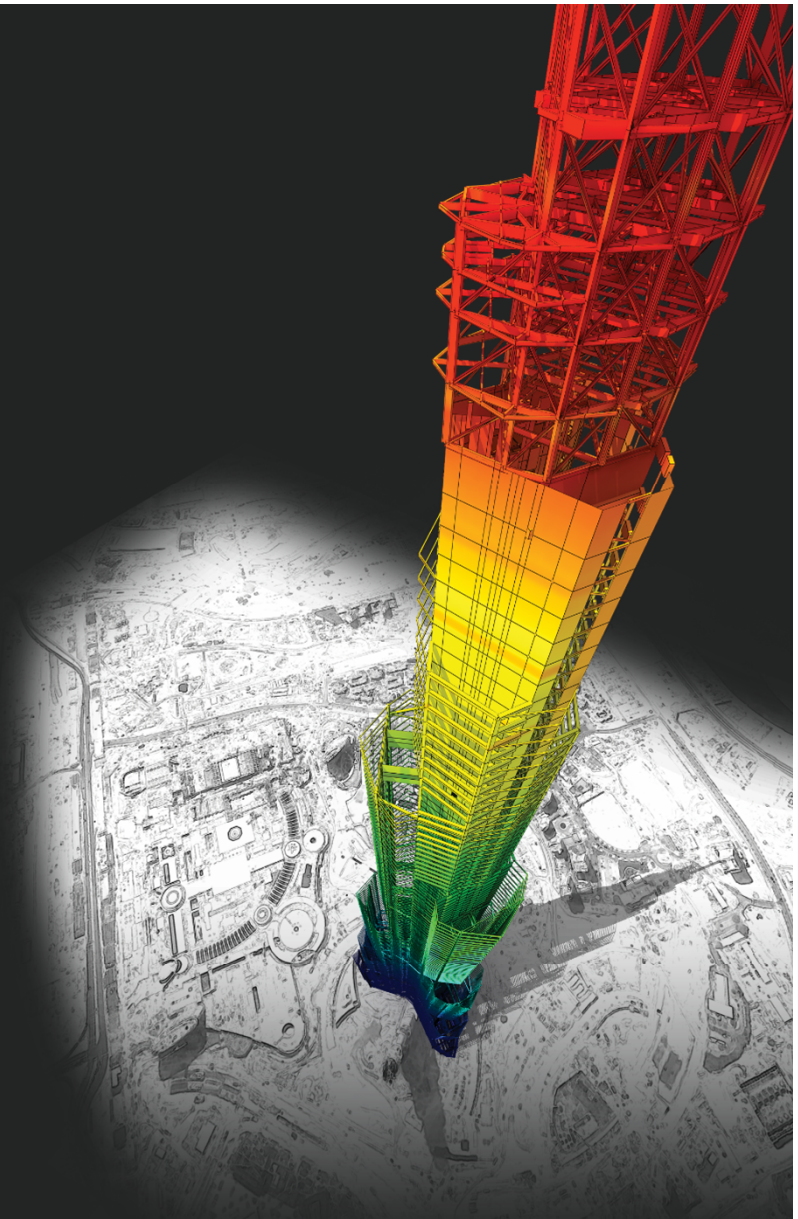


# Release Note

---

Release Date : Nov. 2018

Product Ver. : Gen 2019 (v2.1) and Design+ 2019 (v2.1)



*DESIGN OF General Structures*

*Integrated Design System for Building and General Structures*

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- **midas Design+**

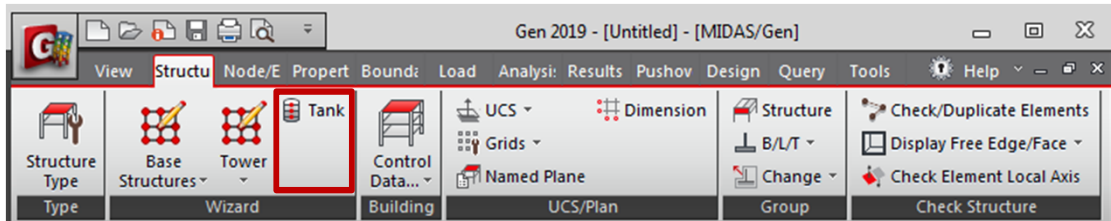
(1) Add steel design as per AISC360-16 and AISC360-16M	20
--	----

*midas* **Gen**

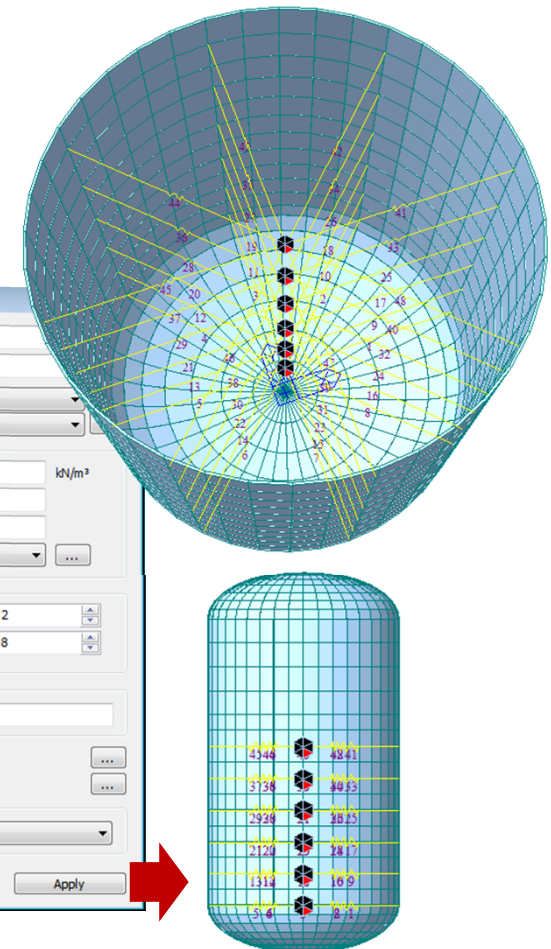
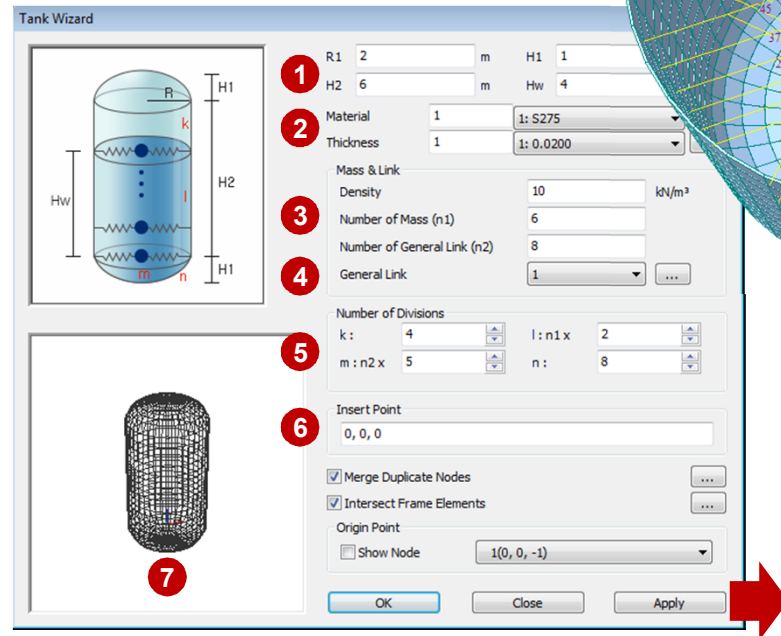
# 1. Wizard sloshing for tank (Mass adding)

- The wizard makes it easy to create a tank model.

Structure > Wizard > Tank



- 1 Input size(R1,H1,H2) of the tank and height(Hw) of filling.
- 2 Select the **Material** and **Thickness**.
- 3 Input **Density** of filling and **Number of Mass & General Link**.
- 4 Select **General Link**.  
(Click ... to define general link properties.)
- 5 Set **Number of Divisions** for meshing plate.
- 6 Input coordination of **Insert Point**.
- 7 Check the model shape with preview image



## 2. Foundation Drop Panel

- It is allowed to Install the drop panel at the bottom of the column.
- It is easy to create foundations with different thicknesses.

**Define Size and Angle of Drop**

Assign Drop Panel

Option  
 Add / Replace    Delete

Drop Panel Name  
 Footing\_45

Apply   Close

---

**Define Drop Panel**

Name  
 Footing\_45  
 Footing\_0

Add  
 Modify  
 Delete

---

**Add/Modify Drop Panel**

Name : Footing\_45

Description :

