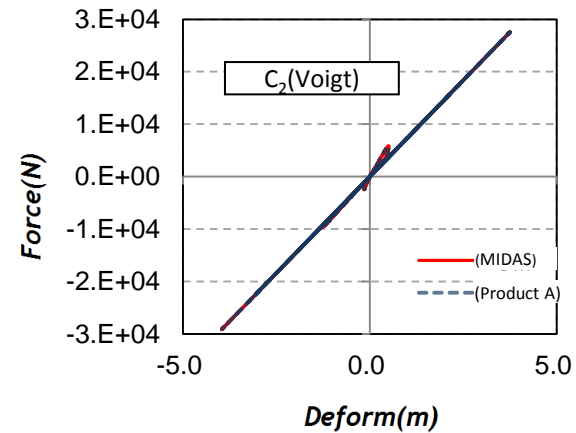
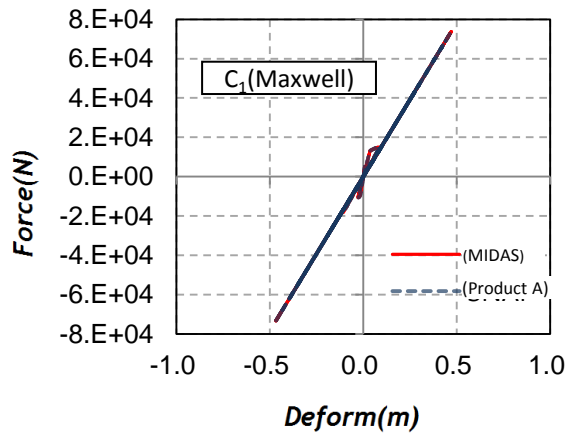
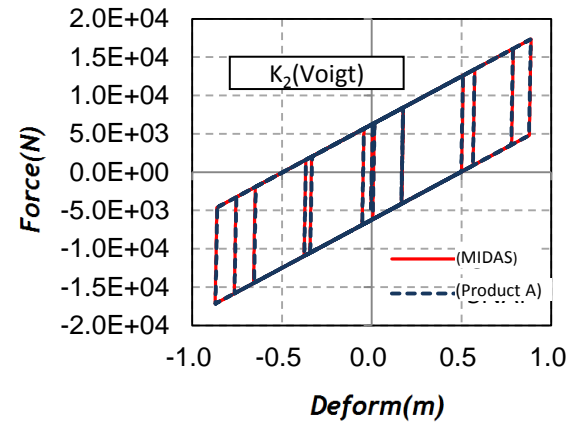
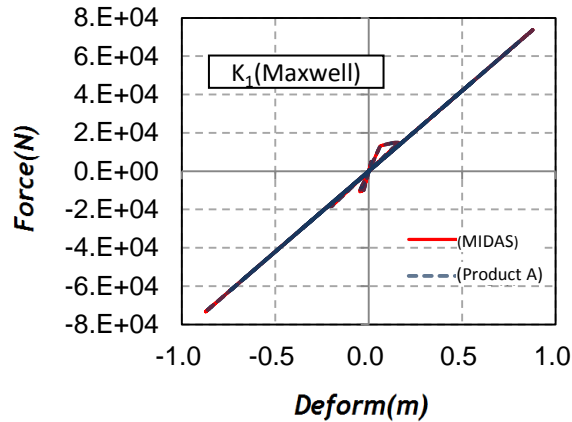
9. Improvement of viscoelastic damper

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

TRC Damper (4 element model)

: Total Components ($K_1(\text{Maxwell}) + K_2(\text{Voigt}) + C_1(\text{Maxwell}) + C_2(\text{Voigt})$) + Mount

Compression with other products (Historical loop)



10. Addition of Energy Result Graph

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

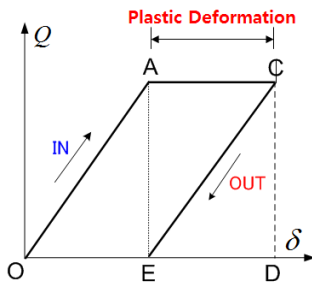
Result > T.H Graph/Text > Time History Energy Graph

