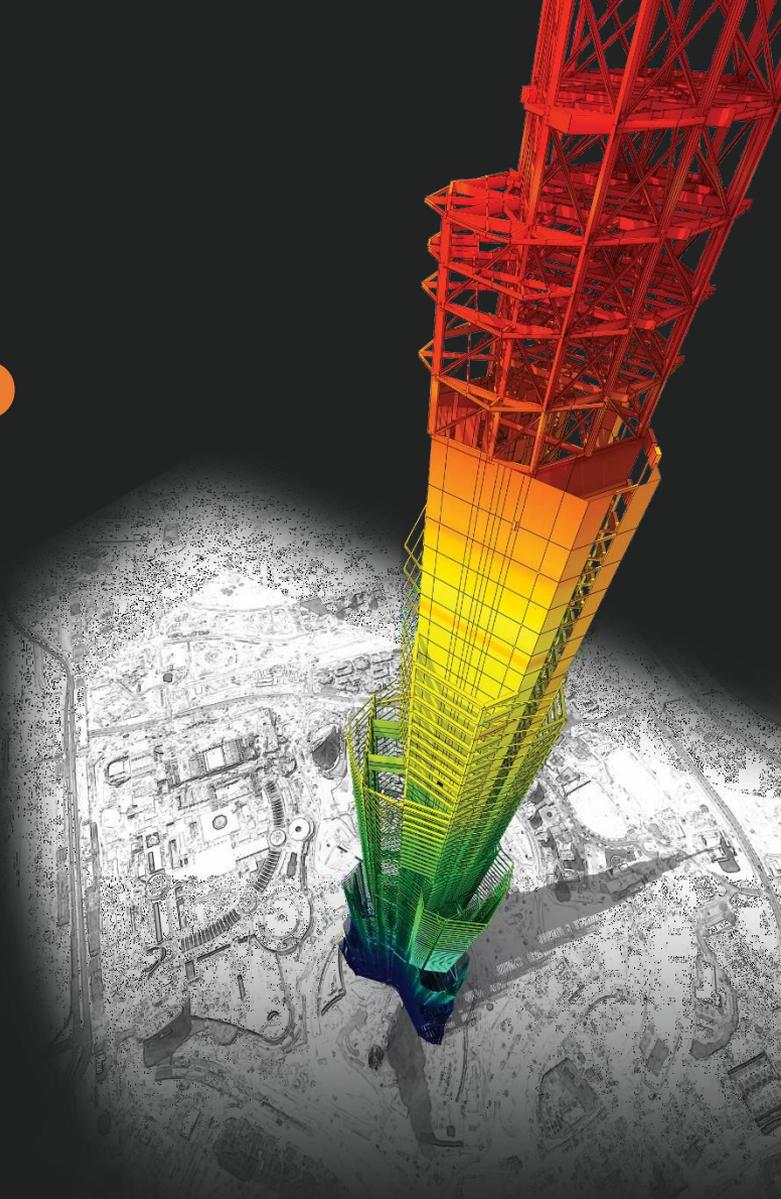


Nota de lanzamiento

Fecha: Junio 2021

Versión : midas Gen 2021 (v2.1) &
Design+2021(v2.1)



Diseño de Estructuras Generales

Sistema integrado para el diseño de edificaciones y estructuras generales

Actualizaciones & Mejoras

- *midas Gen*

1) Mejoras en los factores de escala de rigidez para secciones	4
2) Mejoras en el chequeo a cortante de nudos	11
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5) Adición del anexo de Suecia para el Eurocódigo	17

- *midas Design+*

1) Dimensiones definidas por el usuario para placa colaborante de acero en módulo de vigas compuestas	20
---	----

midas **Gen**

1. Mejoras en los factores de escala de rigidez para secciones

Adición de factores de escala para elementos

- La rigidez se puede definir por miembros y no solamente a secciones.

Properties > Section > Scale Factor > **Element Stiffness Scale Factor**

Tree Menu

Node | **Element** | Boundary | Mass | Load

Element Stiffness Scale Fact

Start Number

Node Number : 5647

Element Number : 6518

Boundary Group Name

Default

Option

Add/Replace Delete

Stiffness Scale Factor

Area : 1

Asy : 1

Asz : 1

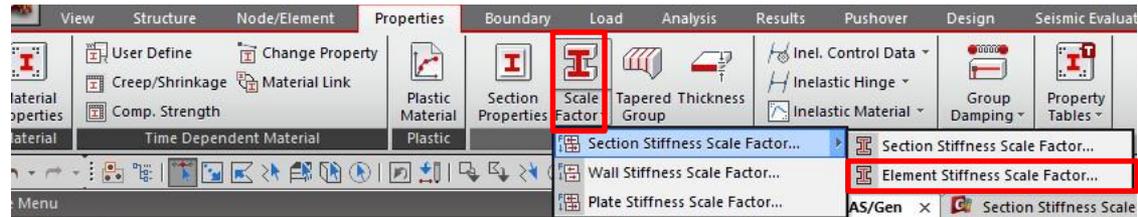
Ixx : 0,55

Iyy : 0,55

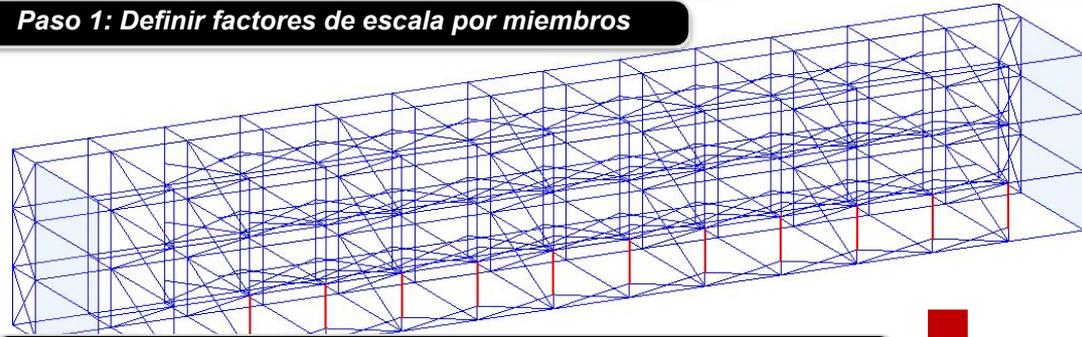
Izz : 1

Weight : 1

Apply Close



Paso 1: Definir factores de escala por miembros

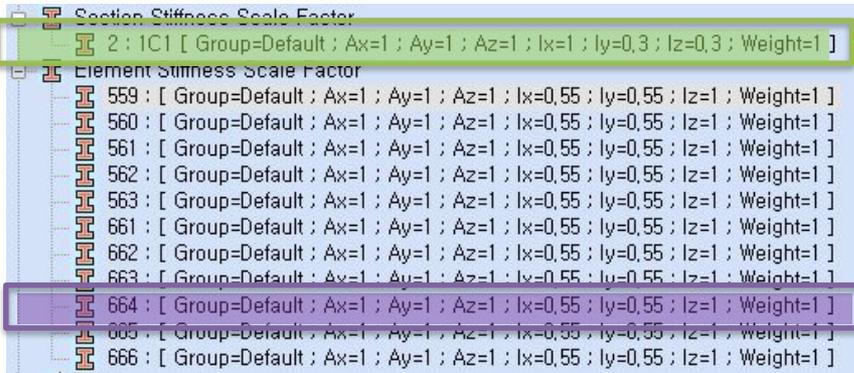


Paso 2: Modificar la tabla de factores de escala de elementos

Elem	Section ID	fArea	fAsy	fAsz	flxx	flyy	flzz	fWgt	Part	Group
559	2	1.0000	1.0000	1.0000	0.5500	0.5500	1.0000	1.0000	Before	Default
560	2	1.0000	1.0000	1.0000	0.5500	0.5500	1.0000	1.0000	Before	Default
561	2	1.0000	1.0000	1.0000	0.5500	0.5500	1.0000	1.0000	Before	Default
562	2	1.0000	1.0000	1.0000	0.5500	0.5500	1.0000	1.0000	Before	Default
563	2	1.0000	1.0000	1.0000	0.5500	0.5500	1.0000	1.0000	Before	Default
661	2	1.0000	1.0000	1.0000	0.5500	0.5500	1.0000	1.0000	Before	Default
662	2	1.0000	1.0000	1.0000	0.5500	0.5500	1.0000	1.0000	Before	Default
663	2	1.0000	1.0000	1.0000	0.5500	0.5500	1.0000	1.0000	Before	Default
664	2	1.0000	1.0000	1.0000	0.5500	0.5500	1.0000	1.0000	Before	Default
665	2	1.0000	1.0000	1.0000	0.5500	0.5500	1.0000	1.0000	Before	Default