Location  
 Top of Column    Bottom of Column    Both

Shape

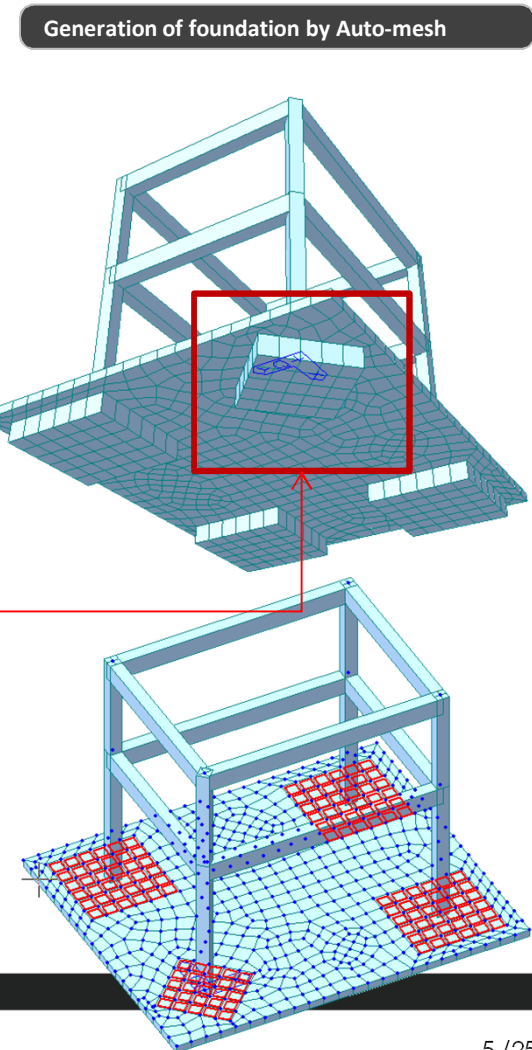
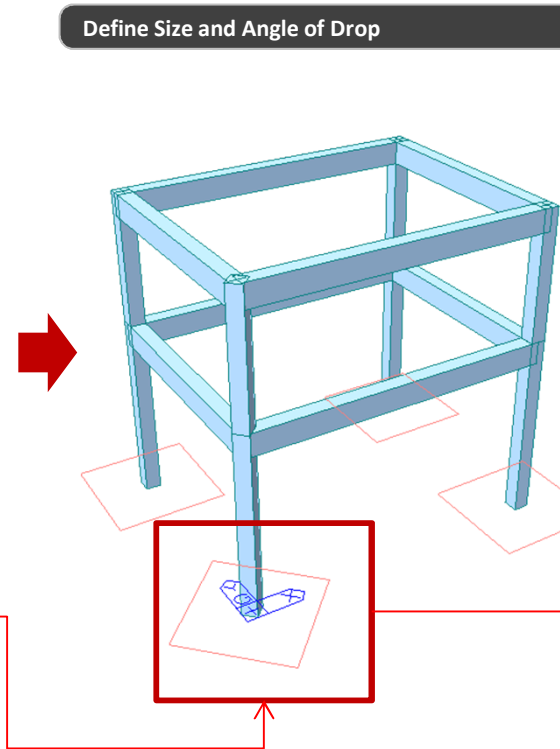
B1	1.5	m
B2	1.5	m
H1	1.5	m
H2	1.5	m

Node

Thickness 0.5 m (Including Slab Thik.)

Angle 45 [deg]

OK   Cancel   Apply



# 3. Check Criteria for Regularity in Plan as per NTC2018

## Check Criteria for Regularity in Plan

EN 1998-1:2004 (E)

(7) For non-regular in elevation buildings the decreased values of the behaviour factor are given by the reference values multiplied by 0,8.

### 4.2.3.2 Criteria for regularity in plan

(1)P For a building to be categorised as being regular in plan, it shall satisfy all the conditions listed in the following paragraphs.

(2) With respect to the lateral stiffness and mass distribution, the building structure shall be approximately symmetrical in plan with respect to two orthogonal axes.

(3) The plan configuration shall be compact, i.e., each floor shall be delimited by a polygonal convex line. If in plan set-backs (re-entrant corners or edge recesses) exist, regularity in plan may still be considered as being satisfied, provided that these set-backs do not affect the floor in-plan stiffness and that, for each set-back, the area between the outline of the floor and a convex polygonal line enveloping the floor does not exceed 5 % of the floor area.

(4) The in-plan stiffness of the floors shall be sufficiently large in comparison with the lateral stiffness of the vertical structural elements, so that the deformation of the floor shall have a small effect on the distribution of the forces among the vertical structural elements. In this respect, the L, C, H, I, and X plan shapes should be carefully examined, notably as concerns the stiffness of the lateral branches, which should be comparable to that of the central part, in order to satisfy the rigid diaphragm condition. The application of this paragraph should be considered for the global behaviour of the building.

(5) The slenderness  $\lambda = L_{max}/L_{min}$  of the building in plan shall be not higher than 4, where  $L_{max}$  and  $L_{min}$  are respectively the larger and smaller in plan dimension of the building, measured in orthogonal directions.

(6) At each level and for each direction of analysis x and y, the structural eccentricity  $e_s$  and the torsional radius  $r$  shall be in accordance with the two conditions below, which are expressed for the direction of analysis y:

$$e_{ox} \leq 0,30 \cdot r_x \tag{4.1a}$$

$$r_x \geq l_s \tag{4.1b}$$

where

$e_{ox}$  is the distance between the centre of stiffness and the centre of mass, measured along the x direction, which is normal to the direction of analysis considered;

$r_x$  is the square root of the ratio of the torsional stiffness to the lateral stiffness in the y direction ("torsional radius"); and

$l_s$  is the radius of gyration of the floor mass in plan (square root of the ratio of (a) the polar moment of inertia of the floor mass in plan with respect to the centre of mass of the floor to (b) the floor mass).

**Define Building control**

Building Control

Use Ground Level  
Ground Level : 0 m

Consider Mass below Ground Level for Eigenvalue Analysis

Story Shear Force Ratio

Consider Wind and Seismic Loads for Flexible Floors

Eccentricity Ratio

Story Center (Mass/Load)

Use Mass  Use Axial Force  Use Shear Force

Load Case : EX

Scale Factor : 1

Load Case	Scale
EX	1

Story Stiffness Center

X-Directional Load Case : EX

Y-Directional Load Case : EY

Story Response of Time History Results

Story Center

Story Average

Story Drift by Maximum of Vertical Elements

**Story Result Table**

- Story Drift...
- Story Drift (Time History Analysis)...
- Story Displacement...
- Story Shear (Response Spectrum Analysis)...
- Story Shear (Time History Analysis)...
- Story Mode Shape...
- Story Eccentricity...
- Story Shear Force Ratio...
- Torsional Amplification Factor...
- Stability Coefficient...
- Irregularity Check Parameter...**
- Weight Irregularity Check...**
- Overturning Moment...
- Story Axial Force Sum...
- Torsional Irregularity Check...
- Criteria for Regularity in Plan...**
- Stiffness Irregularity Check (Weak Story)...**
- Capacity Irregularity Check (Weak Story)...

Select Calculation Method

Country Code : NTC2018

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

**Building Control**

Building Control

Use Ground Level  
Ground Level : 0 m

Consider Mass below Ground Level for Eigenvalue Analysis

Story Shear Force Ratio

Consider Wind and Seismic Loads for Flexible Floors

Eccentricity Ratio

Story Center (Mass/Load)

Use Mass  Use Axial Force  Use Shear Force

Load Case : EX

Scale Factor : 1

Load Case	Scale
EX	1

Story Stiffness Center

X-Directional Load Case : EX

Y-Directional Load Case : EY

Story Response of Time History Results

Story Center

Story Average

Story Drift by Maximum of Vertical Elements

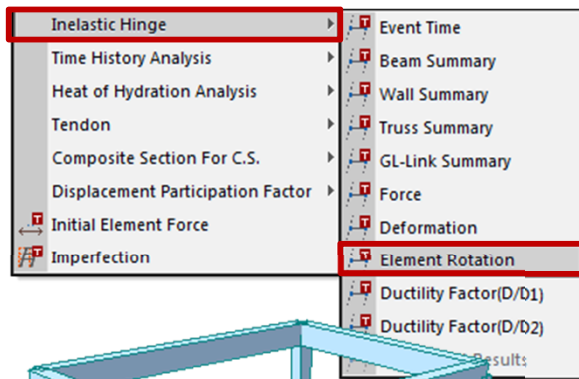
MIDAS/Gen Result - [Criteria for Regularity in Plan]

Story	Level (m)	Translational Mass		Rotational Mass (N/g·m <sup>2</sup> )	Rx (EI Radius)		X		Y	
		X-DIR (N/g)	Y-DIR (N/g)		X (m)	Y (m)	X	Y		
Roof	26.00	831405.41702	831405.41702	169004281.6555	10.34	12.06	0.5263	0.7153	Regular	Regular
6F	22.00	773957.63175	773957.63175	155808106.2827	9.42	9.88	0.4405	0.4853	Regular	Regular
5F	18.00	773957.63175	773957.63175	155808106.2827	9.31	9.00	0.4301	0.4020	Regular	Regular
4F	14.00	782526.19968	782526.19968	157233873.5092	8.75	7.88	0.3810	0.3087	Regular	Regular
3F	9.50	791094.76762	791094.76762	158658979.8772	8.54	7.22	0.3634	0.2601	Regular	Regular
2F	5.00	799663.33556	799663.33556	160083446.6304	7.75	6.49	0.3004	0.2102	Regular	Regular
1F	0.00	0.00000000	0.00000000	0.0000	0.00	0.00	0.0000	0.0000	Regular	Regular

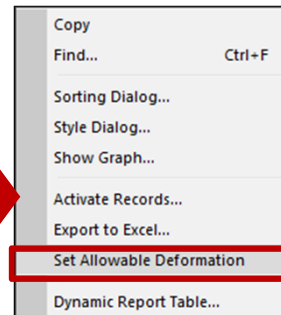
## 4. Inelastic Hinge Deformation Result as per Eurocode

- It is possible to check limitation of rotation for 1D element and wall.
- It is possible to confirm the damage state of the nonlinear behavior of the element by comparing it with the allowable deformation.