Time History Energy Graph

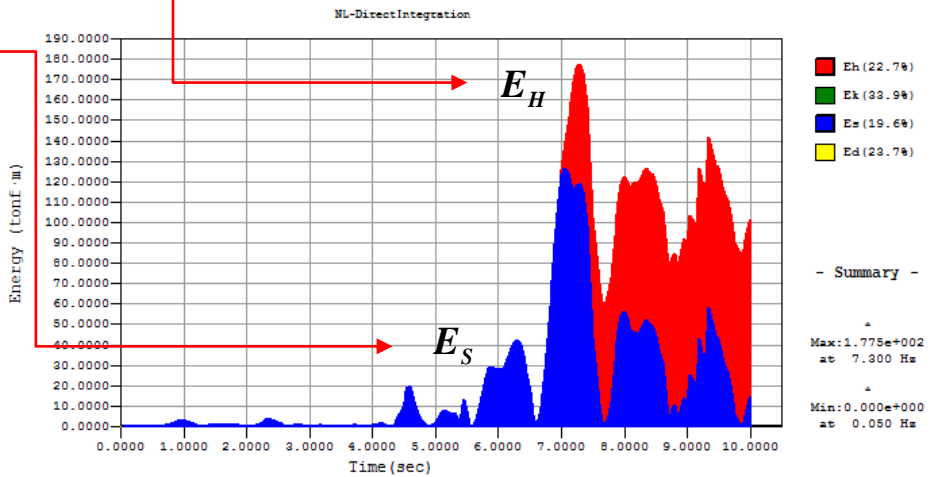
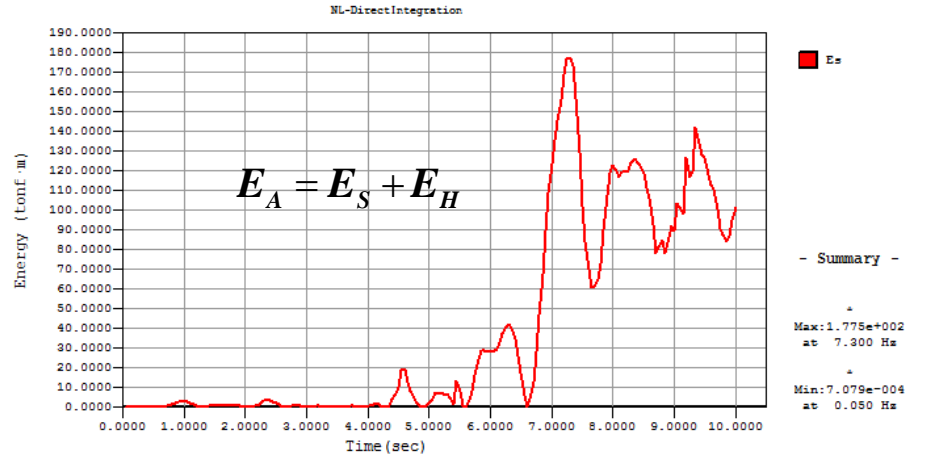
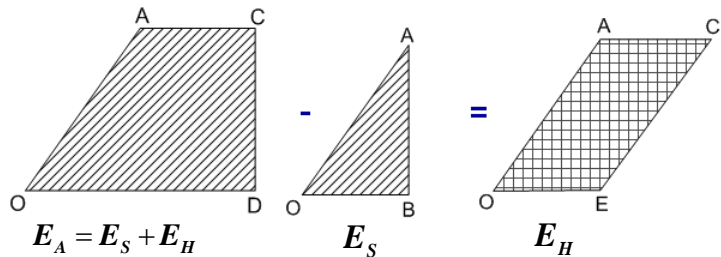
Structure Energy Graph

Time History Energy Graph Select

- Dissipated Inelastic Energy (Eh)
[Inelastic Hinge]
- Kinetic Energy (Ek)
- Elastic Strain Energy (Es)
- Damping Energy (Ed)



■ Input Energy ■ Elastic Energy ■ Dissipated Energy



10. Addition of Energy Result Graph

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

Time History Energy Graph

Structure Energy Graph

Time History Energy Graph Select

- Dissipated Inelastic Energy (Eh)
[Inelastic Hinge]
- Kinetic Energy (Ek)
- Elastic Strain Energy (Es)
- Damping Energy (Ed)
- Maxwell Damper Energy (Em)
[Oil Damper]
- Velocity Dependent Device Energy (Ev)
[Viscous | Viscoelastic Damper]
- Strain Dependent Device Energy (Et)
[Elas. + Inel.][Steel | Hyst. Isolator]
- Isolator Device Energy (Eo)
- Plastic Strain Energy (Ep)
[Plastic Material (Plate)]
- Input Energy (Ei)

Type of Display

Cumulative Value Type

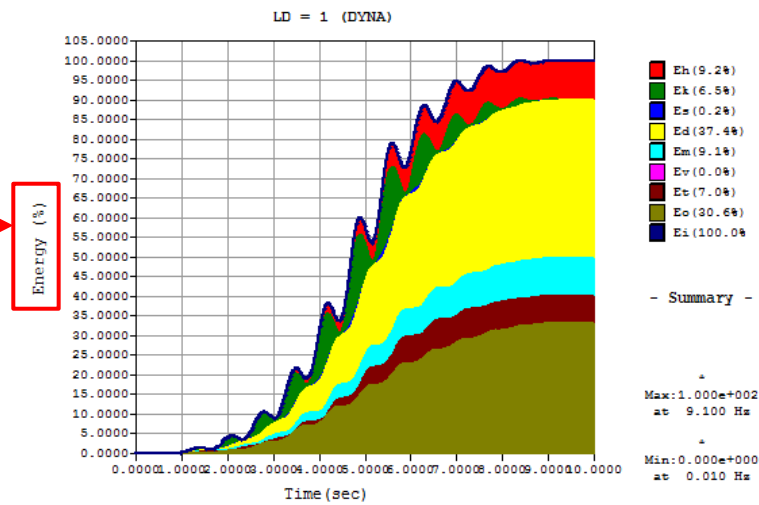
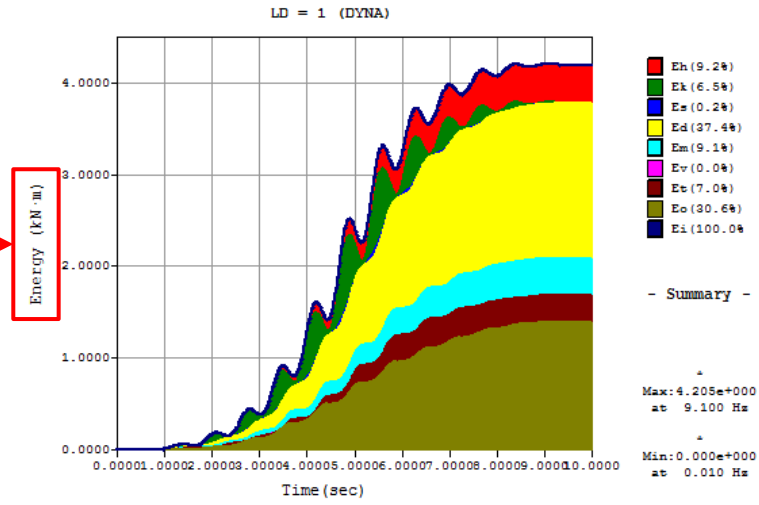
Value Percentage