1. Mejoras en los factores de escala de rigidez para secciones

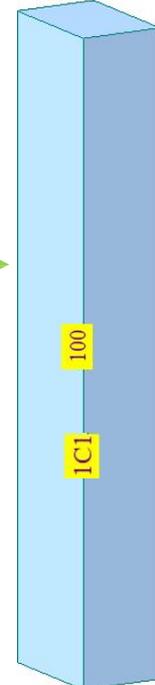
El factor de escala por elemento **Element Stiffness Scale Factor (E.S.S.F.)** tiene prioridad sobre el factor de escala por sección **Section Stiffness Scale Factor (S.S.S.F.)**



Caso 1



Caso 2



Caso 1 : Ambos S.S.S.F. y E.S.S.F se aplican a la sección “1C1”.

□ E.S.S.F es considerado en el análisis.

Caso 2: Solamente S.S.S.F se aplica a la sección “1C1”.
(Element Stiffness Scale Factor no se aplica)

□ S.S.S.F es considerado en el análisis.

- Nombre de la sección : 1C1(ID:2)
- Número de elemento: 664

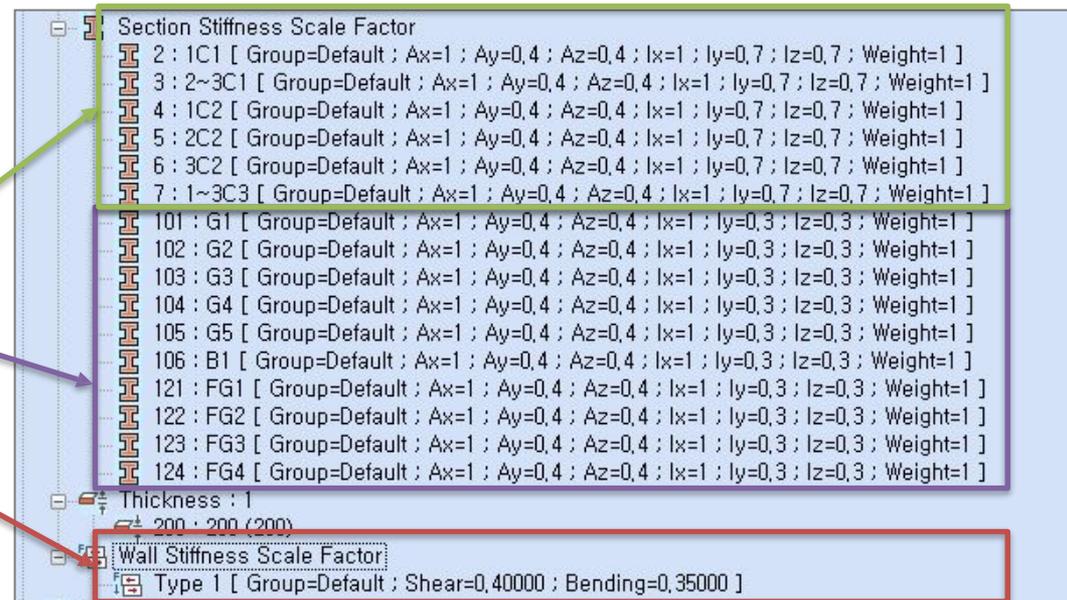
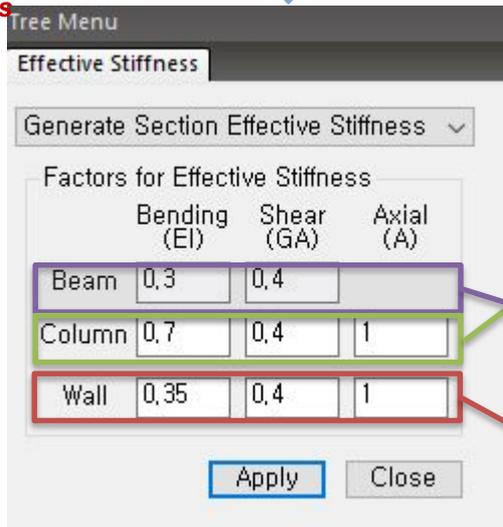
- Nombre de la sección : 1C1(ID:2)
- Número de elemento: 100

1. Mejoras en los factores de escala de rigidez para secciones

Es posible definir factores de escala para secciones de manera colectiva, para cada tipo de miembro (viga, columna, muro)



Pushover > Effective Stiffness > **Generate Section Effective Stiffness**



1. Mejoras en los factores de escala de rigidez para secciones

Es posible el cálculo automático de la relación de rigidez efectiva de columnas de acuerdo con la carga axial producida por cargas gravitacionales



Paso 1: Definir el factor de escala de cargas gravitacionales para calcular la fuerza axial de la columna

✓ Nota

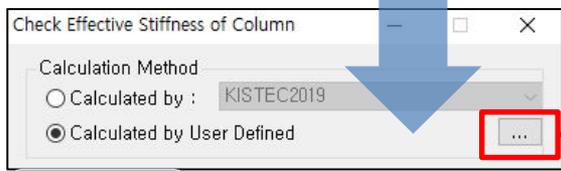
6.4.1.2 Stiffness

Component stiffnesses shall be calculated according to accepted principles of mechanics. Sources of flexibility shall include flexure, shear, axial load, and reinforcement slip from adjacent connections and components. Stiffnesses should be selected to represent the stress and deformation levels to which the components will be subjected, considering volume change effects (temperature and shrinkage) combined with design earthquake and gravity load effects.

Código de referencia : 6.4.1.2 - FEMA273

1. Mejoras en los factores de escala de rigidez para secciones

Paso 2 : Seleccionar el método de cálculo
Paso 3 : Al seleccionar "definido por el usuario", ingresar la relación de fuerza axial y el factor de escala de rigidez a momento en cada punto



	Axial Force Ratio	Bending Stiffness Scale Factor
1st Point	0,1	0,3
2nd Point	0,5	0,7

Nota

Table 10-5. Effective Stiffne

Component	Flexural Rigidity	Shear Ri
Beams—nonprestressed ^a	$0.3E_c I_g$	$0.4E_c A_g$
Beams—prestressed ^a	$E_c I_g$	$0.4E_c A_g$
Columns with compression caused by design gravity loads $\geq 0.5A_g f'_c$	$0.7E_c I_g$	$0.4E_c A_g$
Columns with compression caused by design gravity loads $\leq 0.1A_g f'_c$ or with tension	$0.3E_c I_g$	$0.4E_c A_g$
Beam-column joints	Refer to Section 10.4.2.2.1	
Flat slabs—nonprestressed	Refer to Section 10.4.4.2	$0.4E_c A_g$
Flat slabs—prestressed	Refer to Section 10.4.4.2	$0.4E_c A_g$
Walls-cracked ^b	$0.5E_c A_g$	$0.4E_c A_g$

^aFor T-beams, I_g can be taken as twice the value of I_g of the web alone. Otherwise, I_g should be based on the effective moment of inertia.
^bFor columns with axial compression falling between the limits provided, flexural rigidity should be determined not performed, the more conservative effective stiffnesses should be used.
^cSee Section 10.7.2.2.