### Check Procedure

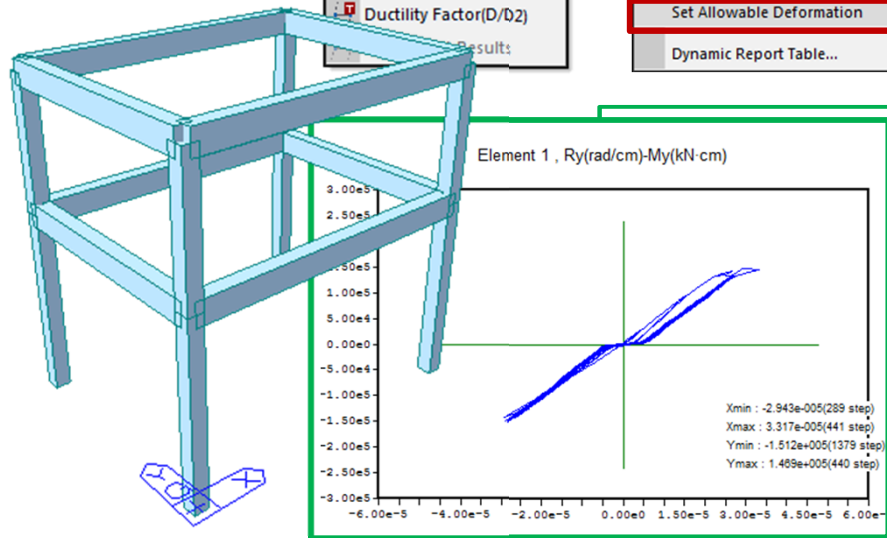


Check right mouse



Result Table - Element Rotation

Elem	Load	Part	Ry				Rz			
			Rotation (rad)	Allowable (rad)	Check	Time (sec)	Rotation (rad)	Allowable (rad)	Check	Time (sec)
1	TX(all)	I	0.000000	0.032493	OK	0.000	0.000000	0.037281	OK	0.000
1	TX(all)	J	0.000000	0.032493	OK	0.000	0.000000	0.037281	OK	0.000
4	TX(all)	I	0.000000	0.032493	OK	0.000	0.000000	0.037281	OK	0.000
4	TX(all)	J	0.000000	0.032493	OK	0.000	0.000000	0.037281	OK	0.000
16	TX(all)	I	0.000000	0.029381	OK	0.000	0.000000	0.033710	OK	0.000
16	TX(all)	J	0.000000	0.029381	OK	0.000	0.000000	0.033710	OK	0.000
20	TX(all)	I	0.000000	0.029381	OK	0.000	0.000000	0.033710	OK	0.000
20	TX(all)	J	0.000000	0.029381	OK	0.000	0.000000	0.033710	OK	0.000
32	TX(all)	I	0.000000	0.032057	OK	0.000	0.000000	0.032057	OK	0.000
32	TX(all)	J	0.000000	0.032057	OK	0.000	0.000000	0.032057	OK	0.000
33	TX(all)	I	0.000000	0.032057	OK	0.000	0.000000	0.032057	OK	0.000
33	TX(all)	J	0.000000	0.032057	OK	0.000	0.000000	0.032057	OK	0.000
36	TX(all)	I	0.000000	0.032057	OK	0.000	0.000000	0.032057	OK	0.000
36	TX(all)	J	0.000000	0.032057	OK	0.000	0.000000	0.032057	OK	0.000
37	TX(all)	I	0.000000	0.032057	OK	0.000	0.000000	0.032057	OK	0.000
37	TX(all)	J	0.000000	0.032057	OK	0.000	0.000000	0.032057	OK	0.000



**Allowable =  $\theta_{um} * 3/4$**

$$\theta_{um} = \frac{1}{\gamma_{el}} 0.016 \cdot (0.3^v) \left[ \frac{\max(0,0|\varphi|)}{\max(0,0|f_c|)} \right]^{0.225} \left( \frac{L_v}{h} \right)^{0.35} 25^{\left( \frac{\alpha_{max} f_{yw}}{f_c} \right)} (1.25^{100 \rho_{sl}}) \quad (A.1)$$

# 5. Improvement Ductile Wall Design as per NTC 2018

*Allowable of setting Boundary Element Rebar Data*

**Design Criteria for Rebars**

Design Criteria for Rebars

For Beam Design  
 Main Rebar : D22  
 Stirrups : D10 Arrangement : 2  
 Side Bar : D13  
 dT : 0 m dB : 0 m  
 Consider Spacing Limit for Main Rebar  
 Spliced Bars :  None  50%  100%

For Column Design  
 Main Rebar : D22  
 Ties/Spirals : D10 Arrangement : Y: 2  
 do : 0 m Z: 2  
 Consider Spacing Limit for Main Rebar  
 Spliced Bars :  None  50%  100%

For Brace Design  
 Main Rebar : D22  
 Ties/Spirals : D10 Arrangement : Y: 2  
 do : 0 m Z: 2  
 Consider Spacing Limit for Main Rebar  
 Spliced Bars :  None  50%  100%

For Shear Wall Design  
 Vertical Rebar : D10,D13  
 Horizontal Rebar : D10 End Rebar From : D13  
 Boundary Element Rebar : D10  
 Boundary Element Rebar Space : 0.2 m  
 de : 0.05 m dw : 0.05 m  
 Input Additional Wall Data...  
 OK Close

**Design Criteria for Rebars by Member**

Design Criteria for Rebars by

Beam | Column | Brace | Wall

Option  
 Add/Replace  Delete

Vertical Rebar : D10  
 Horizontal Rebar : D10  
 End Rebar From : D13  
 Boundary Element Rebar : D10  
 Boundary Element Rebar Space : 0.2 m  
 de : 0.05 m  
 dw : 0.05 m

Select Ductility Class  
 DCH (High Ductility)  
 DCM (Medium Ductility)

**Modify Wall Rebar Data**

Modify Wall Rebar Data

Wall ID	Wall Mark	Start Story	End Story	Bar
1	W1	IF	Roof	In
2	W2	IF	Roof	-
3	W2	IF	Roof	-
4	W2	IF	Roof	-
5	W1	IF	Roof	-
6	W2	IF	Roof	-
7	W2	IF	Roof	-
8	W1	IF	Roof	-
9	W3	IF	Roof	-
10	W3	IF	Roof	-
11	W3	IF	Roof	-

Create Sub Wall ID

Story : IF ~ Roof

Rebar	Data
Vertical	D13 @ 350
Horizontal	D11 @ 280
<input checked="" type="checkbox"/> End	2 4 D13 @ 100
BE Horizontal	D10 @ 200

Wall Property  
 End Rebar, Vertical Rebar  
 dw eDist vDist

Boundary Element Length 0 m  
 Concrete Face to Center of Rebar(dw, de) : 0.05 , 0.05 m  
 Use Model Thickness 0.000 m

Add/Replace Delete Close



# 5. Improvement Ductile Wall Design as per NTC 2018

## Improvement Shear Design of Ductile wall

### Detail Report

```

[[[*]]] ANALYZE SHEAR CAPACITY OF RC-WALL.
-----
( ) Compute maximum spacing of horizontal reinforcement.
  Smax = 0.300 m.

( ) Calculate shear strength of concrete.
  - k = MAX[ 1.0+sqrt(200/d), 2.0 ] = 1.2152 (by d unit is mm).
  - Acv = 1.00000 m^2.
  - As1 = Ast / 2 = 0.00228 m^2.
  - Rho1 = As1 / Acv = 0.00211
  - c.Rdc = 0.18/Gamma_c = 0.1200
  - Str_cp = MIN[ N_Ed/Ag, 0.2*fcd ] = 771.0568 KPa.
  - U_Rdc1 = [ C.Rdc*k*(100*Rho1*fck)^(1/3) + 0.15*Str_cp]*Acv = 379.472 kN.
  - U_Rdc2 = [ 0.035*k^(3/2)*sqrt(fck) + 0.15*Str_cp]*Acv = 351.355 kN.
  - U_Rdc = MAX[ U_Rdc1, U_Rdc2 ] = 379.472 kN.
  - U_Rdc < U_Ed ----> Shear reinforcement is required.
  - Uwd = U_Ed-U_Rdc = 142.525 kN.

( ) Calculate required shear reinforcement. ( Asw1 = 0.00007 m^2. )
  - alpha_s = H_Ed / (U_Ed*Lu) = 0.02946
  - Asw/s1 = Uwd / (0.75*f_ywd*alpha_s*Lu) = 0.00386 m^2/m.
  - Calculate spacing s1 = 0.03692 m.
  - Rho_w = 0.00200 (by concrete and steel grade).
  - Smax = Asw / (h_w*Rho_w) = 0.28532 m.
  Applied spacing s = MIN[ s1, Smax/2 ] = 0.03692 m
  Asw/s = 2*Asw1 / s = 0.00386 m^2/m.

( ) Calculate shear strength of reinforcement.
  alpha_s = H_Ed / (U_Ed*Lu) = 0.029
  U_Rd,s = 0.75*Asw*f_ywd*alpha_s/s = 105.24 kN.

( ) Check Diagonal tension failure of the web to shear.
  alpha_s < 2.0
  Applied spacing s (User Input) = 0.05000 m.
  U_Rd,s = 0.75*Asw*f_ywd*alpha_s/s*Lu*2*Asw1/s = 105.24 kN.
  U_Rd = U_Rdc + U_Rd,s = 484.716 kN.
  U_Rd < U_Ed ----> Not Acceptable

( ) Check ratio of shear capacity.
  - U_Rd,c = 379.47 kN.
  - U_Rd,s = 105.24 kN.
  - U_Rd = U_Rd,c + U_Rd,s = 484.72 kN.
  - Rat_U = U_Ed / U_Rd = 1.077 > 1.000 ----> Not Acceptable !

( ) Check vertical web bar capacity.
  - Rho_w = 0.003
  - Rho_w = 2*Asw1/b_w/s = 0.011
  - Hor = Rho_w*f_yd*b_w*0.9*d = 3858.52 kN.
  - Ver = Rho_w*f_yd*b_w*0.9*d + N_Ed = 2067.55 kN.
  - Ver < Hor ----> Not Acceptable.
  
```

### SUMMARY RESULT OUTPUT

+Wall Mark = W1  
 +V-Rebar : f\_yk = 400 N/mm<sup>2</sup>, H-Rebar : f\_yw = 400 N/mm<sup>2</sup>. Double Layer Rebar. <<RC-Wall Design Result>>.