Time History Load Case

Display Options

No Fill Solid Fill

Percentage Text Result



10. Addition of Energy Result Graph

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

Time History Energy Graph

Structure Energy Graph

Time History Energy Graph Select

- Dissipated Inelastic Energy (Eh)
[Inelastic Hinge]
- Kinetic Energy (Ek)
- Elastic Strain Energy (Es)
- Damping Energy (Ed)
- Maxwell Damper Energy (Em)
[Oil Damper]
- Velocity Dependent Device Energy (Ev)
[Viscous | Viscoelastic Damper]
- Strain Dependent Device Energy (Et)
[Elas. + Inel.][Steel | Hyst. Isolator]
- Isolator Device Energy (Eo)
- Plastic Strain Energy (Ep)
[Plastic Material (Plate)]
- Input Energy (Ei)

Type of Display

Cumulative Value Type

Value Percentage

Time History Load Case

Display Options

No Fill Solid Fill

Percentage Text Result

Text result of the each energy ratio

MIDAS/Text Editor - [App4_Time history analysis.spf]

File Edit View Window Help

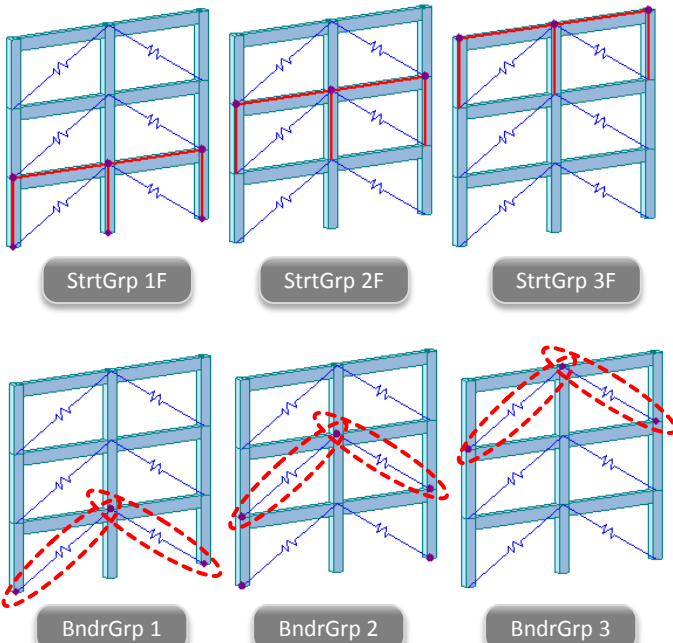
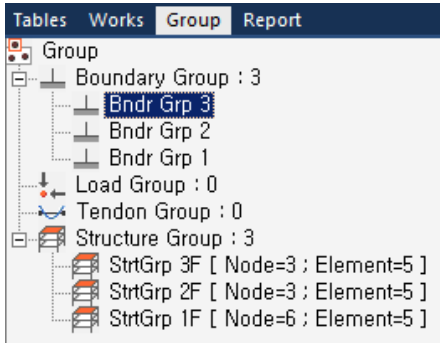
```

00001 TIME HISTORY ANALYSIS | ENERGY RESULT PERCENTATE ; TIME HISTORY LOADCASE NO. = 1
00002
00003
00004
00005
00006 Energy Graph
00007
00008
00009
00010
00011 (1) Dissipated Inelastic Energy [Inealstic Hinge] | Eh
00012
00013 (2) Kinetic Energy | Ek
00014
00015 (3) Elastic Strain Energy | Es
00016
00017 (4) Damping Energy | Ed
00018
00019 (5) Maxwell Damper Energy [Oil Damper] | Em
00020
00021 (6) Velocity Dependent Device Energy | Ev
00022
00023 (7) Strain Dependent Device [Steel | Hyst. Isolator] | Et
00024
00025 (8) Isolator Device Energy | Eo
00026
00027 (9) Plastic Strain Energy [Plastic Matrial (Plate)] | Ep
00028
00029 (10) Input Energy | Ei
00030
00031 Error (Input Energy[Ei] - Energy Sum[(1)~(9)])
00032
00033
    
```

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. Addition of Energy Result Graph

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



Tree Menu

Time History Energy Graph

Group Energy Graph

Time History Energy Graph Select

Elastic Strain Energy (Es)

Structure Group / Boundary Group

Structure Total Energy

- StrtGrp 3F
- StrtGrp 2F
- StrtGrp 1F
- Bndr Grp 3
- Bndr Grp 2
- Bndr Grp 1

Group Check

Type of Display

Cumulative Value Type

Value Percentage

Time History Load Case

DYNA

Display Options

No Fill Solid Fill

Percentage Text Result

Elastic Strain Energy (Es)

Inelastic Energy (Eh)

Kinetic Energy (Ek)

Elastic Strain Energy (Es)

Damping Energy (Ed)

Input Energy (Ei)

Result output of group distribution for each energy item

11. Multi-linear type elastic spring/ link for interface with GTS NX

- 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



Export Nodal Results

Target Nodes

All (By Supports, Point Spring, Spec. Disp.)