Código de referencia : ASCE41-17 Tabla 10-5

1. Mejoras en los factores de escala de rigidez para secciones

Paso 4 : Chequear y actualizar el factor de rigidez efectiva de las columnas.



Al dar clic en 'Update', el factor de rigidez a flexión del miembro seleccionado se actualiza en el modelo. El factor de escala de rigidez actualizado se refleja en los factores de escala por elemento 'Element stiffness Scale Factor'.

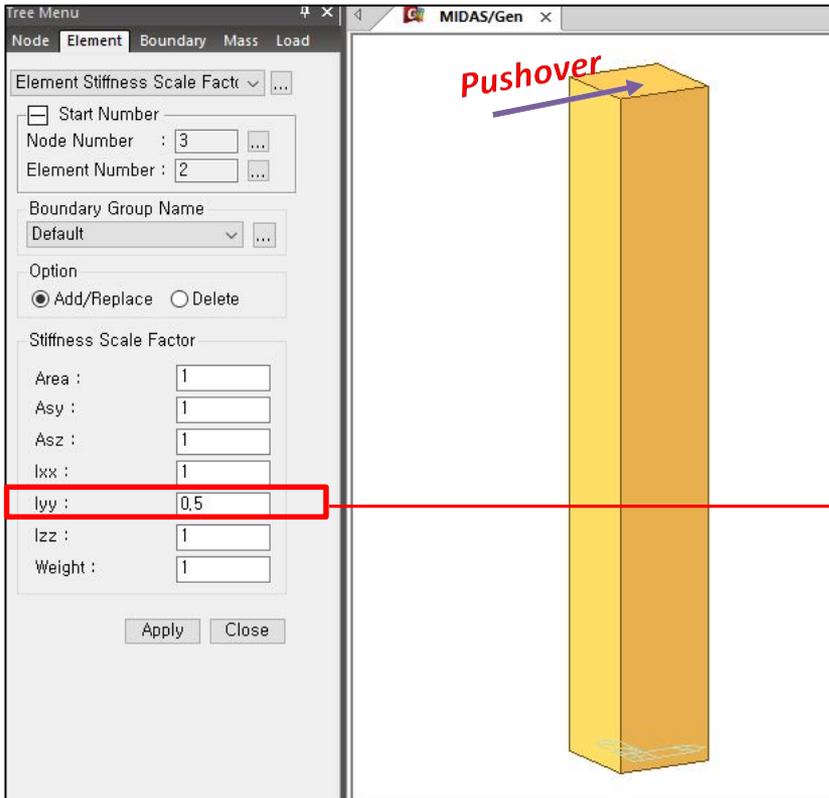
Factor de escala por elemento actualizado

MEMB	SECT	SEL	Section	Axial Load Ratio	Bending Stiffness Scale Factor
95	7	<input checked="" type="checkbox"/>	1-3C3	0.05	0.30
96	4	<input checked="" type="checkbox"/>	1C2	0.11	0.31
97	2	<input checked="" type="checkbox"/>	1C1	0.04	0.30
98	7	<input checked="" type="checkbox"/>	1-3C3	0.06	0.30
99	4	<input checked="" type="checkbox"/>	1C2	0.21	0.41
100	2	<input checked="" type="checkbox"/>	1C1	0.13	0.33
101	7	<input checked="" type="checkbox"/>	1-3C3	0.06	0.30
102	4	<input checked="" type="checkbox"/>	1C2	0.20	0.40
103	2	<input checked="" type="checkbox"/>	1C1	0.13	0.33
104	7	<input checked="" type="checkbox"/>	1-3C3	0.06	0.30

MEMB	SECT	SEL	Section	Axial Load Ratio	Bending Stiffness Scale Factor
95	7	<input checked="" type="checkbox"/>	1-3C3	0.05	0.30
96	4	<input checked="" type="checkbox"/>	1C2	0.11	0.31
97	2	<input checked="" type="checkbox"/>	1C1	0.04	0.30
98	7	<input checked="" type="checkbox"/>	1-3C3	0.06	0.30
99	4	<input checked="" type="checkbox"/>	1C2	0.21	0.41
100	2	<input checked="" type="checkbox"/>	1C1	0.13	0.33
101	7	<input checked="" type="checkbox"/>	1-3C3	0.06	0.30
102	4	<input checked="" type="checkbox"/>	1C2	0.20	0.40
103	2	<input checked="" type="checkbox"/>	1C1	0.13	0.33
104	7	<input checked="" type="checkbox"/>	1-3C3	0.06	0.30

1. Mejoras en los factores de escala de rigidez para secciones

- La rotación en la rótulas se calcula de acuerdo con el factor de escala de rigidez del elemento



Resultado de verificación de seguridad

Elem	Location	Seismic Element	Load	Verify Ductile Mechar		
				Demand	Capacity	Remark
Step for Demand = USER (Step 1), Confidence factor = 1.00						
Press right mouse button and click 'Set Safety Parameters' menu to change step or loadcase						
1	I-end	Primary	test	0.00014182	0.03613520	OK

Resumen de resultados de vigas

Type	Elem	Hinge Location	Pushover Hinge Prop.	Load	Step	Deform	Force
M-Theta	1	I-end	column	test	1	3.832e-004	9.645651

$$\theta = M / (\text{Scale Factor} \times K)$$

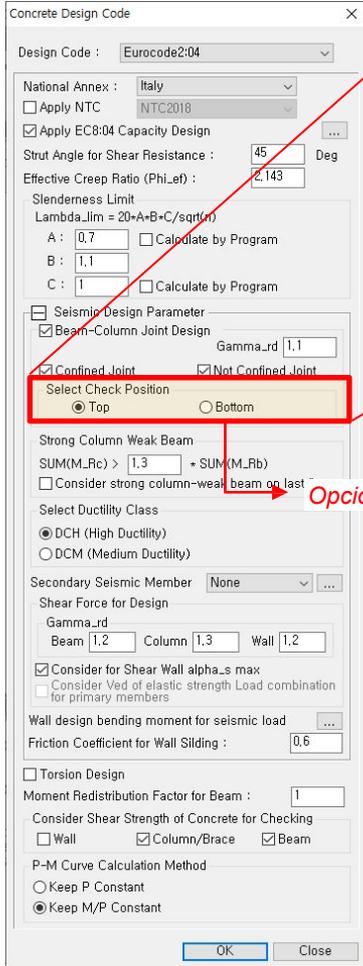
	Default (l _{yy} =1.0)	l _{yy} =0.50
Moment (M)	19.151625kN	9.645651kNm
K (=3EI/L ³ Column for Scale Factor)	136031.	136031.3
Hinge rotation(θ)	0.000140	0.00014182

2. Mejoras en el chequeo a cortante de nudos

Se agregó una opción para el chequeo de nudos en ambos extremos de la columna (Top / Bottom):

En versiones anteriores, el chequeo del nudo en el piso superior no estaba disponible.