STO	HTw	hw	fck	f_yk	f_yw	N(kN)	M(kN-m,LCB,iWAL,Lw)	V(kN,LCB,iWAL,Lw)	AsV	V-Rebar	AswH	H-Rebar	End-Rebar	BE-Rebar	BE-Length		
12F	4000	250	24	400	400	140.	404.	( 1, 5, 4800)	526.	( 1, 8, 7200)	713.	D10@200	500.	D10@280	8-D13@100	Not Use	-
11F	4000	250	24	400	400	1709.	1696.	( 1, 8, 7200)	843.	( 1, 8, 7200)	713.	D10@200	1065.	D10@130	8-D13@100	Not Use	-
10F	4000	250	24	400	400	2545.	2435.	( 1, 8, 7200)	1132.	( 1, 8, 7200)	713.	D10@200	1643.	D10@80	8-D13@100	Not Use	-
9F	4000	250	24	400	400	3356.	3053.	( 1, 8, 7200)	1271.	( 1, 8, 7200)	713.	D10@200	1889.	D10@70	8-D13@100	Not Use	-
8F	4000	250	24	400	400	4139.	3741.	( 1, 8, 7200)	1450.	( 1, 8, 7200)	713.	D10@200	2133.	D10@60	8-D13@100	Not Use	-
7F	4000	250	24	400	400	4893.	4457.	( 1, 8, 7200)	1625.	( 1, 8, 7200)	713.	D10@200	2398.	D10@50	8-D13@100	Not Use	-
6F	4000	250	24	400	400	5631.	5304.	( 1, 8, 7200)	1833.	( 1, 8, 7200)	713.	D10@200	2785.	D10@50	8-D13@100	Not Use	-
5F	4000	250	24	400	400	6091.	5805.	( 1, 8, 7200)	1882.	( 1, 8, 7200)	713.	D10@200	2781.	D10@50	8-D13@100	Not Use	-
4F	4000	250	24	400	400	6767.	7098.	( 1, 8, 7200)	2189.	( 1, 8, 7200)	713.	D10@200	3243.	D10@50	8-D13@100	Not Use	-
3F	4500	250	40	400	400	6893.	8952.	( 1, 8, 7200)	2511.	( 1, 8, 7200)	713.	D10@200	4767.	D10@50	8-D13@100	Not Use	-
2F	4500	250	40	400	400	7966.	11295.	( 1, 8, 7200)	2912.	( 1, 8, 7200)	713.	D10@200	6675.	D10@50	4-D13@150	2-2-D10 @56	1440.0
1F	5000	250	40	400	400	8981.	11825.	( 1, 8, 7200)	2116.	( 1, 8, 7200)	713.	D10@200	1169.	D10@120	4-D13@150	2-2-D10 @56	1440.0

Add rebar data of end zone

Rebar of Web is resisting for shear strength.  
 → Modify rebar space limitation  
 → Change shear strength by rebar

Add END ZONE Chapter

Determine whether horizontal rebar of End Zone is necessary.

Print out Space Limit of horizontal rebar of End Zone

```

[[[*]]] CALCULATE HORIZONTAL REINFORCEMENT IN END ZONE
-----
( ) Compute height of the critical region.
  - hcr = MIN[ MAX[ Lw, HTw/6 ], MIN[ 2Lw, 2hs ] ] = 0.3303 m.
  - z_bot = 0.0000 m.
  - z_top = 5.0000 m.
  ----> Need end horizontal reinforcement check.

( ) Compute maximum spacing of horizontal reinforcement in critical region.
  - Bo = bw - 2*(De-Ebar/2-Sbar/2) = 0.169 m.
  - dbL = 0.010 m.
  - Smax = MIN[ Bo/3, B+Dbar, 125 mm ] = 0.056 m.
  