Selected Nodes

Select Load Case & Direction

Stage: Base

Load Cases/Combination: ST: SW

Step:

Result Type: Reactions

Result Components: All

OK Cancel



Export Nodal Results

Target Nodes

All (By Supports, Spec. Disp.)

Selected Nodes

Load Sets (By Force): User Defined

Output Data

Analysis Set: NS_every step3

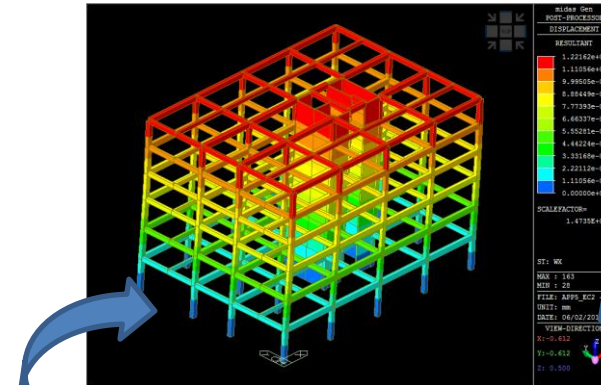
Step: Nonlinear Static(In-situ /

Result Type: Reactions

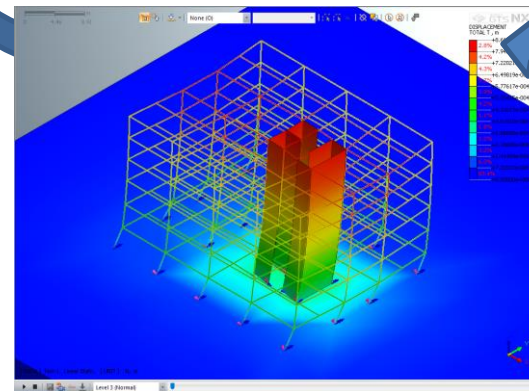
Result Components: All

OK Cancel Apply

Spring Data



Reactions



12. Multi-linear force-deformation function for Point Spring Support and Elastic Link

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

Previous version

	x : m	y : kN
a	0	0
b	0	0
c	0	0
d	0	0
e	0	0
f	0	0

Gen 2019 (v1.1)

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

	d(x) (mm)	F(y) (kN)
1	0.000000	0.000000
2	10.000000	10000.000
3	20.000000	12000.000
4	30.000000	13000.000
5	40.000000	13800.000
6	50.000000	14000.000
7	60.000000	14200.000
8	70.000000	14400.000
9	80.000000	14560.000
10	90.000000	14600.000
11	100.000000	14660.000
12		

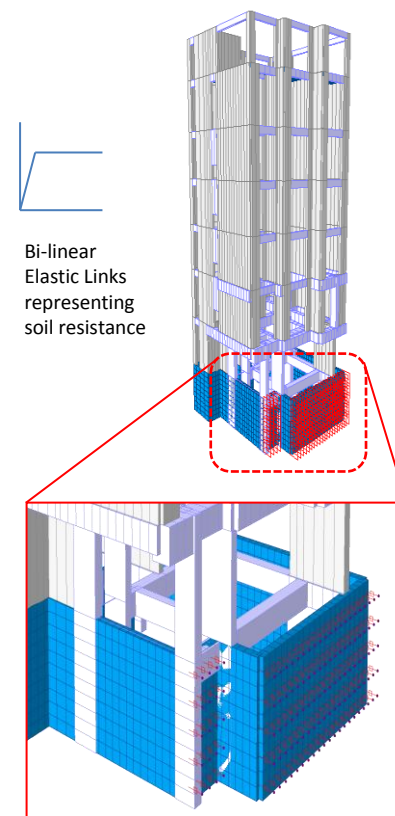
	d(x) (mm)	F(y) (kN)
1	0.000000	0.000000
2	10.000000	10000.000
3	20.000000	12000.000
4	30.000000	13000.000
5	40.000000	13800.000
6	50.000000	14000.000
7	60.000000	14200.000
8	70.000000	14400.000
9	80.000000	14560.000
10	90.000000	14600.000
11	100.000000	14660.000
12		