En midas Gen2021 v2.1, el chequeo de nudos ahora es posible para todos los pisos:



Opción agregada

Select Check Position
 Top Bottom

Reporte de diseño (Gráfico)

1. Design Summary
 Design Code : Eurocode2:04 UNIT SYSTEM : kN, m
 Member Number : 346
 Material Data : fck = 20000, fyk = 400000, fyw = 400000 KPa
 Column Height : 4 m
 Section Property : C3 (No : 303)
 Rebar Pattern : 20 - 6 - D22 Ast = 0.007742 m² (pst = 0.012)

2. Axial and Moments Capacity
 Load Combination : 14 (Pos : J)
 Concentric Max. Axial Load N_Rdmax = 11123.0 kN = 0.22
 Axial Load Ratio N_Ed / N_Rd = 88.1066 / 394.322 = 0.22
 Moment Ratio M_Ed / M_Rd = 217.676 / 984.221 = 0.22
 M_Ed / M_Rd = 210.596 / 953.652 = 0.22
 Normalized Axial Load Ratio M_Ed / M_Rd = 55.0625 / 243.390 = 0.22
 Nu_d / 0.55 = 0.022 / 0.550 = 0.04

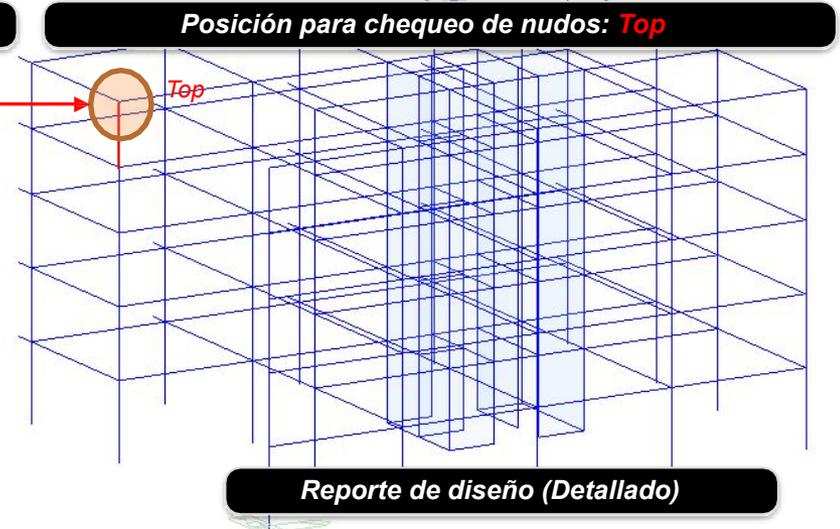
M-N Interaction Diagram

3. Shear Capacity

	y (LCB : 19, POS : J)	z (LCB : 19, POS : J)
Applied Shear Force (V_Ed)	332.720 kN	357.129 kN
V_Ed / V_Rdc	332.720 / 268.154 = 1.241	357.129 / 268.154 = 1.332
V_Ed / V_Rds	332.720 / 359.156 = 0.926	357.129 / 359.156 = 0.994
V_Ed / V_Rdmax	332.720 / 1917.78 = 0.173	357.129 / 1917.78 = 0.186
Shear Ratio	0.926 < 1.000 O.K	0.984 < 1.000 O.K
Asw-H_req	0.00147 m ² /m, 2-D10 @90	0.00158 m ² /m, 2-D10 @90

	y (LCB : 15, POS : J)	z (LCB : 12, POS : J)
Applied Shear Force (V_Ed)	332.720 kN	357.129 kN
V_Ed / V_Rdc	332.720 / 272.497 = 1.221	357.129 / 272.497 = 1.311
V_Ed / V_Rds	332.720 / 359.156 = 0.926	357.129 / 359.156 = 0.994
V_Ed / V_Rdmax	332.720 / 1917.78 = 0.173	357.129 / 1917.78 = 0.186
Shear Ratio	0.926 < 1.000 O.K	0.984 < 1.000 O.K
Asw-H_req	0.00147 m ² /m, 2-D10 @90	0.00158 m ² /m, 2-D10 @90

[JOINT : TOP]
 Ash req / Ash use : 0.00121 / 0.00128 = 0.940
 Joint Ratio : 0.940 < 1.000 O.K
 Ash Joint : 2-9 D10



```

[[[+]]] CALCULATE BEAM-COLUMN JOINT CAPACITY ABOUT MAJOR AXIS. (TOP)
=====
( ) Compute joint geometry information.
[ NTC2018, 7.4.4.3 ]
- bc = 800.0000 mm.
- hc = 800.0000 mm.
- bw = 600.0000 mm.
- hjc = 647.6000 mm.
- hjw = 647.6000 mm.
- bj = MIN( bc, bw*0.5+hc ) = 800.0000 mm.
- All sides don't have beams and bw >= 3/4*bc ----> Nonconfined joint.

( ) Compute maximum spacing of ties/spirals.
- Smax = 50.000 mm. (Hoop spacing for shear)

( ) Compute horizontal shear force in local-z direction.
[ LCB = 15, POS = J ]
[ NTC2018, 7.4.4.3.1 ]
- Applied axial force : Pu = 83.63 kN.
- Applied shear force : Vcz = 24.532 kN.
- Beam Top Reinforcement : SUM As1.Fyd = SUM As1 + fyd(beam) ] = 204.974 kN.
    
```

2. Mejoras en el chequeo a cortante de nudos

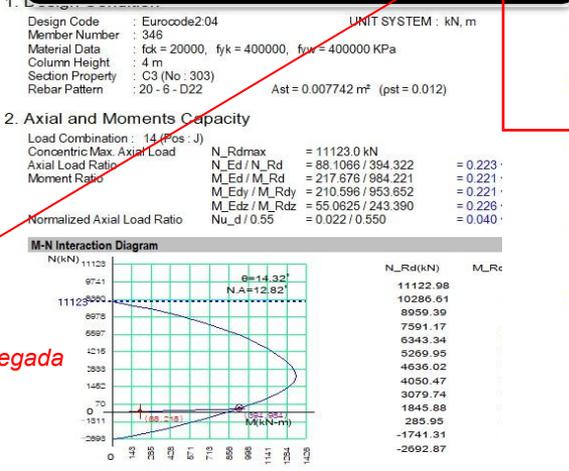
Se agregó una opción para el chequeo de nudos en ambos extremos de la columna (Top / Bottom):

En versiones anteriores, el chequeo del nudo en el piso superior no estaba disponible.

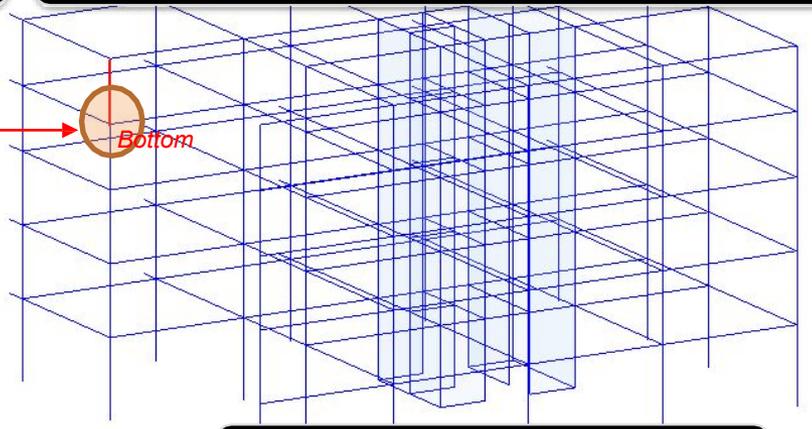
En midas Gen2021 v2.1, el chequeo de nudos ahora es posible para todos los pisos:

Select Check Position
 Top
 Bottom

Reporte de diseño (Gráfico)



Posición para chequeo de nudos: Bottom



Reporte de diseño (Detallado)

```

[[[+]]] CALCULATE BEAM-COLUMN JOINT CAPACITY ABOUT MAJOR AXIS. (BOTTOM)
-----
( ). Compute joint geometry information.
[ NTC2018, 7.4.4.3 ]
- bc = 800.0000 mm.
- hc = 800.0000 mm.
- bw = 600.0000 mm.
- hjc = 647.6000 mm.
- hjw = 647.6000 mm.
- bj = MIN( bc, bw+0.5*hc ) = 800.0000 mm.
- All sides don't have beams and bw >= 3/4*bc ----> Nonconfined joint.

( ). Compute maximum spacing of ties/spirals.
- Smax = 50.000 mm. (Hoop spacing for shear)

( ). Compute horizontal shear force in local-z direction.
[ LCB = 15, POS = I ]
[ NTC2018, 7.4.4.3.1 ]
- Applied axial force : Pu = 147.63 kN.
- Applied shear force : Vcz = 24.932 kN.
- Beam Top Reinforcement : SUM.Ast.Fyd = SUM( Ast + fyd(beam) ) = 704.974 kN.
    
```