```

Items	EN1998-1-2004			NTC2018	
	DCH (5.5)	DCM (5.4)	DCL	CD"A"	CD"B"
<b>DIMENSION</b>					
<b>Thickness limit of web, <math>b_{w,min}</math></b>	[EN1998-1-1:2004, 5.5.1.2.3(2)] → [5.4.1.2.3(1)] $b_{w,min} \geq \max\{0.15m, h_w/20\}$	[EN1998-1-1:2004, 5.4.1.2.3(1)] $b_{w,min} \geq \max\{0.15m, h_w/20\}$		[NTC2018, 7.4.6.1.4, p.236] $b_{w,min} \geq \max\{0.15m, h_w/20\}$	[NTC2018, 7.4.6.1.4, p.236] $b_{w,min} \geq \max\{0.15m, h_w/20\}$
<b>Height of critical region, <math>h_{cr}</math></b>	[EN1998-1-1:2004, 5.5.3.4.5(4)] → [5.4.3.4.2(1)] $h_{cr} = \max\{l_w, h_w/6\}$ $\leq \min\{2l_w, h, (ns6), 2h_c(n \geq 7)\}$	[EN1998-1-1:2004, 5.4.3.4.2(1)] $h_{cr} = \max\{l_w, h_w/6\}$ $\leq \min\{2l_w, h, (ns6), 2h_c(n \geq 7)\}$		[NTC2018, 7.4.4.5.1, p.230] $h_{cr} = \max\{l_w, h_w/6\}$ $\leq \min\{2l_w, h, (ns6), 2h_c(n \geq 7)\}$	[NTC2018, 7.4.4.5.1, p.230] $h_{cr} = \max\{l_w, h_w/6\}$ $\leq \min\{2l_w, h, (ns6), 2h_c(n \geq 7)\}$
<b>BOUNDARY ELEMENT (in critical region)</b>					
<b>Dimension</b>					
<b>Length of confined boundary, <math>l_c</math></b>	[EN1998-1-1:2004, 5.5.3.4.5(6)] → [5.4.3.4.2(6)] $l_c \geq \max\{0.15l_w, 1.5b_w\}$	[EN1998-1-1:2004, 5.4.3.4.2(6)] $l_c \geq \max\{0.15l_w, 1.5b_w\}$		[NTC2018, 7.4.4.5.2, p.232] $l_c \geq \max\{0.20l_w, 1.5b_w\}$	[NTC2018, 7.4.4.5.2, p.232] $l_c \geq \max\{0.20l_w, 1.5b_w\}$
<b>Mechanical volumetric ratio, <math>\omega_{wd}</math></b>	[EN1998-1-1:2004, 5.5.3.4.5(4)] → [5.4.3.4.2(4)] $\alpha\omega_{wd} \geq 30\mu\phi(v_f + \omega_w)\epsilon_{yk,d}b_w/b_o - 0.035$	[EN1998-1-1:2004, 5.4.3.4.2(4)] $\alpha\omega_{wd} \geq 30\mu\phi(v_f + \omega_w)\epsilon_{yk,d}b_w/b_o - 0.035$		[NTC2018, 7.4.6.2.4, p.238] $\alpha\omega_{wd} \geq 30\mu\phi(v_f + \omega_w)\epsilon_{yk,d}b_w/b_o - 0.035$	[NTC2018, 7.4.6.2.4, p.238] $\alpha\omega_{wd} \geq 30\mu\phi(v_f + \omega_w)\epsilon_{yk,d}b_w/b_o - 0.035$
<b>Thickness limit <math>b_w</math></b>					
<b>Longitudinal reinforcement ratio in the boundary elements</b>	[EN1998-1-1:2004, 5.5.3.4.5(8)] → [5.4.3.4.2(8)] $\rho_{min} \geq 0.005$	[EN1998-1-1:2004, 5.4.3.4.2(8)] $\rho_{min} \geq 0.005$		[NTC2018, 7.4.6.2.4, p.238] → [7.4.6.2.2, p.237] $1\% \leq \rho \leq 4\%$	[NTC2018, 7.4.6.2.4, p.238] → [7.4.6.2.2, p.237] $1\% \leq \rho \leq 4\%$
<b>Confined hoop</b>					
<b><math>d_{bw} \geq</math></b>	[EN1998-1-1:2004, 5.5.3.4.5(8)] → [5.5.3.2.2(12)] $\geq 0.4d_{st,max} \sqrt{f_{yk,d}/f_{yk,d}}$	[EN1998-1-1:2004, 5.4.3.2.2(10)] $\geq 6mm$		[NTC2018, 7.4.6.2.2] $\geq \max\{6mm, 0.4d_{st,max} \sqrt{f_{yk,d}/f_{yk,d}}\}$	[NTC2018, 7.4.6.2.2] $\geq 6mm$
<b><math>s_w \geq</math></b>	[EN1998-1-1:2004, 5.5.3.4.5(8)] → [5.5.3.2.2(12)] $\min\{b_w/3, 125mm, 8d_{st}\}$	[EN1998-1-1:2004, 5.4.3.2.2(11)] $\min\{b_w/2, 175mm, 8d_{st}\}$		[NTC2018, 7.4.6.2.2] $\min\{b_w/3, 125mm, 5*6d_{st}\}$	[NTC2018, 7.4.6.2.2] $\min\{b_w/2, 175mm, 8d_{st}\}$
<b><math>\omega_{wd} \geq</math></b>	[EN1998-1-1:2004, 5.5.3.4.5(10)] $\omega_{wd,min} = 0.12$ (in critical region at the base) $\omega_{wd,min} = 0.08$ (in critical region above the base)	[EN1998-1-1:2004, 5.4.3.4.2(9)] → [5.4.3.2.2(9)]-(11) $\omega_{wd,min} = 0.08$ $d_{st,min} = 6mm$ $s = \min\{b_w/2, 175mm, 8d_{st}\}$		[NTC2018, 7.4.6.2.2] $\omega_{wd,min} = 0.12$	[NTC2018, 7.4.6.2.2] $\omega_{wd,min} = 0.08$
<b><math>\alpha\omega_{wd} \geq</math></b>	[EN1998-1-1:2004, 5.5.3.4.5(4)] → [5.4.3.4.2(4)] $\alpha\omega_{wd} \geq 30\mu\phi(v_f + \omega_w)\epsilon_{yk,d}b_w/b_o - 0.035$	[EN1998-1-1:2004, 5.4.3.4.2(4)] $\alpha\omega_{wd} \geq 30\mu\phi(v_f + \omega_w)\epsilon_{yk,d}b_w/b_o - 0.035$		[NTC2018, 7.4.6.2.4, p.238] $\alpha\omega_{wd} \geq 30\mu\phi(v_f + \omega_w)\epsilon_{yk,d}b_w/b_o - 0.035$	[NTC2018, 7.4.6.2.4, p.238] $\alpha\omega_{wd} \geq 30\mu\phi(v_f + \omega_w)\epsilon_{yk,d}b_w/b_o - 0.035$
<b>Transverse reinforcement detail of the boundary element by EC2</b>					
<b>Diagonal compression failure <math>V_{Rd,max}</math></b>	[EN1998-1-1:2004, 5.5.3.4.2(1)] a) outside the critical region : EN1992-1-1:2004 $z = 0.8l_w \tan\theta = 1.0$ b) in the critical region : $0.4V_{Rd,max}$			[NTC2018, 7.4.4.5.1, p.231] Verifica a taglio-compressione del calcestruzzo dell'anima a) outside the critical region : go to §4.1.2.3.5 $z = 0.8l_w \tan\theta = 1.0$ b) in the critical region : $0.4V_{Rd,max}$	[NTC2018, 7.4.4.5.1, p.231] Verifica a taglio-compressione del calcestruzzo dell'anima a) outside the critical region : go to §4.1.2.3.5 $z = 0.8l_w \tan\theta = 1.0$ b) in the critical region : $0.4V_{Rd,max}$
<b>Diagonal tension failure</b>	[EN1998-1-1:2004, 5.5.3.4.3] (2) $\alpha_i \geq 2.0$ : go to EN1992-1-1:2004 $V_{Rd,t} \leq V_{Rd,t} : V_{Rd,t} = V_{Rd,t}$ $V_{Rd,t} > V_{Rd,t} : V_{Rd,t} = V_{Rd,t} = A_{st}f_{yk,d}\cot\theta/s$ (3) $\alpha_i < 2.0$ : horizontal web bars $V_{Rd,t} \leq V_{Rd,t} = V_{Rd,t} + V_{Rd,t}$ $V_{Rd,t} = 0.75\rho_f f_{yk,d} b_w \alpha_i l_w$ (in the critical region, $V_{Rd,t} = 0, N_{Ed}$ is tensile)			[NTC2018, 7.4.4.5.1, p.231] Verifica a taglio-trazione dell'armatura dell'anima (2) $\alpha_i \geq 2.0$ : go to §4.1.2.3.5 $V_{Rd,t} \leq V_{Rd,t} : V_{Rd,t} = V_{Rd,t}$ $V_{Rd,t} > V_{Rd,t} : V_{Rd,t} = V_{Rd,t} = A_{st}f_{yk,d}\cot\theta/s$ ( $z = 0.8l_w \tan\theta = 1.0$ ) (3) $\alpha_i < 2.0$ : horizontal web bars $V_{Rd,t} \leq V_{Rd,t} = V_{Rd,t} + V_{Rd,t}$ $V_{Rd,t} = 0.75\rho_f f_{yk,d} b_w \alpha_i l_w$ (in the critical region, $V_{Rd,t} = 0, N_{Ed}$ is tensile)	[NTC2018, 7.4.4.5.1, p.231] Verifica a taglio-trazione dell'armatura dell'anima (2) $\alpha_i \geq 2.0$ : go to §4.1.2.3.5 $V_{Rd,t} \leq V_{Rd,t} : V_{Rd,t} = V_{Rd,t}$ $V_{Rd,t} > V_{Rd,t} : V_{Rd,t} = V_{Rd,t} = A_{st}f_{yk,d}\cot\theta/s$ ( $z = 0.8l_w \tan\theta = 1.0$ ) (3) $\alpha_i < 2.0$ : horizontal web bars $V_{Rd,t} \leq V_{Rd,t} = V_{Rd,t} + V_{Rd,t}$ $V_{Rd,t} = 0.75\rho_f f_{yk,d} b_w \alpha_i l_w$ (in the critical region, $V_{Rd,t} = 0, N_{Ed}$ is tensile)
<b>Sliding Failure</b>	[EN1998-1-1:2004, 5.5.3.4.4] (1) $V_{Ed} \leq V_{Rd,s}$ (2) $V_{Rd,s} = V_{Ed} + V_{Ed}$			[NTC2018, 7.4.4.5.1, p.231] Verifica a scorrimento nelle zone dissipative (1) $V_{Ed} \leq V_{Rd,s}$ (2) $V_{Rd,s} = V_{Ed} + V_{Ed} + V_{Ed}$	[NTC2018, 7.4.4.5.1, p.231] Verifica a scorrimento nelle zone dissipative (1) $V_{Ed} \leq V_{Rd,s}$ (2) $V_{Rd,s} = V_{Ed} + V_{Ed} + V_{Ed}$
<b>BOUNDARY ELEMENT (over the rest of the wall height)</b>					
<b>Above the critical region</b>	[EN1998-1-1:2004, 5.5.3.4.5(12)] → [5.4.3.4.2(11)] Go to EN1992-1-1:2004 $\rho_{vert,min} = 0.005$	[EN1998-1-1:2004, 5.4.3.4.2(11)] Go to EN1992-1-1:2004 $\rho_{vert,min} = 0.005$			
<b>WEB REINFORCEMENT</b>					
<b>Vertical reinforcement</b>					
<b><math>\rho_{v,min}</math></b>	[EN1998-1-1:2004, 5.5.3.4.5(13)] 0.002		[EN1992-1-1:2004, 9.6.2(1)] 0.002	[NTC2018, 7.4.6.2.4, p.238] 0.002	[NTC2018, 7.4.6.2.4, p.238] 0.002
<b><math>\rho_{v,max}</math></b>			[EN1992-1-1:2004, 9.6.2(1)] 0.04		
<b><math>d_{bw,min}</math></b>	[EN1998-1-1:2004, 5.5.3.4.5(15)] 8mm				
<b><math>d_{bw,max}</math></b>	[EN1998-1-1:2004, 5.5.3.4.5(15)] $b_w/8$			[NTC2018, 7.4.6.2.4] $b_w/10$	[NTC2018, 7.4.6.2.4] $b_w/10$
<b><math>s_{v,max}</math></b>	[EN1998-1-1:2004, 5.5.3.4.5(15)] $\min\{250mm, 25d_{st}\}$		[EN1992-1-1:2004, 9.6.2(3)] $\min\{3 * b_{wp}, 400mm\}$	[NTC2018, 7.4.6.2.4] 30cm	[NTC2018, 7.4.6.2.4] 30cm
<b>Horizontal reinforcement</b>					
<b><math>\rho_{h,min}</math></b>	[EN1998-1-1:2004, 5.5.3.4.5(13)] 0.002		[EN1992-1-1:2004, 9.6.3(1)] $A_{s,h,min} = \max\{0.25A_{sw}, 0.001A_s\}$	[NTC2018, 7.4.6.2.4, p.238] 0.002	[NTC2018, 7.4.6.2.4, p.238] 0.002
<b><math>d_{bh,min}</math></b>	[EN1998-1-1:2004, 5.5.3.4.5(15)] 8mm				
<b><math>d_{bh,max}</math></b>	[EN1998-1-1:2004, 5.5.3.4.5(15)] $b_w/8$			[NTC2018, 7.4.6.2.4] $b_w/10$	[NTC2018, 7.4.6.2.4] $b_w/10$
<b><math>s_{h,max}</math></b>	[EN1998-1-1:2004, 5.5.3.4.5(15)] $\min\{250mm, 25d_{st}\}$		[EN1992-1-1:2004, 9.6.3(2)] 400mm	[NTC2018, 7.4.6.2.4] 30cm	[NTC2018, 7.4.6.2.4] 30cm
<b>NORMALIZED AXIAL FORCE</b>					
<b><math>v_d</math></b>	[EN1998-1-1:2004, 5.5.3.4.1(2)] $v_d \leq 0.35$	[EN1998-1-1:2004, 5.4.3.4.1(2)] $v_d \leq 0.4$		[7.4.4.5.1, p.230] $v_d \leq 0.4$	[7.4.4.5.1, p.230] $v_d \leq 0.35$

# 6. Pushover Load Pattern using story inertia force in RS analysis reference

- The load patterns can be created by converting response spectrum load to static load.

## Procedure for generating Load Pattern

### Step 1 : Create Static Seismic Load from RS force

**Check right mouse**

Story	Level (m)	Spectrum	Inertia Force		Shear Force						
			X (kN)	Y (kN)	Spring Reactions		Without Spring		With Spring		
					X (kN)	Y (kN)	X (kN)	Y (kN)	X (kN)	Y (kN)	
Roof	6.6000	Rx(RS)	7.9936e+001	5.6626e-001	0.0000e+000	0.0000e+000	0.0000e+000	0.0000e+000	0.0000e+000	0.0000e+000	0.0000e+000
7F	6.3000	Rx(RS)	7.1683e+000	6.4057e-002	0.0000e+000	0.0000e+000	7.9936e+001	5.6626e-001	7.9936e+001	5.6626e-001	7.9936e+001
6F	5.7000	Rx(RS)	1.2918e+002	1.0689e+000	0.0000e+000	0.0000e+000	8.7103e+001	6.3015e-001	8.7103e+001	6.3015e-001	8.7103e+001
5F	5.1000	Rx(RS)	6.5297e+001	5.5283e-001	0.0000e+000	0.0000e+000	2.1599e+002	1.6990e+000	2.1599e+002	1.6990e+000	2.1599e+002
4F	4.9000	Rx(RS)	1.7889e+001	1.3012e-001	0.0000e+000	0.0000e+000	2.8112e+002	2.2516e+000	2.8112e+002	2.2516e+000	2.8112e+002
3F	4.3000	Rx(RS)	5.8860e+001	4.8790e-001	0.0000e+000	0.0000e+000	2.9891e+002	2.3816e+000	2.9891e+002	2.3816e+000	2.9891e+002
2F	4.2000	Rx(RS)	6.0015e+002	3.5879e+000	0.0000e+000	0.0000e+000	3.5759e+002	2.8670e+000	3.5759e+002	2.8670e+000	3.5759e+002
1F	0.0000	Rx(RS)	9.5803e+002	6.4508e+000	0.0000e+000	0.0000e+000	9.5803e+002	6.4508e+000	9.5803e+002	6.4508e+000	9.5803e+002
Roof	6.6000	Ry(RS)	1.0638e+001	5.5534e+001	0.0000e+000	0.0000e+000	0.0000e+000	0.0000e+000	0.0000e+000	0.0000e+000	0.0000e+000
7F	6.3000	Ry(RS)	1.0887e+000	6.2674e+000	0.0000e+000	0.0000e+000	1.0638e+001	5.5534e+001	1.0638e+001	5.5534e+001	8.5000e-001
6F	5.7000	Ry(RS)	1.4281e+001	1.0518e+002	0.0000e+000	0.0000e+000	1.1272e+001	6.1704e+001	1.1272e+001	6.1704e+001	1.4000e+000
5F	5.1000	Ry(RS)	2.4565e+000	5.3769e+001	0.0000e+000	0.0000e+000	1.7376e+001	1.6682e+002	1.7376e+001	1.6682e+002	1.4000e+000
4F	4.9000	Ry(RS)	2.3234e+000	1.2635e+001	0.0000e+000	0.0000e+000	1.7597e+001	2.2050e+002	1.7597e+001	2.2050e+002	1.4000e+000
3F	4.3000	Ry(RS)	2.9828e+000	4.7721e+001	0.0000e+000	0.0000e+000	1.6936e+001	2.3309e+002	1.6936e+001	2.3309e+002	1.4000e+000
2F	4.2000	Ry(RS)	1.9063e+001	3.6213e+002	0.0000e+000	0.0000e+000	1.4347e+001	2.7937e+002	1.4347e+001	2.7937e+002	1.4000e+000
1F	0.0000	Ry(RS)	6.4567e+000	6.3210e+002	0.0000e+000	0.0000e+000	6.4567e+000	6.3210e+002	6.4567e+000	6.3210e+002	1.4000e+000