13. Nonlinear Elastic Links for Pushover Analysis

- 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



Bi-linear Elastic Links representing soil resistance

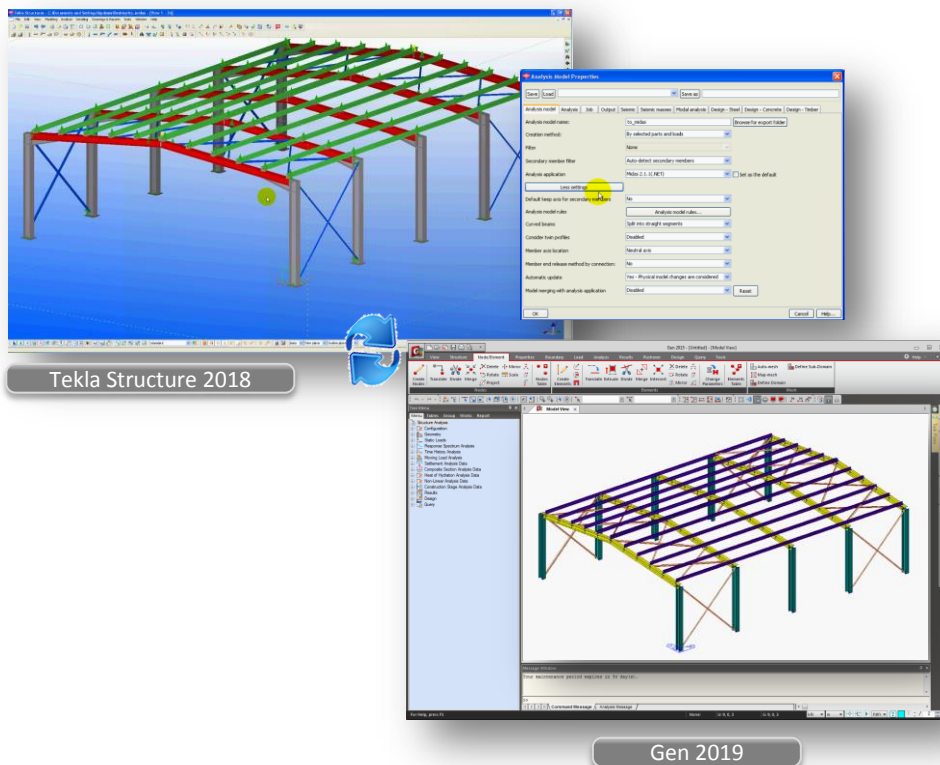
Pushover Analysis for the underground structure

14. Tekla Structure 2018 Interface

- 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

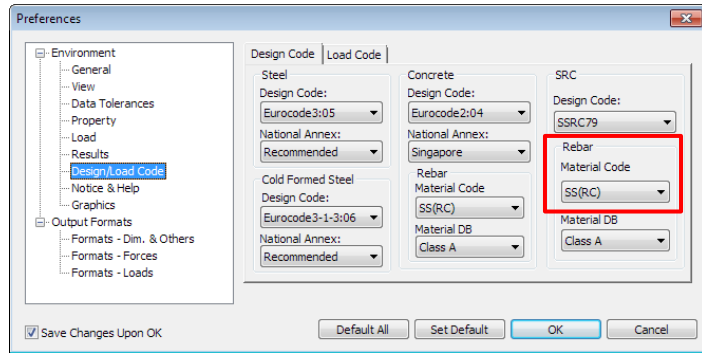


Category	Features	Tekla <> Gen
MATERIAL	concrete	<>
	steel	<>
	pre cast - wood and other types	<>
	Material user defined	<>
ELEMENT TYPE/ ROTATIONS	vertical column	<>
	inclined column	<>
	straight beam	<>
	curved beam	>
	Slab	<>
	vertical panel	>
2D ELEMENTS	Concrete panels and slab	<>
BOUNDARY CONDITIONS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

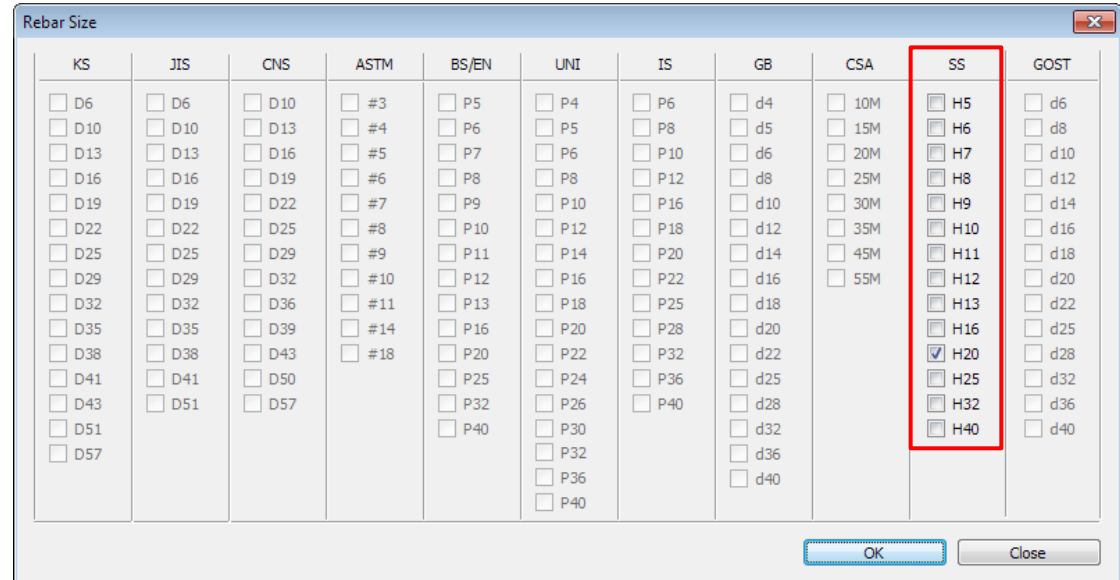
15. Reinforcement as per SS560 : 2010

- 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 Column

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

WorkBar

Add new member

System: SRC

Type: Column

Name:

Option... Add

Keep Sect. & Bar Data

RC: Steel SRC Aluminum Reinforce

SRC Design Procedure

- Design Option
 - SRC : AISC-LRFD 10M**
 - Rebar Code : ASTM
 - Material DB : ASTM09
 - Section Code : AISC10(US)
 - Steel Option
 - Preference
 - Composite Beam
 - Column (2)
 - SC01
 - SC02
 - CFT Column

Start Page Member Member List Drawing Quantity

General

Member Name: SC01

Apply this Member to: Dwg & Report

Material

Concrete: 3.481 ksi

Main Bar: 58.015 ksi

Hoop Bar: 58.015 ksi

H-Beam: A36

Stud: A36

Shape

Rectangular Circle

Section

Width: 19.69 in

Height: 19.69 in

Length(x): 11.48 ft

Length(y): 11.48 ft

Kx: 1.00

Ky: 1.00

H-Beam

Shape: H Section

Use DB: W8X40

Force & Moment

Axial: 100.00 kip

Moment(x): 80.00 kip.in

Moment(y): 80.00 kip.in

Shear(x): 50.00 kip

Shear(y): 60.00 kip

Coefficient / Factor

Cmx: 0.600

Cmy: 0.600

Bd: 0.600

Load Combinations (1) ...