3. Valor del periodo T1 definido por el usuario para el diseño a cortante según EC8:04 & NTC2018

- Permite definir el periodo fundamental (T1) directamente para el diseño a cortante de muros esbeltos

Concrete Design Code

Design Code : Eurocode2:04

National Annex : Italy

Apply NTC : NTC2018

Apply Special Provisions for Seismic Design

Strut Angle for Shear Resistance : 45 Deg

Effective Creep Ratio (Phi_Lef) : 2,14

Slenderness Limit

Lambda_lim = 25/(eet/epsilon)

EC8:04 Capacity Design

Structure Information

Structure Type : Coupled Wall System

Behavior Factor (q)

Calculate by Program

Alpha_u / Alpha_1 : 1,2

User Input

q 2 q0 2

Fundamental Period(T1)

Calculate by Program *Opción agregada*

User Input

T1_X 0,1 T1_Y 0,1

Elastic Response Spectrum

Default By Function BS_SLV_q=2_cat-B_T1

Spectrum Parameters

Soil Factor (S)	Tb	Tc	Td
1,2	0,131	0,3931	2,6

Ref. Reak Ground Acc. (AgR) : 0,147 g

Importance Factor(I) : 1

Viscous Damping Ratio (xi) : 5 %

OK Cancel

Ecuación aplicada : 5.25 (EC8:04)

$$V_{Ed} = \varepsilon \cdot V'_{Ed} \tag{5.24}$$

where

V_{Ed} is the shear force from the analysis;

ε is the magnification factor, calculated from expression (5.25), but not less than 1,5:

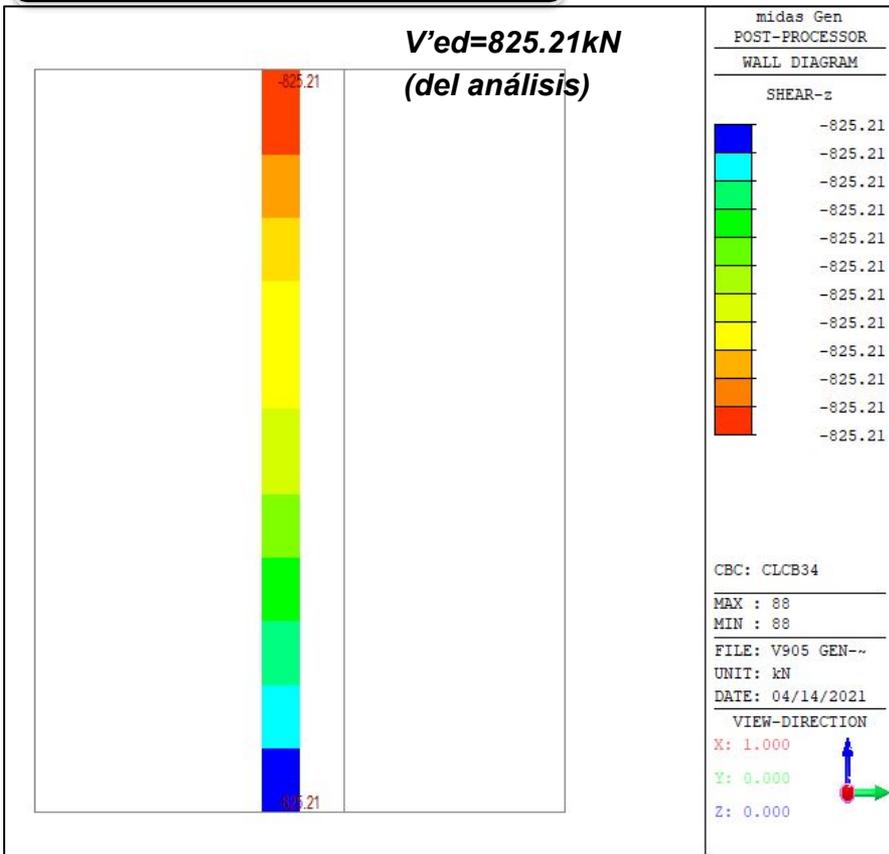
$$\varepsilon = q \cdot \sqrt{\left(\frac{\gamma_{Rd}}{q} \cdot \frac{M_{Rd}}{M_{Ed}}\right)^2 + 0,1 \left(\frac{S_e(T_c)}{S_e(T_1)}\right)^2} \leq q \tag{5.25}$$

T_1 is the fundamental period of vibration of the building in the direction of shear forces V_{Ed} ;

3. Valor del periodo T1 definido por el usuario para el diseño a cortante según EC8:04 & NTC2018

- Permite definir el periodo fundamental (T1) directamente para el diseño a cortante de muros esbeltos

Fuerza cortante del análisis (V'ed)



Fuerza cortante aplicada (Ved=ε * V'ed)

Fundamental Period(T1)

Calculate by Program

User Input

T1_X 0,1 T1_Y 0,1

Shear Capacity

Applied Shear Force V_Ed = 1650.43 kN (Load Combination : 1)

Shear Ratio by Conc V_Ed/V_Rdc = 1650.43 / 476.234 = 3.4656

Shear Ratio by V_Rds V_Ed/V_Rds = 1650.43 / 1395.39 = 1.1828

Shear Ratio by V_Rdmax V_Ed/V_Rdmax = 1650.43 / 986.047 = 1.6738

T1 = 1.2486 sec(Calculado por Gen)

ε = 2.0

Ved = 2.0 * 825.21 = 1650.43 kN

Fundamental Period(T1)

Calculate by Program

User Input

T1_X 0,1 T1_Y 0,1

Shear Capacity

Applied Shear Force V_Ed = 1287.67 kN (Load Combination : 1)

Shear Ratio by Conc V_Ed/V_Rdc = 1287.67 / 565.751 = 2.2760

Shear Ratio by V_Rds V_Ed/V_Rds = 1287.67 / 1131.97 = 1.1376

Shear Ratio by V_Rdmax V_Ed/V_Rdmax = 1287.67 / 973.873 = 1.3222

T1 = 0.1sec(Definido por el usuario)

ε = 1.56

Ved = 1.56 * 825.21 = 1287.67 kN

4. Nuevo método para el cálculo del momento de diseño según NTC2018

- El Método 2 es un método alternativo en el que el momento de diseño del muro superior se aplica excesivamente al método del código (Método 1).

Concrete Design Code

Design Code : Eurocode2:04

National Annex : Italy

Apply NTC

Apply EC8:04 Capacity Design

Strut Angle for Shear Resistance : 45 Deg

Effective Creep Ratio (Phi_Lef) : 2,143

Slenderness Limit

$\Lambda_{lim} = 20 \cdot A \cdot B \cdot C / \sqrt{n}$

A : 0,7 Calculate by Program

B : 1,1 Calculate by Program

C : 1 Calculate by Program

Seismic Design Parameter

Beam-Column Joint Design

Gamma_rd 1,1

Confined Joint Not Confined Joint

Select Check Position

Top Bottom

Strong Column Weak Beam

$SUM(M_{Rc}) > [1,3 \cdot SUM(M_{Rb})]$

Consider strong column-weak beam on last floor

Select Ductility Class

DCH (High Ductility)

DCM (Medium Ductility)

Secondary Seismic Member None

Shear Force for Design

Gamma_rd

Beam 1,2 Column 1,3 Wall 1,2

Consider for Shear Wall $\alpha_{s,max}$

Consider Ved of elastic strength Load combination for primary members

Wall design bending moment for seismic load

Friction Coefficient for Wall Sliding : 0,6

Torsion Design

Moment Redistribution Factor for Beam : 1

Consider Shear Strength of Concrete for Checking

Wall Column/Brace Beam

P-M Curve Calculation Method

Keep P Constant

Keep M/P Constant

OK Close

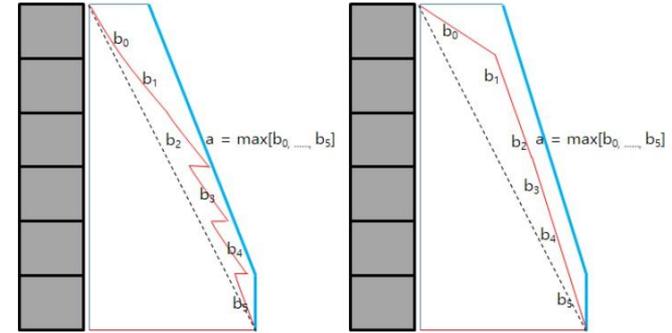
Método 1: Procedimiento actual

Wall design bending moment for seismic load

Wall Design Method

Method-1 Method-2

OK Close



- 1) Rojo: Resultado del análisis
- 2) Azul: Usa el valor máximo de la pendiente del diagrama rojo.