**Create Static Seismic Load From RS Inertia Forces**

Spectrum Load Cases

- RX
- RY

OK Cancel

### Step 3 : Select Static Load case > RS Inertia

Load Case(Qud)

Load Type : Static Load Cases

Load Case : RX Inertia Scale Factor : 1

Add Modify Delete

Load	Scale
RX Inertia	1

### Step 2 : Check Addition of Converted Load

Static Load Cases

Name : RX Inertia Type : Earthquake (E) Description : Inertia Force For RX

Add Modify Delete

Name	Type	Description
DL	Dead Load (D)	
LL	Live Load (L)	
WX	Wind Load on Structure (W)	
WX	Wind Load on Structure (W)	
RX Inertia	Earthquake (E)	Inertia Force For RX
RY Inertia	Earthquake (E)	Inertia Force For RY

Static Loads

- Static Load Case 1 [DL : ]
  - Self Weight [SZ=-1]
  - Element Beam Loads : 144
  - Floor Loads : 36
- Static Load Case 2 [LL : ]
  - Element Beam Loads : 144
  - Floor Loads : 36
- Static Load Case 3 [WX : ]
  - Wind Loads [KBC(2009)]
- Static Load Case 4 [WY : ]
  - Wind Loads [KBC(2009)]
- Static Load Case 5 [RX Inertia ; Inertia Force For RX]
  - Static Seismic Loads [Eurocode-8(2004)]
- Static Load Case 6 [RY Inertia ; Inertia Force For RY]
  - Static Seismic Loads [Eurocode-8(2004)]
- Response Spectrum Analysis
  - Response Spectrum Functions : 1
  - Response Spectrum Load Cases : 2

Add Static Load Case

Add Static Load by RC

# 7. Check Beam Deflection as per ACI318-14, ACI318M-14 and NSR-10

- The calculation of deflection takes into account cracked section and long-term behavior.
- The ratio of the analysis results considering the long-term deflection coefficient to the allowable displacement is provided.

### Check on Deflection Option in Design Setting

### Setting Design Parameter

### Deflection Check in Design result table

MEMB	SECT	Span	Deflection			
			Short-Time Def	Long-Time Def	Short-Time Rat-D	Long-Time Rat-D
0						
1			0.0073	0.33	0.0143	0.86

### 24.2.3 Calculation of immediate deflections

**24.2.3.4** Modulus of elasticity,  $E_c$ , shall be permitted to be calculated in accordance with 19.2.2.

**24.2.3.5** For nonprestressed members, effective moment of inertia,  $I_e$ , shall be calculated by Eq. (24.2.3.5a) unless obtained by a more comprehensive analysis, but  $I_e$  shall not be greater than  $I_g$ .

$$I_e = \left( \frac{M_{cr}}{M_a} \right)^3 I_g + \left[ 1 - \left( \frac{M_{cr}}{M_a} \right)^3 \right] I_{cr} \quad (24.2.3.5a)$$

where  $M_{cr}$  is calculated by

$$M_{cr} = \frac{f_r I_g}{y_t} \quad (24.2.3.5b)$$

**24.2.4.1.1** Unless obtained from a more comprehensive analysis, additional time-dependent deflection resulting from creep and shrinkage of flexural members shall be calculated as the product of the immediate deflection caused by sustained load and the factor  $\lambda_\Delta$

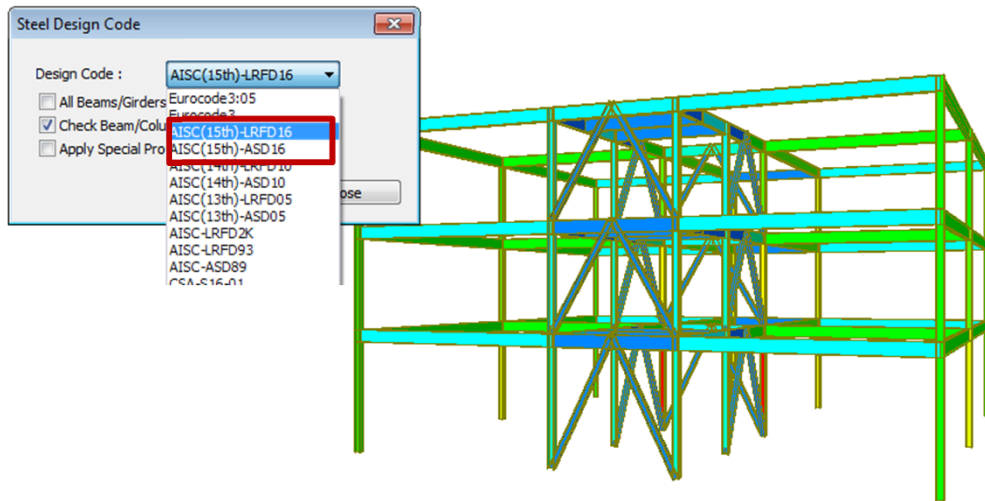
$$\lambda_\Delta = \frac{\xi}{1 + 50\rho'} \quad (24.2.4.1.1)$$

**sustained loads**

Sustained load duration, months	Time-dependent factor $\xi$
3	1.0
6	1.2
12	1.4
60 or more	2.0

# 8. Add Steel Design as per AISC360-16

## Steel Design as per AISC360-16



### Design Result Table

AISC(15th)-LRFD16 Code Checking Result Dialog

Code: AISC(15th)-LRFD16    Unit: kN, m    Primary Sorting Option: SECT

CH	MEMB	SECT	SE	Section		LCB	Len	Ly	Cb	Ky	B1y	B2y	Pr	Mry	Mrz	Vry	Vrz	Tr	Def
				Material	Fy														
NG	73	101		C1		2	6.00000	6.00000	1.000	1.000	1.193	1.000	-2869.8	-135.88	276.935	-14.171	28.0349	0.00000	-
	2.968	0.055		A572-50	344738		6.00000	6.00000		1.000	4.881	1.000	2193.00	363.038	185.894	1563.73	509.867	0.00000	-
NG	226	221		SG1		2	12.00000	12.00000	1.000	1.000	1.000	1.000	0.00000	-811.02	0.00000	0.00000	-388.13	0.00000	-
	1.264	0.384		A36	248211		4.00000	12.00000		1.000	1.000	1.000	3228.34	641.661	104.696	0.00000	1011.24	0.00000	-
OK	106	1001		BR1		6	6.70820	6.70820	1.000	1.000	1.070	1.000	-405.00	0.00000	0.00000	0.00000	0.00000	0.00000	-
	0.278	0.000		A36	248211		6.70820	6.70820		1.000	1.236	1.000	1454.79	243.208	128.125	0.00000	0.00000	0.00000	-

### Graphic Report (Summary Report)

1. Design Information

Design Code : AISC(15th)-LRFD16  
 Unit System : kN, m  
 Member No : 106  
 Material : A36 (No.4)  
 Section Name : BR1 (No.1001)  
 Member Length : 6.70820

2. Member Forces

Axial Force : Fxk = -405.00  
 Bending Moments : Myk = 0.00000  
 End Moments : M1k = 0.00000, M2k = 0.00000  
 Shear Forces : Fyk = 0.00000, Fzk = 0.00000

3. Design Parameters

Unbraced Lengths : Lx = 6.70820, Ly = 6.70820  
 Effective Length Factors : Kx = 1.0, Ky = 1.0  
 Moment Factor / Bending Coefficient : Cb = 1.0

4. Checking Results

Slenderness Ratio : KL/r = 102.8 < 200.0  
 Axial Strength : Pr/Pc = 405.00/1454.79  
 Bending Strength : Mr/Mc = 0.00024  
 Combined Strength : Pr/Pc = 0.28 > 0.20  
 Shear Strength : Vr/Vc = 0.000 < 1.0

### Detail Report

MIDAS/Text Editor - [App1\_Steel.acs]

midas Gen - Steel Code Checking [ AISC(15th)-LRFD16 ]    Gen 2019

PROJECT : MEMBER NO = 106, ELEMENT TYPE = Truss, SECTION NO = 1001  
 LOADCOMB NO = 6, MATERIAL NO = 4  
 SECTION PROPERTIES : Designation = BR1  
 Shape = I - Section, (Rolled)  
 Depth = 0.256, Top F Width = 0.256, Bot.F Width = 0.256  
 Web Thick = 0.011, Top F Thick = 0.017, Bot.F Thick = 0.017

Area = 1.13548e-002, Asy = 5.89625e-003, Asz = 2.76928e-003  
 Vbar = 1.28816e-001, Zbar = 1.29794e-001, Iy = 5.65548e-003, Iz = 8.19405e-003  
 Syy = 1.89482e-003, Szz = 3.76942e-003, Zyy = 1.22247e-003, Zzz = 5.73547e-003  
 Iyy = 1.41955e-004, Izz = 4.82828e-005, Iyz = 8.00000e-006  
 J = 1.11506e-001, Ry = 6.52788e-002, Rz = 1.03225e-000, Cwp = 7.00756e-007

DESIGN PARAMETERS FOR STRENGTH EVALUATION :  
 Lx = 6.70820e+000, Ly = 6.70820e+000, Lu = 6.70820e+000  
 Ky = 1.00000e+000, Kz = 1.00000e+000

MATERIAL PROPERTIES :  
 Fy = 2.48211e+005, Es = 1.99948e+008, MATERIAL NAME = A36

COMPUTE MOMENT MODIFICATION FACTORS AND MODIFIED MOMENTS.