Design(F4) Check(F5) Report ...

Double click to Zoom

19.685

1.5748

8.25

8.07

19.685

Rebar

MAIN BAR					
Layer	No	Row	Main	Dc	
Layer 1	4	2	#8	1.57	in
Max.Num Maximum Rebar Layout (Layer 1) : 16-4-#8					
HOOP BAR					
End	#3	@ 5.91	in	<input type="checkbox"/> Use User Input	
Center	#3	@ 11.81	in		

Main Bar Arrangement

Corner (Auto Calc) Identically Distribute

Corner (by User : 3.07 in)

Check Load Transfer

External force to steel only External force to concrete only

External force to Both materials concurrently

Headed Stud

Type: M19

Space: 11.81 in No. (Web) 1 EA

Length: 3.15 in No. (Flg) 1 EA

Spacing Limit of Main Rebar

Do not splice 50% 100%

Apply(F3)

PM Interaction Curve

Double click to Zoom

1750

1500

1275

1000

750

500

250

0

-250

-500

-750

-400

0

800

1600

2400

3200

4000

45.95°

50.63°

eb=14.5

M (kip.in)

P (kip)

Calculation Result

Check Item	Direction X	Direction Y	Remark
REQUIREMENT FOR MATERIAL			
Fck,min (ksi)	3.481	3.046	OK(0.875)
Fck,max (ksi)	3.481	10.15	OK(0.343)
Fy,max (ksi)	36.00	76.14	OK(0.473)
Fyr,max (ksi)	58.02	76.14	OK(0.762)
MOMENT CAPACITY			
psr			
ps			
σ			
σPn (kip)			
σMn (kip.in)			
Pu/σPn			
Mu/σMn			
smax (in)			
s/smmax			
σVn,con (kip)			
σVn,stl+bar (kip)			
σVn,stl (kip)			

↓ Drawing

MIDASIT SRC COLUMN LIST

NAME	SECTION	NAME	SECTION
SC01		SC02	
(19.69x19.69)		(19.69x19.69)	
STEEL SECT.	W8X40	STEEL SECT.	W8X40
MAIN BAR	4-#8	MAIN BAR	12-#8
HOOP (MID)	#3@11.81	HOOP (MID)	#3@11.81
HOOP (END)	#3@5.906	HOOP (END)	#3@5.906
STUD (WEB)		STUD (WEB)	
STUD (FLG.)		STUD (FLG.)	

2. CFT Column

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

Check Item	Direction X	Direction Y	Remark
REQUIREMENT FOR MATERIAL			
Fck,min (ksi)	3.481	3.046	OK(0.875)
Fck,max (ksi)	3.481	10.15	OK(0.343)
Fy,max (ksi)	36.00	76.14	OK(0.473)
As,min(%)	8.552	1.000	OK(0.117)
WIDTH-THICKNESS RATIO			
BTR	OK(0.184)		Compact
AXIAL CAPACITY			
σPn (kip)	881		σ=0.750
Pu/σPn	OK(0.114)		
MOMENT CAPACITY			
σMn (kip.in)	1759	1759	σ=0.900
Mu/σMn	OK(0.028)	OK(0.045)	
COMBINED RATIO			
ComRat	OK(0.131)		Pr/Pc < 0.2
SHEAR CAPACITY			
σVn,stl (kip)	167	167	σ=0.900

↓ Summary report

1. General Information

Design Code	Unit System
AISC-LRFD10M	N, mm

2. Material & Section

Concrete Material	Steel Material	Steel Shape
24.00MPa	A36 (Fy = 248MPa)	HSS16X.375

3. Length

L1	L2	K1	K2	Lc
3.500m	3.500m	1.000	1.000	0.000m

4. Force

Px	Mux	Muy	Vux	Vuy
445kN	5.64kN.m	9.03kN.m	222kN	222kN

5. Check Limitation

Check Items	Value	Criteria	Ratio
Lower Limit of Conc. (f _{c,min})	24.00	21.00	0.875
Upper Limit of Conc. (f _{c,max})	24.00	70.00	0.343
Upper Limit of Steel (F _y)	248	76.14	0.307
Steel Section Area Ratio (A _s / A _g)	0.0852	0.0848	1.000

Detail report →

9. Check Flexural Strength About Major Axis

(1) Check Flexural Strength About Minor Axis

- $K_c = f_c h^2 = 3,601 \text{ kN}$
- $K_s = F_y \frac{d-t}{2} = 437 \text{ kN}$
- $\text{Param} = \sqrt{(0.0260K_c + 2K_s)^2 + 0.857K_c K_s}$
- $\theta = \frac{0.0260K_c - 2K_s}{0.0848K_c} + \frac{\text{Param}}{0.0848K_c} = 2.395 \text{ radian}$