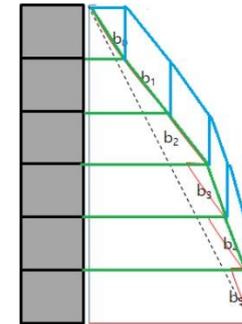
Método 2: Nuevo método de diseño acorde al código (EC & NTC)

Wall design bending moment for seismic load

Wall Design Method

Method-1 Method-2

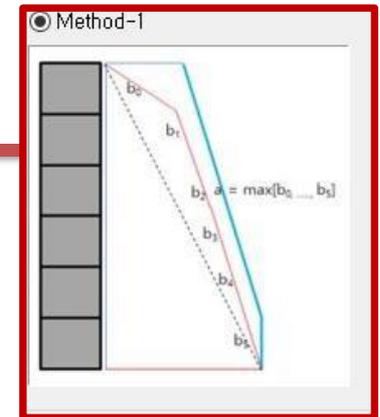
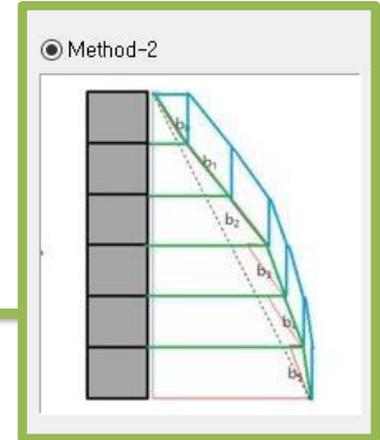
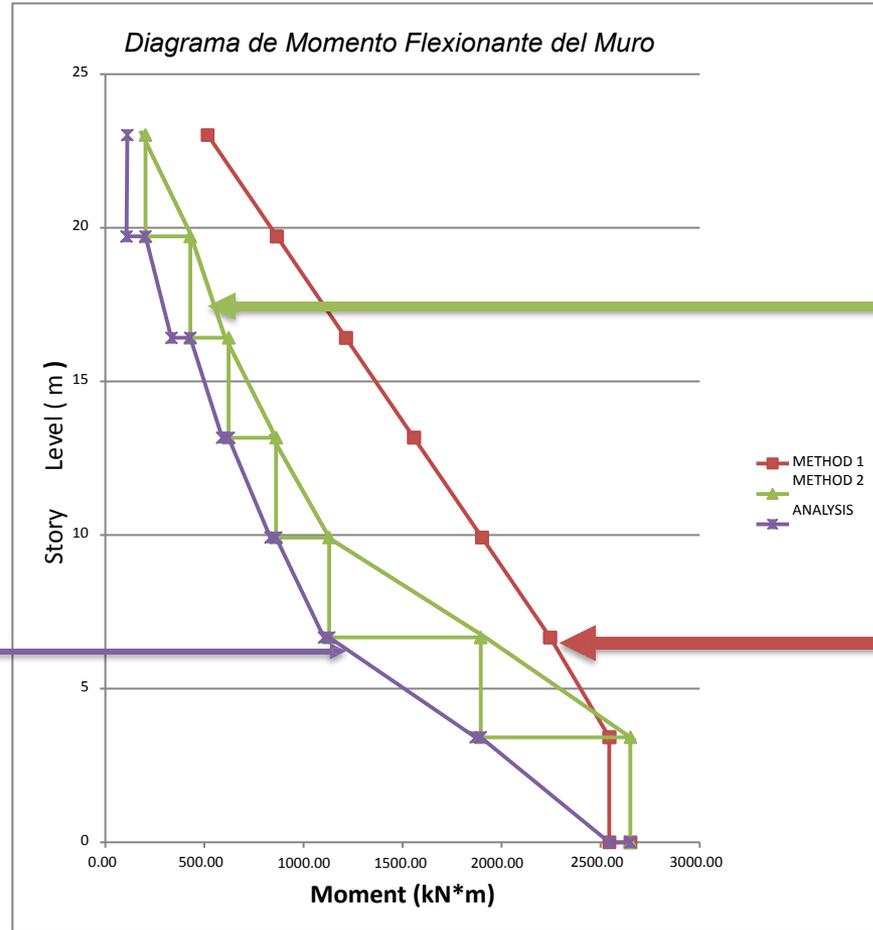
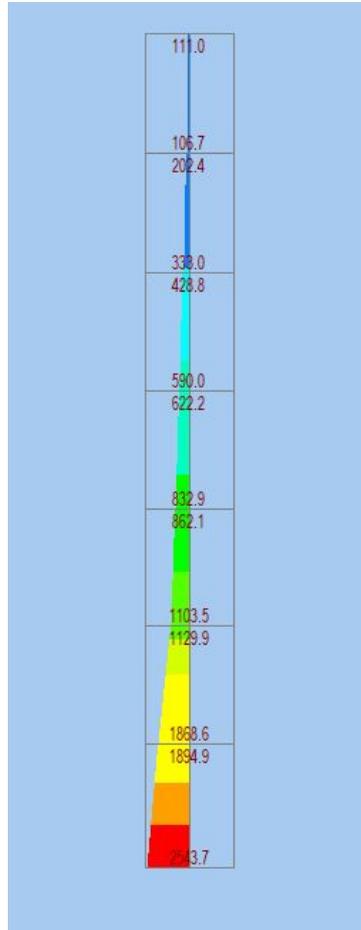
OK Close



- 1) Rojo: Resultado del análisis
- 2) Verde: Envolvente de los momentos a flexión máximos
- 3) Azul: Diagrama verde trasladado en la dirección Z

4. Nuevo método para el cálculo del momento de diseño según NTC2018

- El Método 2 es un método alternativo en el que el momento de diseño del muro superior se aplica excesivamente al método del código (Método 1).



5. Adición del anexo de Suecia para el Eurocódigo

Anexo de Suecia (BFS2019:1) para el diseño de acero

Steel Design Code

Design Code : Eurocode3:05

National Annex : Sweden(2019)

All Beams/Girders are Laterally Braced

Check Beam/Column Deflection

Apply Special Provisions for Seismic Design

Biaxial moments for buckling resistance

Biaxial moments at the same location

Maximum moments along the member

OK Close

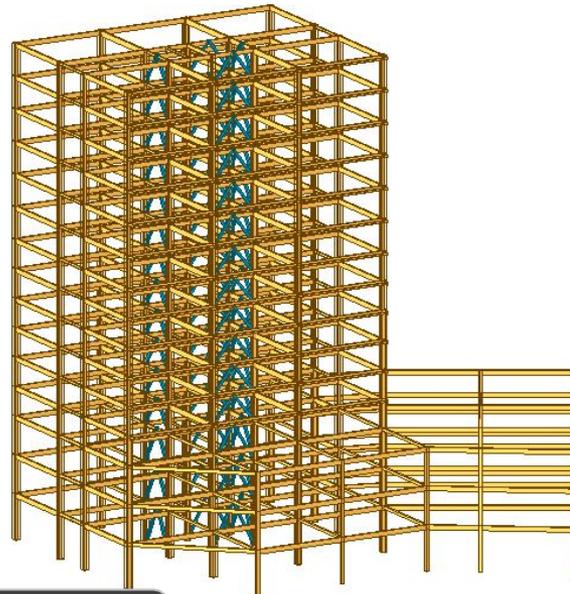


Tabla de Resultados de Diseño

Eurocode3:05 Code Checking Result Dialog

Code : EC3:05, SWE2019 Unit : kN , m Primary Sorting Option

Sorted by Member Property Change... Update...