Factored force/moments caused by unit load case.  
 Load combination ID = 6

Load Case	Pa	Mx1	Mx2	Mz1	Mz2
DL	-81.88	0.00	0.00	0.00	0.00
LL	-25.85	0.00	0.00	0.00	0.00
DL+LL	-107.73	0.00	0.00	0.00	0.00
OTHER CASES	-237.27	0.00	0.00	0.00	0.00
TOTAL	-482.73	0.00	0.00	0.00	0.00

Member end moments caused by gravity load(DL+LL).  
 Mx1c = 0.00, Mx2c = 0.00  
 Mz1c = 0.00, Mz2c = 0.00

Compute coefficient assuming no lateral translation of the frame (Cmy, Cnz)  
 AISC(15th) Specification Eq.16.1-4b, (C2-4)  
 Cmy = 1.000 (User defined or default value)  
 Cnz = 1.000 (User defined or default value)

# 9. Improvement of Seismic Design for ACI318-14, ACI318M-14 and NSR-10

Concrete Design Code

Design Code : ACI318-14

Apply Special Provisions for Seismic Design

Select Frame Type

Special Moment Frames

Intermediate Moment Frames

Ordinary Moment Frames

Shear Wall Type

Special RC Structural Wall

Boundary Element Method

$c \geq lw/600(1.55u/hw)$

Deflection Amplification Factor (Cd) : 4.50

Important Factor (Ie) : 1.25

$f_c \geq 0.2f_{ck}$

---

Shear for Design

Update by Code

Method

MAX(Ve1, Ve2)  MIN(Ve1, Ve2)  Ve1  Ve2

Ve1,  $V_g + a1 \cdot \text{SUM}(M_n)/L$  , a1 = 1

Ve2,  $V_g + a2 \cdot V_{eq}$  , a2 = 2

Member Types to be excluded in Seismic Design

Sub-Beam  Cantilever

Underground Beam/Column

Torsion Design

Torsion Reduction Factor for Beam : 1

Moment Redistribution Factor for Beam : 1

OK Close

Design setting in Gen2019 v1.1

Concrete Design Code

Design Code : ACI318-14

Check Beam Deflection

Apply Special Provisions for Seismic Design

Select Frame Type

Special Moment Frames

Intermediate Moment Frames

Ordinary Moment Frames

Consider strong column-weak beam on last floor

Shear Wall Type

Special RC Structural Wall

Boundary Element Method

$c \geq lw/600(1.55u/hw)$

Deflection Amplification Factor (Cd) : 4.50

Important Factor (Ie) : 1.25

$f_c \geq 0.2f_{ck}$

---

Shear for Design

Update by Code

Method

MAX(Ve1, Ve2)  MIN(Ve1, Ve2)  Ve1  Ve2

Ve1,  $V_g + a1 \cdot \text{SUM}(M_n)/L$  , a1 = 1

Ve2,  $V_g + a2 \cdot V_{eq}$  (Beam) , a2 = 2

Ve2,  $V_g + a2 \cdot V_{eq}$  (Column) , a2 = 2

Beam-Column Joint Design

Member Types to be excluded in Seismic Design

Sub-Beam  Cantilever

Underground Beam/Column

Torsion Design

Torsion Reduction Factor for Beam : 1

Moment Redistribution Factor for Beam : 1

Design setting in Gen2019 v2.1

In the seismic design, the Amplification factor (a2) can be separately applied to calculate the shear force of the column and beam.

# 10. Add Design Option for Strong Column-Weak Beam Check on Roof

Concrete Design Code

Design Code : ACI318-14

Apply Special Provisions for Seismic Design

Select Frame Type

Special Moment Frames

Intermediate Moment Frames

Ordinary Moment Frames

Shear Wall Type

Special RC Structural Wall

Boundary Element Method

$c \geq lw/600(1.55u/hw)$

Deflection Amplification Factor (Cd) : 4.50

Important Factor (Ie) : 1.25

$fc \geq 0.2fck$

Shear for Design

Update by Code

Method

MAX(Ve1, Ve2)  MIN(Ve1, Ve2)  Ve1  Ve2

Ve1, Vg + a1\*SUM(Mn)/L, a1 = 1

Ve2, Vg + a2\*VeQ, a2 = 2

Member Types to be excluded in Seismic Design

Sub-Beam  Cantilever

Underground Beam/Column

Torsion Design

Torsion Reduction Factor for Beam : 1

Moment Redistribution Factor for Beam : 1

OK Close

Design setting in Gen2019 v1.1

Concrete Design Code

Design Code : ACI318-14

Apply Special Provisions for Seismic Design

Select Frame Type

Special Moment Frames

Intermediate Moment Frames

Ordinary Moment Frames

Consider strong column-weak beam on last floor

Shear Wall Type

Special RC Structural Wall

Boundary Element Method

$c \geq lw/600(1.55u/hw)$

Deflection Amplification Factor (Cd) : 4.50

Important Factor (Ie) : 1.25

$fc \geq 0.2fck$

Shear for Design

Update by Code

Method

MAX(Ve1, Ve2)  MIN(Ve1, Ve2)  Ve1  Ve2

Ve1, Vg + a1\*SUM(Mn)/L, a1 = 1

Ve2, Vg + a2\*VeQ (Beam), a2 = 2

Ve2, Vg + a2\*VeQ (Column), a2 = 2

Beam-Column Joint Design

Member Types to be excluded in Seismic Design

Sub-Beam  Cantilever

Underground Beam/Column

Torsion Design

Torsion Reduction Factor for Beam : 1

Moment Redistribution Factor for Beam : 1

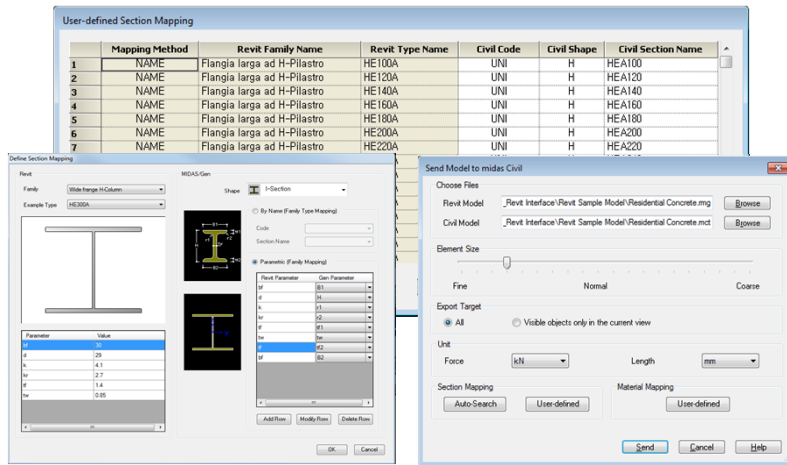
Design setting in Gen2019 v2.1

In previous versions, the checking of 'Strong Column-Weak Beam' on the roof have not been supported. From, midas Gen 2019 (v2.1), it is possible to consider the 'Strong Column-Weak Beam' on the roof.

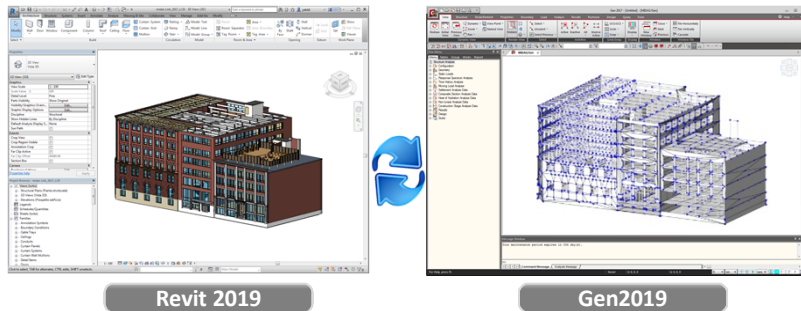
# 11. Revit 2019 Interface

Using Midas Link for Revit Structure, direct data transfer between midas Gen and Revit 2019 is available for Building Information Modeling (BIM) workflow. Midas Link for Revit Structure enables us to directly transfer a Revit model data to midas Gen, and deliver it back to the Revit model file. This feature is provided as an Add-In module in Revit Structure and midas Gen text file (\*.mgt) is used for the roundtrip

- **File > Import > midas Gen MGT File**
- **File > Export > midas Gen MGT File**



Send Model to midas Gen



	Functions	Revit <> Gen
Linear Elements	Structural Column	<>
	Beam	<>
	Brace	<>
	Curved Beam	>
	Beam System	>
	Truss	>
	Planar Elements	Foundation Slab
Structural Floor		<>
Structural Wall		<>
Wall Opening & Window		>
Door		>
Vertical or Shaft Opening		>
Boundary		Offset
	Rigid Link	>
	Cross-Section Rotation	>
	End Release	>
	Isolated Foundation Support	>
	Point Boundary Condition	>
	Line Boundary Condition	>
	Wall Foundation	>
	Area Boundary Condition	>
	Load	Load Nature
Load Case		>
Load Combination		>
Hosted Point Load		>
Hosted Line Load		>
Hosted Area Load		>
Other Parameters	Material	<>
	Level	>