(2) Calculate plastic section modulus

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

(3) Calculate plastic flexural strength

- $M_p = Z_{pl} F_y - \frac{Z_{pl} 0.85f_c}{2} = 221 \text{ kN.m}$

(4) Calculate flexural strength about major axis (ϕM_n)

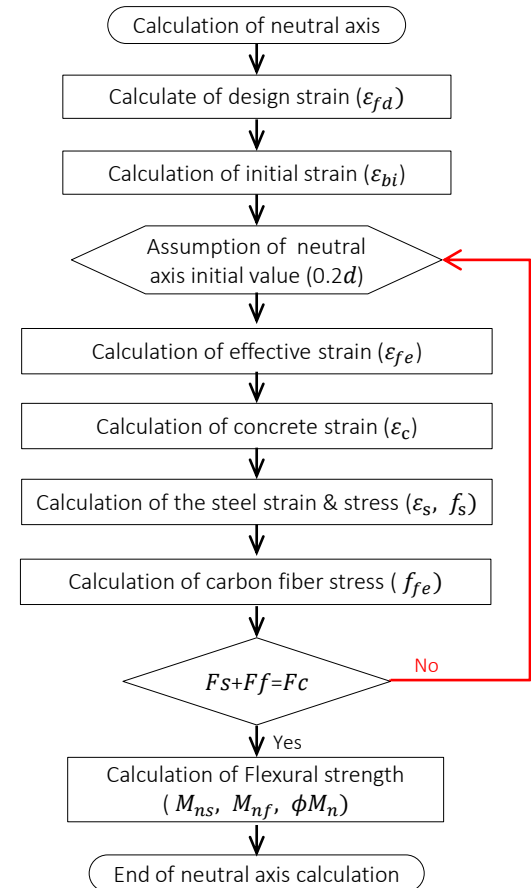
- $M_n = M_p = 221 \text{ kN.m}$
- Resistance factor for flexure : $\phi = 0.900$
- $\phi M_n = 199 \text{ kN.m}$
- $M_u / \phi M_n = 0.0284 < 1.000 \rightarrow \text{O.K.}$

3. Carbon fiber strengthened beam

- 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.

Check Item	Value	Criteria	Ratio
Negative Moment (Before)			
Strength (kip.in)	-	-	-
Rebar Ratio (Min)	-	-	-
Rebar Ratio (Max)	-	-	-
Rebar Space (in)	-	-	-
Positive Moment (Before)			
Strength (kip.in)	30.00	1283	OK(0.023)
Rebar Ratio (Min)	0.00434	0.00013	OK(0.030)
Rebar Ratio (Max)	0.00434	0.03096	OK(0.140)
Rebar Space (in)	10.85	17.63	OK(0.615)
Shear Force (Before)			
Strength (kip)	30.00	50.74	OK(0.591)
Max. Strength (kip)	30.00	34.57	OK(0.868)
Rebar Space (in)	11.81	11.57	NG(1.021)
Skin Rebar			
Rebar Space (in)	-	-	-
Negative Moment (After)			
Limit (kip.in)	-	-	-
Strength (kip.in)	-	-	-
Stress (ksi)	-	-	-
Creep (ksi)	-	-	-
Positive Moment (After)			
Limit (kip.in)	116	1283	OK(0.091)
Strength (kip.in)	30.00	1952	OK(0.015)
Stress (ksi)	3.471	32.00	OK(0.108)
Creep (ksi)	3.289	223	OK(0.015)
Shear Force (After)			
Strength (kip)	30.00	34.57	OK(0.868)
Development Length			
Pos.(1) (in)		4.247	
Pos.(2) (in)		4.247	

Flow chart of neutral axis calculation



4. Aluminum beam/column

- 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

WorkBar

- Add new member
- System: Aluminum
- Type: Beam/Column (Gene)
- Name: AG01
- Option... Add
- Keep Sect. & Bar Data
- RC | Steel | SRC | Aluminum | Reinforce
- Aluminum Design Procedure
- Design Option
 - Aluminum : AA-ASD05
 - Material DB : AA
 - Section Code : AISC 10(US)
 - Aluminum Option
 - Preference
 - Beam/Column (1)
 - Beam/Column (General) (1)
 - AG01

Member

Start Page | Member | Member List | Drawing | Quantity

General

Member Name: AG01
Apply this Member to: Dwg & Report

Material

Material: 2014-T6511
Product: Extrusions

Section

Section: IJ-7781

Force & Factor

Check Minor Axis

Axial Force: 7.00 kN
Moment (x): 2.50 kN.m
Moment (y): 0.00 kN.m
Shear (x): 0.00 kN
Shear (y): 2.00 kN

Cmx: 0.85
Cmy: 0.85
Cb: 1.00
m: 0.67

Load Combinations (1) ...

Span

Lx: 1.00 m
Ly: 1.00 m
Kx: 1.00
Ky: 1.00
Lb: 1.00 m

Deflection

by Wind: 0.00 mm
by Self: 0.00 mm
Deflection Criteria ...