SECT MEMB

CH	MEMB	SECT	SE	Section		LCB	Len		Ky	Bmy	N,Ed	My,Ed	My,Rd	Mz,Ed	Vy,Ed	Vz,Ed	T,Ed	Def
				Material	Fy		Lb	Lz										
OK	254	221	□	SG1, W24x76	248211	2	12.0000	12.0000	1.000	1.000	0.00000	-458.65	-458.65	0.00000	0.00000	181.729	-	-0.0142
	0.707	0.165		A36	248211		4.00000	12.0000	1.000	1.000	3587.05	648.575	813.491	116.329	0.00000	1101.29	-	0.04800
OK	251	222	□	SG2, W18x55	248211	3	3.00000	3.00000	1.000	1.000	0.00000	-235.96	-235.96	0.00000	0.00000	141.276	-	-0.0016
	0.518	0.194		A36	248211		2.00000	3.00000	1.000	1.000	2594.20	0.00000	455.555	75.2479	0.00000	729.078	-	0.02400
OK	125	223	□	SG3, W18x55	248211	6	6.00000	6.00000	1.000	1.000	0.00000	228.311	228.311	0.00000	0.00000	114.076	-	-0.0031
	0.501	0.156		A36	248211		2.00000	6.00000	1.000	1.000	2594.20	0.00000	455.555	75.2479	0.00000	729.078	-	0.02400
	24	224	□	SG4, W30x116			10.8000	10.8000	1.000	1.000	0.00000	1274.54	1274.54	0.00000	0.00000	-562.25	-	-0.0465

Reporte Gráfico

Preview Window

Memb No.: 25

1. Design Information

Design Code Eurocode3:05 & SWE2019

Unit System kN, m

Member No 25

Material A36 (No.1)

(Fy = 248211, Es = 199948024)

Section Name SG4 (No.224)

(Rolled: W30x116)

Member Length : 10.8000

2. Member Forces

Axial Force Fx = 0.0

My = 1240.64

Bending Moments

End Moments

My1 = 1240.64, My2 = 1184.15, Mz1 = 0.0, Mz2 = 0.0

Shear Forces

Fy = 0.0

Fz = 562.25

3. Design Parameters

Unbraced Lengths

Effective Length Factors

Equivalent Uniform Moment Factors

4. Checking Result

Slenderness Ratio

$L/r = 194.2 <$

Axial Resistance

$N_{Ed}/N_{Rd} = 0.00$

Bending Resistance

$M_{Ed}/M_{Rd} = 1240.64$

$M_{Ed}/M_{Rd} = 0.0000$

Combined Resistance

$R_{M,Rd} = \max(N_{Ed}/N_{Rd}, M_{Ed}/M_{Rd})$

Reporte Detallado

midas Gen - Steel Code Checking Eurocode3:05, SWE2019

Gen 2021

PROJECT : 25, ELEMENT TYPE = Beam

LOADING NO = 2, MATERIAL NO = 1, SECTION NO = 224

UNIT SYSTEM : kN, m

SECTION PROPERTIES : Designation = 304, W30x116

Shape = I - Section, (Rolled)

Depth = 0.762, Top Flange = 0.267, Bot. Flange = 0.267

Web Thick = 0.014, Top Flange = 0.022, Bot. Flange = 0.022

Area = 2.20645e-002, Avy = 1.12450e-002, Avz = 1.23830e-002

Iybar = 1.33286e-001, Izbar = 3.81127e-001, Iy = 2.19151e-001, Iz = 8.86264e-003

Wely = 5.39134e-003, Welz = 5.12915e-004, Wply = 5.18415e-003, Wplz = 8.06244e-004

Jy = 2.05202e-003, Jz = 5.82630e-005, Jyc = 0.00000e+000

iy = 3.04800e-001, iz = 5.56200e-002

J = 2.67637e-006, Cwp = 9.34829e-006

DESIGN PARAMETERS FOR STRENGTH EVALUATION :

Ly = 1.00000e+001, Lz = 1.00000e+001, Lb = 2.70000e+000

Ky = 1.00000e+000, Kz = 1.00000e+000

MATERIAL PROPERTIES :

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

FORCES AND MOMENTS AT (1) POINT :

Axial Force Fx = 0.00000e+000

Shear Forces Fy = 0.00000e+000, Fz = 5.60279e+002

Bending Moments My = 1.24064e+003, Mz = 0.00000e+000

End Moments My1 = 1.24064e+003, My2 = 1.18415e+003 (for Lb)

My1 = 1.24064e+003, My2 = 1.18415e+003 (for Ly)

Mz1 = 0.00000e+000, Mz2 = 0.00000e+000 (for Lz)

Sign convention for stress and axial force.

- Stress : Compression positive.

- Axial force: Tension positive.

CLASSIFY LEFT-TOP FLANGE OF SECTION (BTR).

Determine classification of compression outstand flanges.

[Eurocode3:05 Table 5.2 (Sheet 2 of 3), EN 1993-1-5]

c = 50(1 + 256/Fy) = 0.97

d/tf = BTR = 5.84

sigmal1 = 200287.268 kPa.

sigmam2 = 200287.268 kPa.

BTR < Sig = (Class 1) : Plastic.

midas Gen - Steel Code Checking Eurocode3:05, SWE2019

Gen 2021

Ln 62 / 383 , Col 102

5. Adición del anexo de Suecia para el Eurocódigo

Anexo de Suecia (BFS2019:1) para el diseño de concreto reforzado

Concrete Design Code

Design Code : Eurocode2:04

National Annex : **Sweden(2019)**

Apply NTC NTC2018

Apply EC8:04 Capacity Design

Strut Angle for Shear Resistance : 45 Deg

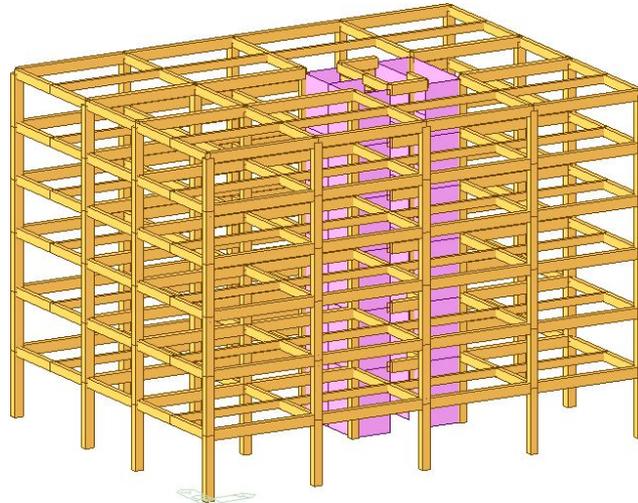
Effective Creep Ratio (PhiLef) : 2.14

Slenderness Limit

Lambda_lim = 20*A+B+C/sqrt(n)

A : 0.7 Calculate by Program

B : 1.1



Reporte Gráfico



Reporte Detallado

MIDAS/Text Editor - [App5_EC2 Design-Finial model.rcs]

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mides Gen - RC-Column Design [ Eurocode2:04 & Eurocode8:04 ] Gen 2021
-----
( ). Calculate design moment for slender/non-slender element about minor axis.
- Minimum moment by eccentricity.
  Ein_z = 20.000 Nmm.
- M_Ed_min = N_Ed + Ein_z = 4096847.327 Nmm.
- Applied design moment.
  M_Ed_app = MAX( M_Ed, M_Ed_min ) = 54339527.396 Nmm.
----> M_Ed_app is applied for design.