# 12. Add Material DB and Load Combination for Aluminum

**Load Combinations Dialog - Load Combination List**

No	Name	Active	Type	Description
1	aLCB1	Strengt	Add	(D)
2	aLCB2	Strengt	Add	(D) + (L)
3	aLCB3	Strengt	Add	(D) + 1.0WX
4	aLCB4	Strengt	Add	(D) + 1.0WY
5	aLCB5	Strengt	Add	(D) + 1.0Wx_Ecc
6	aLCB6	Strengt	Add	(D) + 1.0Wy_Ecc
7	aLCB7	Strengt	Add	(D) - 1.0WX
8	aLCB8	Strengt	Add	(D) - 1.0WY
9	aLCB9	Strengt	Add	(D) - 1.0Wx_Ecc
10	aLCB10	Strengt	Add	(D) - 1.0Wy_Ecc
11	aLCB11	Strengt	Add	(D) + 0.7EX
12	aLCB12	Strengt	Add	(D) + 0.7EY
13	aLCB13	Strengt	Add	(D) - 0.7EX
14	aLCB14	Strengt	Add	(D) - 0.7EY
15	aLCB15	Strengt	Add	(D) + 0.7(1.0)(RX)(RS)
16	aLCB16	Strengt	Add	(D) + 0.7(1.0)(RX)(RS)
17	aLCB17	Strengt	Add	(D) + 0.7(1.0)(RY)(RS)
18	aLCB18	Strengt	Add	(D) + 0.7(1.0)(RY)(RS)
19	aLCB19	Strengt	Add	(D) - 0.7(1.0)(RX)(RS)
20	aLCB20	Strengt	Add	(D) - 0.7(1.0)(RX)(RS)
21	aLCB21	Strengt	Add	(D) - 0.7(1.0)(RY)(RS)

**Automatic Generation of Load Combinations Dialog**

- Option:  Add
- Code Selection:  Aluminum, Design Code: AA-ASD05
- Scale Up of Response Spectrum Load Cases: Scale Up Factor: 1
- Manipulation of Construction Stage Load Case:  ST Only
- Generate Additional Load Combinations:  for Special Seismic Load,  for Vertical Seismic Forces

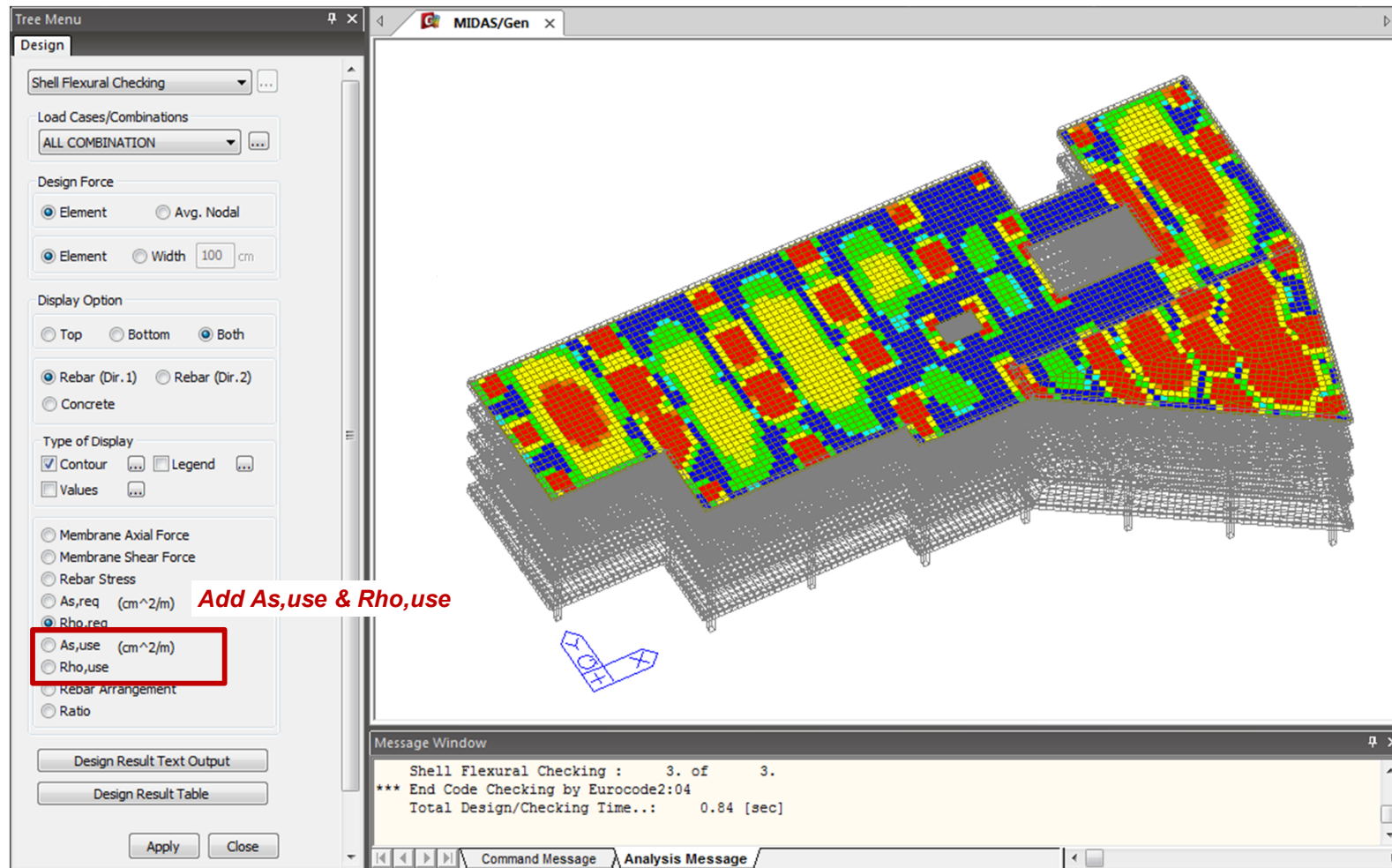
**Material Data Dialog**

- General: Material ID: 1, Name: 3003-H18
- Elasticity Data: Type of Design: Aluminum, Standard: AA(A), DB: SUUS+H18, Product: Sheet, Concrete Standard: AA(A), GB50429-07(A)
- Aluminum Properties: Modulus of Elasticity: 6.9637e+007 kN/m<sup>2</sup>, Poisson's Ratio: 0.33, Thermal Coefficient: 2.3000e-005 1/[C], Weight Density: 26.48 kN/m<sup>3</sup>

Load Combination for Aluminum Design

Material Data for Aluminum Design

# 13. Add options of $A_{s,use}$ and $Rho_{,use}$ in shell flexural checking



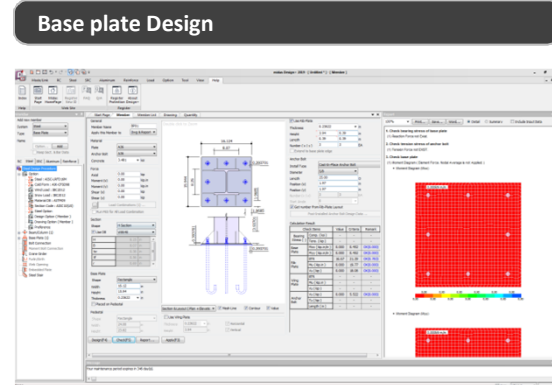
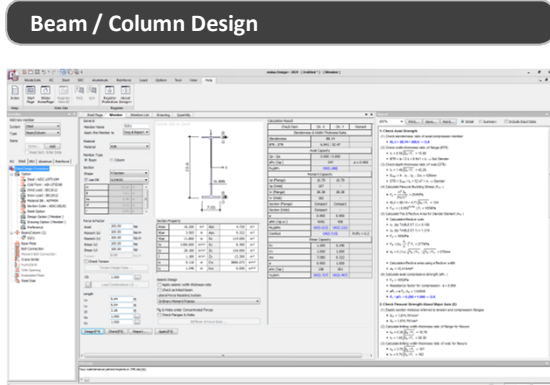
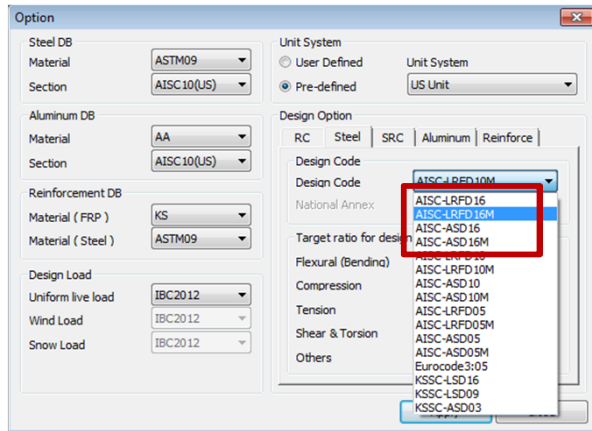
*midas* **Design+**

# 1. Add Steel Design as per AISC360-16 and AISC360-16M

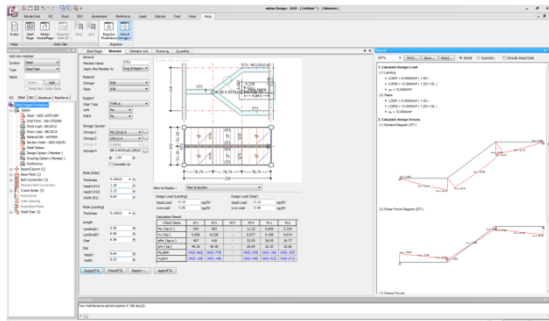
## • Supported Design Items

: Steel Beam/Column, CFT Column, SRC Column, Crane Girder, Bolt Connection, Steel Stair

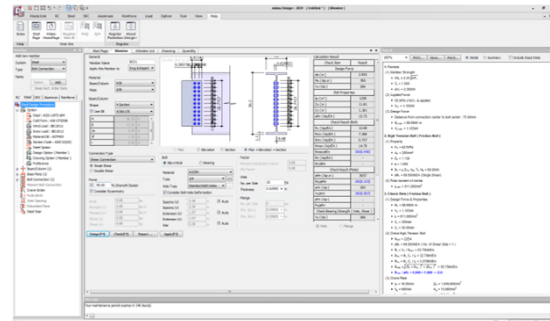
### Steel Design as AISC360-16



### Stair Design



### Bolt Connection Design



### Crane Girder Design