Design(F-4) | Check(F5) | Report ... | Apply(F3)

Double click to Zoom

Section Property

Area	856.485	mm ²	Asx	383.142	mm ²
Xbar	73.919	mm	Asy	189.311	mm ²
Ybar	29.602	mm	Sx	14343.683	mm ³
Ix	424606.000	mm ² ·x ²	Sy	26958.625	mm ³
Iy	1992760.000	mm ² ·x ²	Zx	-	mm ³
J	847467.000	mm ² ·x ²	Zy	-	mm ³
Ix	-	mm	Cw	-	mm ² ·x ³
Iy	-	mm	Ixy	-	mm ² ·x ²

Design Data

Sect.	CHK	Major			Minor		
		t	b, Rb	h, ae	t	b, Rb	h, ae
13	<input type="checkbox"/>	2.00	-	150.00	2.00	-	150.00
14	<input checked="" type="checkbox"/>	-	-	-	-	-	-
COMPRESSION IN BEAM ELEMENTS							
15	<input type="checkbox"/>	2.00	100.00	-	2.00	100.00	-
16	<input type="checkbox"/>	2.00	100.00	-	2.00	100.00	-
16.1	<input checked="" type="checkbox"/>	2.00	100.00	-	2.00	100.00	-
16.2	<input type="checkbox"/>	2.00	100.00	-	2.00	100.00	-
16.3	<input type="checkbox"/>	2.00	100.00	-	2.00	100.00	-
COMPRESSION IN BEAM ELEMENTS							
17	<input type="checkbox"/>	2.00	100.00	-	2.00	100.00	-
18	<input checked="" type="checkbox"/>	2.00	-	150.00	2.00	-	150.00
19	<input type="checkbox"/>	2.00	-	150.00	2.00	-	150.00
SHEAR IN ELEMENTS							
20	<input checked="" type="checkbox"/>	2.00	-	150.00	2.00	-	150.00
21	<input type="checkbox"/>	2.00	-	150.00	2.00	-	150.00

Select All | Unselect All

Moment of Inertia

Iox: 0.00 mm²·x²
Ioy: 0.00 mm²·x²

Edge Stiffener

ds: 50.00 mm
Ds: 50.00 mm
As: 0.00 mm²
Theta: 0.00

Section Property

Area	856.485	mm ²	Asx	383.142	mm ²
Xbar	73.919	mm	Asy	189.311	mm ²
Ybar	29.602	mm	Sx	14343.683	mm ³
Ix	424606.000	mm ² ·x ²	Sy	26958.625	mm ³
Iy	1992760.000	mm ² ·x ²	Zx	-	mm ³
J	847467.000	mm ² ·x ²	Zy	-	mm ³
Ix	-	mm	Cw	-	mm ² ·x ³
Iy	-	mm	Ixy	-	mm ² ·x ²

Calculation Result

COMPRESSION STRESS				
Sect.	S	S1	S2	F
Sect. 3.4.7	1141	-73.25	1363	148
BENDING STRESS (MAJOR AXIS)				
Sect.	S	S1	S2	F
Sect. 3.4.14	1215	3109	28585	230
Sect. 3.4.16.1	1270	70.69	2519	205
Sect. 3.4.18	1905	1083	1538	186
SHEAR STRESS (MAJOR AXIS)				
Sect.	S	S1	S2	F
Sect. 3.4.20	1905	835	1360	51.15
STRESS RATIO				
-	f	F	f / F	
Axial	8.173	148	OK(0.055)	
Bending(Major)	174	186	OK(0.937)	
Bending(Minor)	-	-	-	
Shear(Major)	10.56	51.15	OK(0.207)	
Shear(Minor)	-	-	-	
COMBINED RATIO (AXIAL + BENDING)				
-	R1	R2	R	
Combined	0.888	0.972	OK(0.972)	
COMBINED RATIO (AXIAL + BENDING + SHEAR)				
-	Major		Minor	
Combined	NG(1.035)		-	
DEFLECTION				

5. Improvement of Rib plate for base plate

- 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.

The screenshot displays the software interface for designing a base plate with a rib plate. The main drawing area shows a plan view of the base plate with dimensions: total width 609.55 mm, total height 604.978 mm, and a central rib plate width of 409.55 mm. The rib plate is 6 mm thick and 100 mm high. The base plate is 6 mm thick and 100 mm high. The drawing also shows a section view of the base plate and rib plate.

The **Base Plate** settings are as follows:

- Shape: Rectangle
- Width: 409.55 mm
- Height: 404.98 mm
- Thickness: 6 mm
- Placed on Pedestal

The **Use Rib Plate** settings are as follows:

- Use Rib Plate
- Thickness: 6 mm
- Height: 100.00 mm
- Length: 10.00 mm
- Number (x | y): 1 | 3 EA
- Extend to base plate edge

The **Anchor Bolt** settings are as follows:

- Install Type: Cast-In-Place Anchor Bolt
- Diameter: 5/8
- Length: 25.00 mm
- Position (x): 50.00 mm
- Position (y): 50.00 mm
- Number (x | y): 2 | 2 EA
- Start Angle: 0
- Get number from Rib-Plate Layout

The **Calculation Result** table is as follows:

Check Items	Value	Criteria	Remark
Bearing Stress ()	Comp. (MPa)		
	Tens. (kN)		
Base Plate	Mxx (kN.m/m)		
	Myy (kN.m/m)		
Rib Plate	BTR		
	Mu (kN.m)		
Wing Plate	BTR		
	Mu (kN.m)		
Anchor Bolt	Vu (kN)		
	Tu (kN)		
	Length (mm)		

The **Report** window shows the following results:

1. Check bearing stress of base plate

2. Check tension stress of anchor bolt

The stress distribution plot shows a maximum stress of 45.49 MPa and a minimum stress of -31.05 MPa. The maximum stress is located at the top right corner of the base plate. The minimum stress is located at the bottom left corner of the base plate.

σ_{max}	σ_{min}	ϕ	F_n	$\sigma_{max} / \phi F_n$
45.49 MPa	0.0594 MPa	0.650	30.42 MPa	2.301