( ). Design forces/moments of column(brace).
- Axial Force (Compression) N_Ed = 2048421.87 N.
- Combined Bending Moment M_Ed = 40939466.99 Nmm.
- Bending Moment about Local-y M_Ed_y = 189300632.19 Nmm.
- Bending Moment about Local-z M_Ed_z = 355817484.97 Nmm.
- Shear Force of Local-y V_Ed_y = 377350.15 N.
- Shear Force of Local-z V_Ed_z = 408951.15 N.

-----
[[[+]]] ANALYZE CAPACITY OF BIAXIALLY LOADED RC COLUMN(RC-BRACE).
-----

( ). Design Moment about y-direction For Ductile Design.
- M_Ed1 = 111445587.34 Nmm.(from Load Combination)
- M_Ed2 = 189300632.19 Nmm.(from Moment Resistance of Beams)
- M_Ed = MAX(M_Ed1, M_Ed2) = 189300632.19 Nmm.

( ). Design Moment about z-direction For Ductile Design.
- M_Ed1 = 54339527.40 Nmm.(from Load Combination)
- M_Ed2 = 355817484.97 Nmm.(from Moment Resistance of Beams)
- M_Ed = MAX(M_Ed1, M_Ed2) = 355817484.97 Nmm.

( ). Compute design parameters.
- As = 42000.0000 mm2.
- fyk = 7853.9200 mm2.
- Rhot = Ast/As = 0.018700.
- lambda_b = 0.0000 ( fcd <= 50 MPa.).
- eta = 1.0000 ( fcd <= 50 MPa.).
- gamma_c = 1.50 (for Fundamental or Earthquakes).
- Alpha_cc = 1.00 (Default or User Defined).
- fcd = Alpha_cc + fck / gamma_c = 20.000 MPa.
- gamma_s = 1.15 (for Fundamental or Earthquakes).
- fyd = fyk / gamma_s = 344.760 MPa.

( ). Check the ratio of reinforcement.
- Rmin = 0.01000.
- Rhot = 0.018700.
- Rmin < Rhot ----> O.K!

-----
mides Gen - RC-Column Design [ Eurocode2:04 & Eurocode8:04 ] Gen 2021
    
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Tabla de Resultados de Diseño

Eurocode2:04 RC-Column Design Result Dialog

Code : EC2:04.SWE2019 Unit : N mm Primary Sorting Option

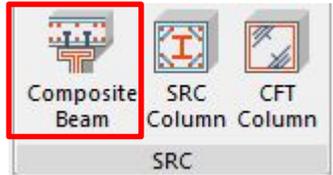
Sorted by Member Property

MEMB SECT	L	Section Bc Hc	f _{ck} Height	f _{yk} f _w	LC B	Uc Rat-Uc	N _{Ed} Rat-N	M _{Ed} Rat-M	Ast	V-Rebar	LC B	V _{Ed} .end V _{Ed} .mid	Rat-V.end Rat-V.mid	Asw-H.e Asw-H.m	H-Rebar.end H-Rebar.mid	Ash.req Ash.us	Rat-As h	J-Rebar
0		C1	30.000	500.000	10	0.471	2894578	1.1E+09	11781	24-7-P25	12	395581	0.978	4524.0	2-P12 @50	4731.50	0.972	Failure
106		600.0	600.0	4500.0	400.000	0.856	0.983	0.974			13	555884	0.830	3258.2	2-P10 @40	4869.48		
0		C1A	30.000	500.000	13	0.249	1496645	4.2E+07	6872.2	14-5-P25	13	431672	0.959	3098.8	2-P12 @70	2229.89	0.986	2-10 P12
156		500.0	600.0	5000.0	400.000	0.454	0.188	0.190			13	431672	0.986	3098.8	2-P10 @50	2262.00		
0		C2	30.000	500.000	11	0.333	783175	9.9E+08	10799	22-6-P25	11	389761	0.964	3231.4	2-P12 @70	3300.71	0.955	2-22 P12
206		600.0	600.0	4000.0	400.000	0.605	0.912	0.927			11	419485	0.939	2458.6	2-P10 @60	3455.76		
0		C3	30.000	500.000	10	0.261	675835	7.5E+08	7853.9	16-5-P25	12	411273	0.898	2513.3	2-P12 @90	3216.31	0.975	2-21 P12
306		600.0	700.0	4000.0	400.000	0.474	0.780	0.770			12	393084	0.880	2303.9	2-P10 @60	3298.68		

midas ***Design+***

1. Dimensiones definidas por el usuario para placa colaborante de acero en módulo de vigas compuestas

- Las dimensiones pueden ser definidas manualmente:



Sección de la base de datos

Section Deck Load Vibration

Deck Plate
 Use Deck Plate
 User Defined Prop. ...

Section DPL-75x200x58x80x1.6

Hr	75.00	mm
Sr	200.00	mm
Br0	58.00	mm
Br1	80.00	mm
t	1.60	mm

Direction Perpendicular to Beam

Sección definida por el usuario

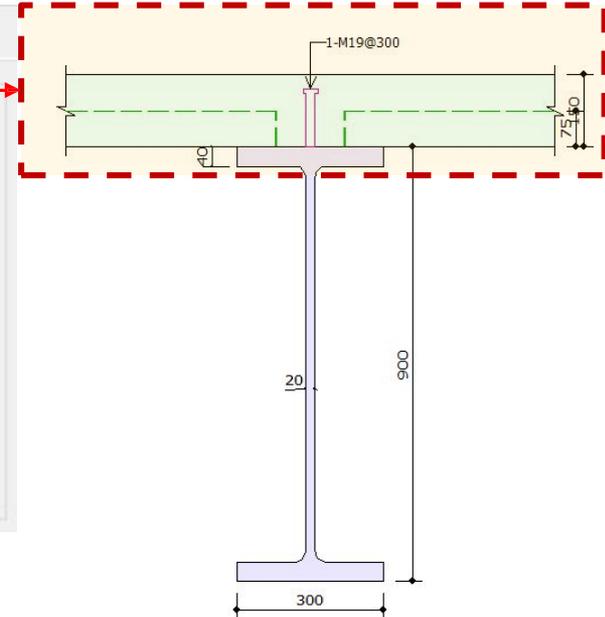
Section Deck Load Vibration

Deck Plate
 Use Deck Plate
 User Defined Prop. ...

Section DPL-75x100x58x80x1.6

Hr	75.00	mm
Sr	200.00	mm
Br0	58.00	mm
Br1	80.00	mm
t	1.60	mm

Direction Perpendicular to Beam



1. Dimensiones definidas por el usuario para placa colaborante de acero en módulo de vigas compuestas

- Las propiedades de la sección compuesta pueden ser definidas de acuerdo a la base de datos, o también ingresando los datos manualmente:

Sección definida por el usuario

Propiedades autocalculadas de la sección y reporte

Deck Plate

Use Deck Plate

User Defined Prop. ...

Section: DPL-80x200x58x80x2

Hr	80.00	mm
Sr	200.00	mm
Br0	58.00	mm
Br1	80.00	mm
t	2.00	mm

Direction: Perpendicular to Beam

Deck Properties

User Defined

A	3355.44	mm ²
W	0.00	kN/m ³
Centr	47.21	mm
Ixx	2550127.58	mm ² x ²
Z(+)	55190.14	mm ³
Z(-)	80208.37	mm ³
Ht	25.46	mm

(4) Deck Plate : DPL-80x200x58x80x2

• Direction : Perpendicular to Beam

H _r	S _r	B ₀	B _{r1}	t	H _t
80.00mm	200mm	58.00mm	80.00mm	2.000mm	25.46mm
A	W	C _y	I _{xx}	Z(+)	Z(-)
3,355mm ²	0.000kN/m ³	47.21mm	2,550,128mm ⁴	55,190mm ³	80,208mm ³

1. Sección de la base de datos: Se utilizan las propiedades predefinidas en la base de datos

2. Sección definida por el usuario: Se utilizan las propiedades calculadas automáticamente como secciones de espesor delgado.